PROJECT MANAGEMENT SKILLS FOR HIGHLY SUCCESSFUL VIRTUAL PROJECT TEAMS

by

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February 2022

Abstract

Virtual project teams gained wider acceptance in organizations over the past 30 years, supported by improved communications technology and spurred by global competition. Virtual working arrangements provide benefits to employers, employees, and the environment. The COVID-19 pandemic of 2020-2021 stimulated the transition from traditional to virtual project teams. Project management in the virtual environment requires different skills than leading in the collocated environment. Skills that lead to successful project outcomes in the traditional environment do not simply transfer to the virtual environment. Project managers must focus on new skills, especially those that contribute to developing open communication and building trust. This qualitative case study examined the problem that some project managers lack the skills to lead in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. This case study also filled a gap in the literature, providing real-world best practices of project management leadership skills applied in the virtual environment. Seventeen (17) virtual project team managers and project team members from the MITRE Corporation, a leader in the government contracting industry, shared their experiences leading successful project teams. Through semi-structured interviews, coding, and analysis, five main themes emerged: Importance of Communication to the Success of Virtual Project Teams, Importance of Trust on the Performance of Virtual Project Teams, The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams, Virtual Project Teams Create Advantages, and Virtual Project Teams Present Challenges. The practical application of these themes resulted in nine lessons learned. Understanding these themes and applying the lessons learned should improve the practice of project management, general business, and virtual project success.

Keywords: virtual project teams, project management, trust, communication

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by

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A Dissertation Submitted In Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Liberty University, School of Business

February 2022

Approvals

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Dedication

I dedicate this dissertation to my family. Thank you to my passionate and intelligent children, Alex and Katie, for believing in me, supporting me, and for sharing their unlimited, much needed, technical assistance. You two inspire and humble me each and every day. It was your faith in me that kept me persevering when I considered abandoning this long journey. I would also like to thank my husband, Jerry. Thank you for allowing me to take this time to pursue my dream, sharing your professional experience and contacts, providing unpaid editing services, occasional counseling services, and for generously financing this educational journey. I am not sure what the future holds, but I know life is better with you by my side.

Thank you to my parents, Larry and Linda Wellman, for covering my entire life with prayer and love. I am beyond appreciative of your unwavering support, which enabled me to accept challenges that frightened me. You both championed my love for education and most importantly my faith in God. Your lives are a testimony for humbly serving others in the name of God. My father went to live with the Lord during my doctoral journey, but my mother faithfully listened to my daily trials and tribulations, shared her wisdom, and encouraged me to continue until the end. Finally, I would like to thank my grandmother, Dr. Ruth Wellman, who fostered a love for science and a lifetime of learning within me. My grandmother completed her doctorate in 1971, at the age of 51 from the University of Ohio before it was fashionable for an older woman to pursue higher education. She was a fearless believer of Christ, a proud warrior of God and a trailblazer for higher education among women. Knowing the zeal with which she pursued her degree, and the challenges she encountered encouraged me to pursue my dreams and follow in her path.

I dedicate this dissertation to my entire family, and hope it adds to our family legacy of education and never getting too old to pursue your dreams.

Acknowledgments

I would like to acknowledge my chairman, Dr. Keith Mathis, for his guidance and wisdom throughout my dissertation journey. Dr. Mathis provided this doctoral candidate with continual, and much appreciated direction, feedback and support. His tireless commitment to God and the process motivated me to continue when my resolve wavered. Thank you for undertaking and persevering through this process with me.

I would also like to recognize the support of my committee member, Dr. Ranjan George for his support and feedback. I always looked forward to his positive outlook, fresh perspective, and encouraging words. Thank you also to Dr. Edward Moore and Dr. Nicole Lowes for providing direction to the dissertation process, and for their timely responsiveness.

Finally, I would like to thank the Mitre Corporation for granting me access to their amazing, talented, and professional employees. To those that agreed to participate in my study, thank you for honestly sharing your experiences, and trusting me to tell your story. I was beyond impressed at your generosity and grateful for your time. You all continued to serve our nation through your work during the pandemic, and I hope others can incorporate the lessons you learned to successfully work on virtual project teams in the future.

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Section 1: Foundation of the Study

The worldwide COVID-19 pandemic of 2020-2021 ignited the implementation and acceptance of flexible working arrangements and virtual project teams. Before the pandemic, 15% of employees in the United States worked from home, whereas at the height of the coronavirus outbreak in March 2020, 50% of U.S. employees completed their work in a virtual environment (Brynjolfsson et al., 2020). While virtual working arrangements continued to increase over the past several decades, the COVID-19 pandemic stimulated this transition. In the State of Remote Work 2020, Global Workplace Analytics (2020) called the COVID-19 pandemic the largest work-from-home shift ever, "We've officially fast-tracked to the future of work" (p. 1). Thus, there was a unique opportunity to observe virtual project teams during this time of changing workforce and capture lessons learned that can further research and improve the efficiency and effectiveness of virtual project teams in the future (Whillans et al., 2021).

The qualitative case study presented in this research focused on the general problem of a lack of leadership skills among some Project Managers to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. The project management skills that lead to success in traditional project teams do not necessarily lead to success in virtual project teams (Liao, 2017; Maduka et al., 2018). "Generally, virtual teams are more difficult to lead than face-to-face teams" (Efimov et al., 2020). MITRE Corporation's widespread use of virtual project teams uniquely qualified it to provide the case study for this research in the government contracting industry. The investigation of successful project teams at MITRE supported the identification of themes and lessons learned which may facilitate the success of future virtual project managers and their virtual teams.

Section 1 forms the foundation upon which the study lies. Sections discussing the background of the problem, the problem statement, the purpose statement, and the research questions frame the study. The nature of the study section, including a discussion of research paradigms, research designs, research methods, and triangulation outline how the researcher approaches the study. The conceptual framework section lays out the key theories and concepts from the current body of knowledge in both a narrative and graphical format. The definitions of terms section, along with the assumptions, limitations, and delimitations section sets a baseline for understanding the study. The significance of the study highlights how the study can reduce gaps in the literature, hold a biblical worldview, and benefit business and the field of project management. Finally, the foundation of the study includes a thorough review of the professional and academic literature, focusing on the business practices, the problem, concepts, theories, related studies, and the anticipated and discovered themes. Together, these sections serve as the foundation of the study.

Background of the Problem

The number of employees working in a virtual environment, separated geographically from their peers, continues to increase in popularity in the current global business environment. Teleworking in the United States has increased by 159% since 2005 (Global Workplace Analytics, 2019). Advances in technology, especially in telecommunications and internet connectivity, in conjunction with the transition to a more knowledge-based economy, has supported the adaptation of virtual work arrangements and geographically diverse project teams (Kaplan et al., 2018). Virtual environments provide benefits to both organizations and employees including reducing commuting time and its associated environmental impact, improving employee retention by providing work flexibility, reducing the need to relocate critical

employees, improving the ability to recruit by broadening the available applicant pool, reducing real estate costs, increasing productivity, lowering stress, improving work-life balance, and inciting loyalty (Mello, 2019). Additionally, the implementation of virtual project teams improves project effectiveness, realizes cost efficiencies, and encourages innovation (Dulebohn & Hoch, 2017).

The increase in the adaption of virtual project teams introduces new challenges for project managers, especially in establishing the trust and environment of open communication positively impacting project success. Liao (2017) argued virtual team leaders play an integral role in overcoming these challenges and realizing the potential benefits of virtual project teams. However, Moran and Youngdahl (2014) believed leaders of virtual project teams require specific training to effectively manage a virtual team, especially in the skills necessary to establish trust and encourage an atmosphere of open communication. Maduka et al. (2018) determined virtual team leadership differs from traditional team leadership and it is essential for virtual team leaders to be cognizant of the unique leadership competencies critical in achieving effective virtual team leadership. The authors concluded the organization under study failed to achieve its organizational goals due to the poor virtual leadership provided on two virtual project teams. The project leaders lacked the key competencies vital to achieving organizational success: including effective communication and trust. Maduka et al. (2018) summarized, "Understanding the competencies needed for virtual leadership effectiveness is vital to achieving organisational success" (p. 709). Additional research by Newman et al. (2020) analyzed 458 responses from 68 virtual teams and reported a positive relationship between team leaders' effective use of communication and the team members' perception of team performance. Another quantitative research study conducted with 300 multi-national virtual teams in Malaysia described a team

leader's ability to communicate well, build cohesive team relationships and trust predicted a project team's successful performance (Tan et al., 2019). Thus, current research suggests project managers must focus on new skills specific to building trust and open communication on virtual teams to improve overall team performance.

Problem Statement

The general problem addressed was the lack of leadership skills of some project managers to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. Virtual working arrangements continue to increase in the United States (U.S. Bureau of Statistics, 2019); however, the skills leaders successfully employ in the traditional, collocated environment do not simply transfer to the virtual environment (Ford et al., 2017). Many project managers lack the skills necessary to overcome the barriers created by a lack of face-to-face interactions and create high performing teams in the virtual environment; especially employing new techniques to encourage trust and an atmosphere of open communication (Liao, 2017; Olaisen & Revang, 2017; Purvanova & Kenda, 2018; Zuofa & Ochieng, 2017). In a survey of project management professionals working in virtual environments, 76% of participants reported trouble engaging remote team members, 58% struggled to create an atmosphere of open communication, and 55% had trouble building trust within their virtual teams (Pullan & Prokopi, 2016). The specific problem addressed was the lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success.

Purpose Statement

The purpose of this flexible design case study was to understand the reasons contributing to the project manager's lack of the necessary skills to lead projects in the virtual environment, and the effect it has on project efficiency, productivity, and overall project success. Unfortunately, while the current research identifying tools and methods to develop effective co-located project teams is plentiful, there is little research concerning the best practices to ensure effective and productive virtual project teams (Maes & Weldy, 2018). Thus, there is a gap in the literature concerning the appropriate leadership skills project managers should incorporate in their virtual project teams to encourage the trust and open communication necessary to improve project efficiency, productivity, and overall project success. The research presented here extends the existing body of knowledge through an in-depth study of virtual project management to understand the skills project managers effectively employ in the government contracting industry, as guided by the identified research questions.

Research Questions

Developing clear research questions is key to planning and executing successful research (Robson & McCartan, 2016). The flexible, single case study in this research sought to understand the problem of the lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in a reduction in project efficiency, productivity, and overall success. Research questions in case study research, as presented by Creswell and Poth (2018), focused on understanding the specifics of the case. Creswell (2016) added research questions in qualitative research are the broadest possible questions to ask to reframe the purpose of the study. The specific research questions that guided this research study are:

RQ1. What are the causes for the lack of skills among project managers to lead teams in a virtual environment?

RQ2. What project management skills support the leading of collocated teams?

RQ2a. What project management skills support the leading of virtual teams?

RQ3. What specific leadership skills do project managers need to uniquely contribute to virtual team success?

RQ3a. What project management skills encourage trust on a virtual project team?

RQ3b. What project management skills encourage open communication on a virtual project team?

RQ3c. How does the application of these skills influence the ultimate success of a virtual project team?

The first research question (RQ1) focused on understanding "why" project managers lack the skills necessary to lead successful project teams in the virtual environment. RQ1 added context to the problem statement and existing research suggesting project managers lack the skills to successfully lead project teams in the virtual environment (Liao, 2017; Purvanova & Kenda, 2018). The second research question (RQ2 and RQ2a) sought to understand what project management skills leaders can successfully implement from their experience leading collocated teams and successfully apply in the virtual environment. RQ2 also aligned with the problem statement and addressed research suggesting the skills leaders employ in the collocated environment are not necessarily successful in the virtual environment (Ford et al., 2017). The third research question (RQ3) and its sub-questions (RQ3a, RQ3b, and RQ3c) sought to understand what project management skills uniquely contribute to the success of virtual project teams. Since project managers most frequently report difficulties in encouraging trust and open

communication (Olaisen & Revang, 2017; Pullan & Prokopi, 2016; Zuofa & Ochieng, 2017), this research focused on identifying the skills that mediate these challenges and contribute to the ultimate success of a virtual project team. As presented in the problem statement, project managers must adapt new skills to overcome the challenges a lack of face-to-face interactions place on building trust and open communication on virtual project teams.

These research questions collectively guided a case study addressing the problem statement and describe how a successful project manager in the government contracting industry manages a virtual project team. According to Maes and Weldy (2018), while virtual teams are, "fast becoming the vehicles by which organizations conduct business today" (para. 1), there is little research concerning the best practices to ensure effective and productive virtual project teams. These research questions sought to understand the problem of the lack of skills of some project managers to lead teams in the virtual environment, resulting in a reduction in project efficiency, productivity, and overall success; and compensate for the negative effects a lack of face-to-face interactions have on building trust and open communication on a virtual project team in the government contracting industry.

Nature of the Study

A researcher's worldview, or paradigm, affects the research design they choose, the problem statement addressed, and the research questions put forth. In this study, the researcher's pragmatic worldview aligned with the practical analysis of evidence flexibly collected through multiple sources to gain an understanding of a real-world problem. In addition, the problem statement focused on *understanding* the lack of leadership skills of project managers in the government contracting industry to successfully lead virtual project teams, which aligned with a qualitative, rather than quantitative research design. Specifically, a case study was most

appropriate to effectively addresses ‘how’ and ‘why’ research questions that occur in real-world scenarios according to (Yin, 2018). In this case, the research questions addressed *understanding* the skills necessary for project managers to successfully lead virtual project teams, and once identified, *how* the application of these skills influenced the ultimate success of a virtual project team. Thus, for this researcher, addressing the problem statement and research questions of this study, a flexible, qualitative, case study research design was most appropriate.

Discussion of Research Paradigms

Philosophical worldviews affect the way individuals conduct research. They are the lens through which the researcher sees the world and are intimately personal to each researcher. Our worldview affects the way we ask questions, conduct research, and present our findings. The main research paradigms are positivism, post-positivism, constructivism, and pragmatism.

Positivism. Positivism assumes there is one reality, governed by immutable laws humans can discover through scientific means. The positivism paradigm has its roots in natural science and holds, “science is credible and possible because every scientist looking at the same bit of reality sees the same thing” (Robson & McCartan, 2016, p. 22). Positivists approach studies in the social world the same as studies in the natural world, believing they can formulate a law for social phenomenon through the application of scientific methods (Rehman & Alharthi, 2016).

Post-positivism. Post-positivism emerged to overcome challenges associated with the positivist worldview. Like positivists, post-positivists believe there is one true reality in existence, and that reality is not dependent on researcher perspective. However, post-positivists believe a researcher’s values and beliefs affect their observation of reality, and this subjective perspective distorts any understanding of the true reality (Rehman & Alharthi, 2016). Like

positivists, post-positivists rely on the systematic data collection most associated with quantitative research (Robson & McCartan, 2016).

Constructivism. Unlike positivism and post-positivism, constructivism does not argue for an objective reality, but rather, argues individuals create their own subjective reality through social interactions. Constructionists believe people construct their own realities, and constructivist researchers aim to uncover those unique individual viewpoints of individuals. These researchers engage in very personal dialogue with their participants, write in a personal way and develop their theories from the ground up (Creswell, 2016). Thus, the constructivist research paradigm aligns with qualitative research.

Pragmatism. Researchers holding a pragmatic worldview aim to find solutions to real-world problems and focus on the practical outcomes of their research, commonly referred to as 'what works' (Creswell & Poth, 2018). While acknowledging researcher values affect the design and conclusion of studies, pragmatists believe this influence does not negatively impact their results (Robson & McCartan, 2016). According to Creswell (2014), pragmatism often leads researchers to use multiple forms of data collection and analysis, including interviews, document analysis, artifacts, and observation. Korte and Mercurio (2017) argued pragmatism bridges the gap between academicians and practitioners as it focuses on making tangible improvements in the everyday experiences of people in the real world. "There is a wonderful sense in Pragmatism of staying close to the ground and getting one's hands dirty while striving to improve the human world in which we live and work" (Korte & Mercurio, 2017, para. 84).

The author conducting this research aligned with the pragmatism paradigm. The pragmatic philosophical worldview affects how a researcher conducts a study as it is the lens through which a researcher views the world. Thus, holding a pragmatic research paradigm means

a researcher will place more emphasis on common sense and the practicality in each situation, while remaining flexible in choosing how he examines the real world. The pragmatic research paradigm guided this case study seeking to understand the practical problem that project managers in the government contracting arena lack the skills necessary to lead their teams in a virtual environment successfully.

Discussion of Design

There are three main designs available for conducting research: fixed, flexible, and mixed methods. The research design represents the strategy, or general approach a researcher employs to address their study. The defined problem statement, purpose, and research questions of a study guide the researcher to select the appropriate design.

Fixed Design. The fixed design allows researchers to test objective theories and hypothesis using quantitative methods (Creswell, 2014). Research questions are "fixed" before data collection, and researchers employ hard, statistical data to examine the variables designed to accept or reject a hypothesis. In general, fixed design research focuses on identifying cause and effect through deductive reasoning, standardized and objective protocols for data collection, with a focus on generalizability (Morgan, 2014). Fixed designs usually assume a detached researcher focusing on aggregating group characteristics and general tendencies, rather than individual cases (Robson & McCartan, 2016). The basic function of quantitative research is to *explain* human behavior (House, 2018).

Flexible Design. Unlike quantitative designs, flexible designs do not start with a theory to test, but assumptions to explore through qualitative methods. The research design is flexible, indicating the research design may adapt and evolve as the research progresses (Robson & McCartan, 2016). Qualitative designs are appropriate when the researcher seeks a detailed

understanding of a problem or issue (Creswell & Poth, 2018). Uncovering the rich understanding of qualitative research is time and labor intensive, based on the interpretation of personal interactions and experience, and requires researchers to focus on ethical and privacy issues (Stake, 2010). Flexible research designs support research when its purpose and procedures are inductive, subjective, and contextual (Morgan, 2014). The basic function of qualitative research is to *understand*, rather than explain human behavior (House, 2018).

Mixed Methods Design. A mixed method research design is a rapidly emerging research paradigm that bridges the gap between quantitative and qualitative designs (Baškarada & Koronios, 2018). There is consensus regarding the quantitative and qualitative methods researchers employ in both the fixed and flexible research designs. However, the mixed method design provides the researcher the ability to choose a combination of methods which provide the greatest advantages for the research (Morgan, 2014). Researchers choosing a mixed methods design believe the combination of the qualitative and quantitative designs allow for a more complete analysis of the research question. A mixed method design incorporates elements from both qualitative and quantitative research, and thus, enhances triangulation (Robson & McCartan, 2016).

The study presented here incorporated a flexible design using a qualitative method. The flexible, qualitative approach was appropriate for addressing the problem statement presented for this research which focused on understanding the real-life problem that project managers in the government contracting arena lack the skills necessary to lead their project successfully in a virtual environment. The flexible design using a qualitative approach was also appropriate as the research questions were open-ended and addressed through interviews. A fixed design using

quantitative methods was not appropriate since the research's goal was not to assign correlation or determine causation (Robson & McCartan, 2016).

Discussion of Method

There are five main approaches to qualitative research design: narrative, phenomenological, case study, grounded theory, and ethnography (Creswell & Poth, 2018). The research problem, purpose and research questions collectively determine which of these qualitative research designs methods best fits a particular study.

Narrative. The narrative design of qualitative research is most appropriate when the life experiences of an individual can address the research question. While there are no strict rules guiding narrative research design, the researcher begins by identifying an appropriate individual (or two or three) whose life story correlates to the identified research phenomenon (Creswell, 2016). The researcher collects the subject's experiences through interviews, observations, and document analysis, and then chronologically organizes these stories. The researcher incorporates a coding system to allow themes to emerge from this restorying. Finally, the researcher will place context around the stories to add detail, often a description of the people involved in the study, the physical location, culture, and historical context. The personal accounts associated with the narrative research design can provide rich, intensive data illuminating the central research question.

There are several challenges associated with the narrative research design. First, the narrative design requires the accumulation of extensive data to create detailed accounts of the individual's experiences, and this requires a significant time commitment from both the researcher and the subject. The subject must also be open, able, and available for interviews and artifact analysis as they play an active, collaborative role in narrative research. Secondly, since

the researcher is the primary instrument (as in all qualitative research) there is inherent bias. To accurately capture the subject's experience, the researcher must first understand the effect of their personal perspectives, and minimize the influence their own culture, demographics, and previous experiences have on the re-storying. In addition, the researcher needs the ability to discern if the subject is completely honest and forthright when sharing their experiences. Additional data collection strategies, such as document analysis and photos can help add context and validate the individual's stories.

Phenomenological. The phenomenological research design explores the experiences of individuals who have experienced a specific phenomenon. The researcher's intention is to focus on the commonalities and describe the essence of those shared lived experiences (Creswell, 2016). Unlike the narrative design, the researcher identifies and collects data from several individuals, generally three to fifteen, who have experienced the phenomenon described in the research question. Interviews are the most common data collection strategy employed, although observation and document analysis often add richness and validity. Themes emerge from an analysis of the significant statements from the interview transcripts, and the researcher uses these descriptions to capture the essence of the phenomenon as experienced by the research subjects. The essence describes "what" the individuals experienced as well as "how" they experienced it (Moustakas, 1994).

One of the main challenges of phenomenological research, similar to the narrative design, is the vast amounts of data collected from research participants, and the large amount of time required to analyze and validate this data. A second challenge to this type of research is personal bias. The researcher's goal in phenomenology is to document the lived experiences of their subjects, setting aside their own opinions and experiences with the phenomenon. Bracketing

helps the researcher identify their own experiences with the phenomenon, remove this bias from the project, and focus on the subject's experiences with a fresh perspective. Bracketing may be a difficult task, and while a researcher can never completely remove their personal bias, self-reflection and practice can help minimize its effect on the research. In addition, peer debriefing will prove invaluable to ensure this bracketing is effective.

Case Study. The case study is an appropriate methodology in qualitative research when the research questions seek to understand a contemporary issue through the in-depth analysis and description of a single, or multiple, real-life case using a variety of qualitative data collection techniques (Creswell & Poth, 2018). According to Yin (2018), case study is most appropriate when answering "how" and "why" research questions in the real world and not a controlled environment. If the research is intrinsic, the researcher will choose a unique case to highlight an issue; if the research is instrumental, the researcher will identify and select a case to understand the research question (Stake, 1995). Researchers choose a single case if they are critical, unusual, common, revelatory, or longitudinal (Yin, 2018), and can be holistic in nature (examines an entire group or program), or the more complex, embedded (examines subunits within the case). Researchers choose multiple cases to address generalizability and perform cross-case analysis (Creswell & Poth, 2018) and replication (Yin, 2018). To fully understand the case, researchers will incorporate multiple data collection strategies including interviews, observations, and document analysis. The researcher's work will culminate in a description of the case, themes, and a summary of the findings, called assertions by Stake (1995), patterns or explanations by Yin (2018), or lessons learned by Creswell and Poth (2018).

The identification of the case is at the heart of the study and defines the research. Thus, the largest, and most basic challenge of the case study design is identifying a case to address the

research questions. A second challenge to the case study research design is the perceived rigor of the study. Historically, case study research was a "soft" form of research, often confused with non-research case studies (Yin, 2018). However, it is currently a challenging, "hard" form of research that requires following a clearly defined methodological path and has become more accepted in the past 30 years (Creswell & Poth, 2018). To combat this obstacle, the researcher should be thorough in their research design, follow clear procedures, and provide a well-documented case description and fair analysis.

Grounded Theory. The grounded theory qualitative research design is most appropriate when the researcher's goal is to generate a theory to explain a process, action, or interaction, and no existing theories answer the research questions (Creswell, 2016). The theory is 'grounded' in data collected from many participants and analyzed as part of the study. Grounded theory goes beyond description and focuses on discovering a new theory with, "a central phenomenon, causal conditions, strategies, conditions and context, and consequence" (Creswell & Poth, 2018, p. 89). American sociologists Glaser and Strauss introduced the grounded theory research design in 1967, believing theories should arise from data collected in the field (Robson & McCartan, 2016). Creswell and Poth (2018) defined two types of grounded theory: systematic (systematically conducting interviews in the field until the categories under investigation reach saturation), and constructivist (emphasizes diversity and does not focus on a core category). Grounded theory research involves a researcher going out into the field to collect data, most commonly through interviews, however observation and document analysis can also be employed. Data collection and data analysis occur simultaneously as the research is an iterative process (Creswell & Poth, 2018).

The first challenge in grounded theory is for researchers to put aside their personal experience, beliefs, and biases. A researcher needs to keep an open mind, developing their new theory from the data they collect in the field, and not influenced by existing knowledge. Following the structured, systematic grounded theory approach, and using coding methodologies ensures the theories developed focus on the data collected, significantly reducing the effect of personal bias. A second challenge of the grounded theory research design is deciding when the theory is well-established, and the research complete (Robson & McCartan, 2016). The researcher collects data from the field, analyzes the data, and then returns to the field to collect additional data to address gaps and support his developing theory. The process continues until they meet a saturation point, where additional data contributes nothing substantial to the new theory. Creswell and Poth (2018) believed this saturation occurs after 20 to 60 interviews (Creswell & Poth, 2018). A third challenge is identifying a group of participants through theoretical sampling. Instead of a random selection, subjects have experienced the process under investigation and can aid in the formulation of the theory.

Ethnography. The final qualitative research design, ethnography, is most appropriate when the researchers aim is to study the culture within a social group to understand how a culture sharing group works (Robson & McCartan, 2016). While grounded theory aims to develop a theory, ethnography starts with a theory and then observes the group, as an insider, to create a new way of understanding the group and how it functions (Creswell & Poth, 2018). Ethnographical research has its origins in early 20th century anthropology but has gained wider acceptance in recent years (Creswell & Poth, 2018). In ethnography, the researcher becomes immersed and accepted within the group to study them in a natural environment over time. Collected through participant observation, rich, descriptive data describes the group culture. The

culture group investigated is quite large and must be well-established to ensure cultural norms have fully emerged. While there are many types of ethnographies, the two main forms are realist and critical. In realist ethnography, the researcher seeks an objective description of a culture-sharing group as a detached observer, reporting from a third-party perspective (Creswell & Poth, 2018). In critical ethnographies, the researcher is openly an advocate for a marginalized group. The researcher's intent is to bring about change, giving more power and a stronger voice to those without power and voice (Creswell & Poth, 2018).

One challenge in ethnography is the researcher becoming too involved in the social group, often called 'going native' and negatively impacting the quality of the study (Robson & McCartan, 2016). According to Creswell and Poth (2018), a researcher who 'goes native' may compromise the research study or make it impossible to complete. A second challenge in ethnography is the time required to complete a "full-scale" study of the culture group. Historically, the researcher stayed in the field for "two or more years" (Robson & McCartan, 2016, p. 157). Recent ethnographies have reduced this time, but still require the development of an intimate relationship in the group. Creswell (2016) argues researchers must spend considerable time, possibly six months or more, in the field to understand the shared culture of the group.

The specific qualitative method adopted for this research was the case study. A case study allowed the researcher to develop a detailed, intensive knowledge about the specific case. Case studies are a rigorous form of research investigating a phenomenon in a real-world context incorporating multiple sources of data collection, including interviews, observations, and document analysis, over time to fully understand the case (Robson & McCartan, 2016). For this research, the case examined successful project managers from the government contracting

industry, where successful project managers have moved from leading collocated project teams to leading virtual project teams. Case study research questions are open-ended, evolve, are nondirectional, and focus on gaining an in-depth understanding of a clearly bounded system (Creswell & Poth, 2018). A bounded system is a case, and in this research the case came from a pool of successful virtual project teams operating in the government contracting industry. The research questions sought to understand the team's experience, exploring their project manager's lack of skills to lead virtual project teams, as well as understanding *what* project management skills are successful in leading virtual project teams. The questions specifically focused on which skills are successful in developing a sense of trust and open communication within the team. Thus, the research questions in this study appropriately aligned with the case study research design.

Discussion of Triangulation

Triangulation is one method researchers can employ to enhance validation in their studies and improve rigor (Robson & McCartan, 2016). Triangulation involves using multiple sources to study research data. Natow (2020) described different forms of triangulation, including multiple data sources, multiple methodologies, multiple data analysis techniques, and multiple researchers. Multiple data sources may involve collection data over different time periods, from different locations, or from different perspectives. Implementing multiple methodologies involves varying the data collection techniques used, such as a combination of interviews, observation, and document analysis. Multiple data analysis techniques may involve the researcher using both inductive and deductive approaches in their analysis. Finally, triangulation involving multiple researchers can occur in data collection or data analysis, but Natow (2020) warned all researchers must match the skills of the primary researcher. When researchers use

multiple sources to corroborate findings, the data converges, increasing confidence (Yin, 2018). Triangulation allows researchers to have confidence they have, "the meaning right" (Stake, 2010, p. 124). Creswell and Poth (2018) believed triangulation is one of the most common, and easily implemented validation strategy.

In this qualitative study, triangulation of data included using multiple interview sources to corroborate themes and perspectives. While project managers were the key interview subjects, project team member interviews and interviews with the human resources department supplemented these interviews and added additional perspectives, clarification, and feedback to the research. In addition, whenever available, documents, including emails and meeting minutes, provided another form of data triangulation to supplement the interview data.

Summary of the Nature of the Study

The flexible, qualitative case study research design was the most appropriate research methodology to study the problem statement and research questions set forth in this study. In addition, the pragmatic research paradigm held by this researcher supported the real-world nature of the case study research methodology, and its flexible data collection techniques. The in-depth nature of the case study design allowed the researcher to gain an *understanding* of the lack of skills of some project managers in the government contracting industry necessary to successfully lead virtual project teams and *how* the application of certain identified skills influenced the ultimate success of a virtual project team.

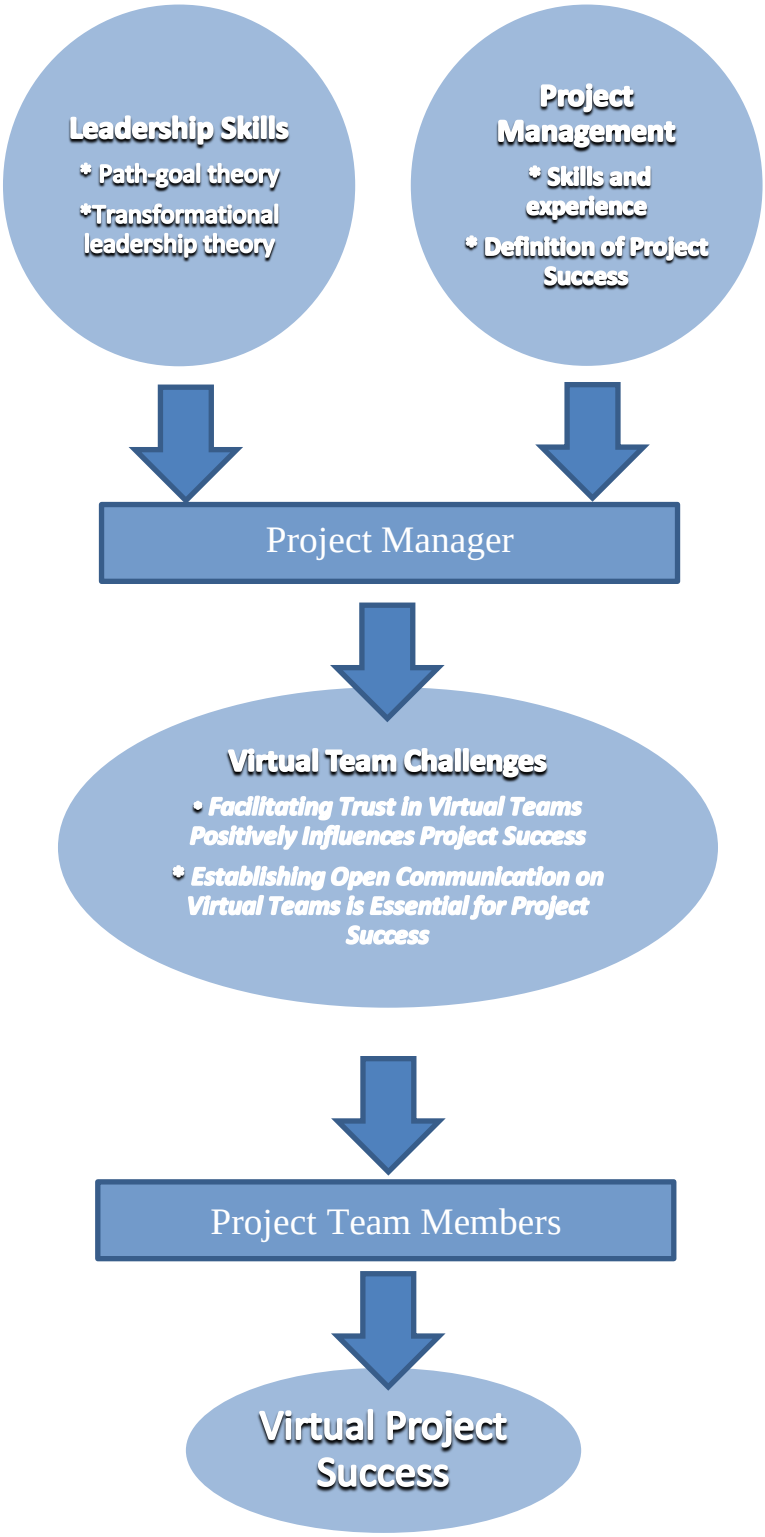
Conceptual Framework

Project management and leadership skills influence the success of project managers. Often this knowledge and experience enable them to lead traditional project teams successfully. However, when faced with the challenges of a virtual project team, they often find the need to

incorporate additional concepts to be successful in leading virtual project teams. Two leadership theories, and two well-established concepts from the current body of literature guided this study. Specifically, the path-goal theory developed by House (1996) and transformational leadership theory introduced by Bass (1985) provided the theoretical basis for this research. Concepts from current literature concerning the challenges of virtual project teams, and guiding project management concepts, also guided this research. Together, these theories and concepts served as the conceptual framework for the design of this research. The conceptual framework graphically depicts key aspects of research and provides a visual representation of the overall study (Robson & McCartan, 2016). Figure 1 represents the conceptual framework for this research.

Figure 1

Conceptual Framework Diagram



Concepts

Two well-established concepts from the current body of literature guided this study. The first concept involves the challenges of virtual project teams. Specifically, the concepts facilitating trust in virtual teams positively influences project success and establishing open communication on virtual teams is essential for project success. The second concept involves guiding project management concepts. Specifically, the generally accepted concepts that skills and experience influence project success, and the concept of the triple constraints, or the iron triangle, which indicates project success.

Virtual Team Challenges. The number of virtual employees, and thus, the number of virtual project teams continues to increase. In 2018, five million employees worked in a virtual environment at least half the time, comprising approximately 3.6% of the workforce in the United States (Global Workplace Analytics, 2020). The number of virtual employees has grown 173% since 2005 (Global Workplace Analytics, 2020), and studies show employees are eager to move to virtual work. According to Global Workplace Analytics (2020), a 2016 Gallup poll revealed 35% of workers would change jobs to work from home full-time, and a third of workers would take a pay cut of up to 5% of their salary for the opportunity. Virtual work arrangements also benefit employers and the environment. According to Mello (2019) virtual work improves productivity and employee retention rates, reduces real estate costs, opens the applicant pool, reduces commuter time, stress, and positively impacts the environment. In addition, “Virtual teams allow organizations to use the best people, with the appropriate skills and talents, wherever they might be located in the world” (Pullan & Prokopi, 2016, para. 10). The collaboration between these geographically dispersed teams can provide corporations with a competitive advantage by enhancing productivity and improving customer service (Zuofa & Ochieng, 2017).

Unfortunately, research shows supporting employees in the virtual environment provides many unique challenges. Managers must learn and adapt new leadership skills to prepare for leading in the virtual environment. The skills project managers successfully applied in the traditional, collocated work environment do not necessarily prepare them to successfully manage, build trust and communicate in the virtual environment (Schmidt, 2014).

The literature indicates successful project managers of virtual teams focus on establishing trust and open communication (Killingsworth et al., 2016; Liao, 2017). Verburg et al. (2013) agreed, virtual project managers need to approach their projects differently than leaders of collocated teams, highlighting the establishment of trust and open communication. Zuofa and Ochieng (2017) believed specific team leader behaviors can mediate the challenges of ineffective communication and lack of trust in virtual project teams.

Facilitating Trust in Virtual Teams Positively Influences Project Success. For virtual teams to be effective, they must collaborate well, which requires trust (Mehta & Shah, 2019). Thus, team leaders of virtual project teams must establish an environment of trust to facilitate this team collaboration and ultimate project success (Dixon, 2017). While "trust is important for any team to function and excel … its importance for virtual teams is even more critical" (Cascio & Shurygailo, 2008, p. 373). "Indeed, trust is the glue that holds virtual teams together" (Ford et al., 2017, para. 39).

Trust develops over time through first-hand experiences. While occasional face-to-face interactions enhance the formation of trust among team members, when that is not feasible due to cost and time restraints, an increase in team communication can help build trust on a virtual team (Mehta & Shah, 2019). Once established, consistent video and online communications can help maintain this trust (Dixon, 2017).

Trust is one of the main issues causing virtual work arrangements to fail and occurs at all levels. One study in the federal government discovered despite encouragement from the highest organizational levels, virtual work practices failed due to a lack of managerial trust (Brown et al., 2016). Employers often deny their employees the opportunity to work virtually, even if the employee requests it, their job is compatible, and the organization supports it if they lack significant trust in their employee (Kaplan et al., 2018). Thus, the successful implementation of virtual projects requires trust at all levels, with executives, managers, employees and within the project team.

Establishing Open Communication on Virtual Teams is Essential for Project Success. Open and honest communication is essential to performance and trust within strong project teams, and unless properly managed, is especially challenging in virtual environments which feature limited in-person communication (Chang et al., 2013; Fan et al., 2013; Hunt & Weintraub, 2017). While communication on virtual project teams can lack the richness of context available through facial expressions and non-verbal behavior, studies have shown improvement when teams utilize multiple modes of communication (e.g., email, videoconferencing, telephone, in-person; Foster, 2015; Morgan et al., 2014). Video technologies have the greatest promise to provide the nuances of face-to-face communications other technologies lack (Pullan & Prokopi, 2016).

A sense of isolation among virtual employees can complicate building trust and effective communications on a team (Chang et al., 2013). One study reported 62.5% of virtual team participants felt a sense of isolation because of a lack of face-to-face interactions with their team members (El-Sofany et al., 2014). “Virtual team members require more attention, not less. Technology makes them feel isolated, not connected. Therefore, what we need to provide virtual

team members is a feeling of connectedness" (Moran & Youngdahl, 2014, p. 180). One solution for this problem is the implementation of periodic face-to-face meetings among a project team. The lack of face-to-face communication is especially troubling when teams form and establish relationships (Purvanova, 2014). According to Rhoads (2010), the richness of cues available when meeting in-person can have a positive long-term effect on the level of communication and trust within virtual teams. Dube and Robey (2009) suggested including face-to-face communications to improve team performance.

Project Management. Project management positively influences project success (Badewi, 2016) and is critical to the successful economic growth of organizations (Larson & Gray, 2018). "Projects form the bridge between strategy and results" (Moran & Youngdahl, 2014, p. 33). While creating strategy is critical, "the full potential value of even the most advantageous strategy is only achieved through effective implementation … poor execution often squanders the value companies anticipate from innovative, advantageous strategic initiatives" (Galpin, 2018, p. 35). Thus, it is imperative to educate project managers in project management skills, and this is especially true for project managers of virtual project teams.

Skills and Experience Influence Project Success. It is crucial managers receive training specifically to lead virtual project teams. According to Schmidt (2014), successful skills in leading traditional collocated teams are not consistently effective in the virtual environment. "Virtual leadership differs from traditional leadership not in *what* leadership is, but in *how* leaders apply leadership functions and behaviors to address the unique challenges they face in their virtual environment" (Purvanova & Kenda, 2018, para. 37). Verburg et al. (2013) examined 30 experienced project managers from nine global companies and postulated project manager competency and the experience of virtual team leaders affected by the success of virtual project

teams. They also discovered setting rules for communication, project management style, project manager competence, and trust were vital conditions for successful project execution and task accomplishment in virtual project teams. Iorio and Taylor (2015) similarly indicated effective project leadership helped overcome virtual team challenges, improving overall team performance. Prior experience leading geographically dispersed teams, and experience with the technologies supporting virtual team interactions, improved virtual project manager performance.

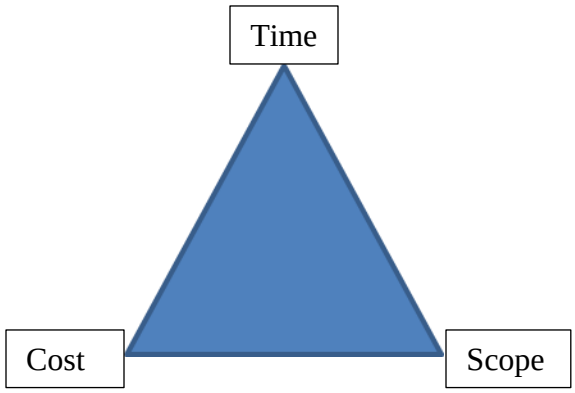
The Triple Constraints, or the Iron Triangle, Indicates Project Success. One of the most controversial aspects of project management is identifying the factors defining project success. Traditionally, the 'triple constraints' of time, cost and scope, also referred to as the 'iron triangle,' indicate success of a project (Cullen & Parker, 2015). "The triangle is a representation of the most basic criteria by which project success is measured, namely, whether the project is delivered by the due date, within budget, and to some agreed level of quality, performance or scope" (Pollack et al., 2018, para. 1). The three vertices of the iron triangle connect and influence each other, as shown in Figure 2. Any change in one side impacts the other two. For example, reducing the time for project completion may cause an increase in project cost, or require a reduction in the project scope.

More recently, the definition of a project has expanded, and the iron triangle includes additional factors such as customer satisfaction, corporate reputation, compliance with government regulation, strategic alliance, technical superiority, and ethical conduct (Kerzner et al., 2011). The Project Management Body of Knowledge (2017) states key stakeholders should agree to and document the objectives defining project success in the planning phase of project management. In addition, these success factors may change over the lifetime of the project, and

ultimately, it is the project manager's responsibility to manage all changes and ensure all key stakeholders understand the effect of the changes (Larson & Gray, 2018).

Figure 2

Iron Triangle



Theories

Ensuring project teams work together effectively is the function of leaders. Thus, project managers must understand the function of team leaders to ensure their project teams perform at the highest level. Especially since these project teams are responsible for much of the work completed in organizations. However, according to Amelkin et al. (2018), teams perform better than individuals on complex tasks only when they collaborate and work together. Thus, it is essential project managers effectively unite individuals with different backgrounds and experiences to improve their decision-making. Two theories with valid application to this research are the path-goal and transformational leadership theories. Each includes strong foundational aspects to influence the team and provide insight in both the traditional setting, as well as the virtual team environment.

Path-Goal Theory. The essence of the path-goal theory developed by House (1996) is, "leaders, to be effective, engage in behaviors that complement subordinates' environments and abilities in a manner that compensates for deficiencies and is instrumental to subordinate

satisfaction and individual and work unit performance" (para. 2). Leaders can positively influence team performance by adapting their leadership to the virtual work environment. Path-goal theory defines four categories of leadership behavior: directive, supportive, achievement-oriented, and participative.

Directive leadership behaviors provide structure, expectations and clear guidance required to perform tasks and achieve goals. Directive leadership is effective when teams are working on complex or ambiguous tasks (Byrd, 2019; MacDonald, 2013). According to House (1996), these behaviors include, "letting subordinates know what they are expected to do, scheduling and coordinating work, giving specific guidance, and clarifying policies, rules, and procedures" (p. 326). Farhan (2018) believed many managers adopt this style even though it can have a negative effect on employee satisfaction and performance.

Supportive leadership behaviors create a psychologically supportive work environment. Supportive leadership is especially conducive for managing mundane tasks or when team members exhibit dissatisfaction (Byrd, 2019; MacDonald, 2013). According to House (1996), these behaviors aim to satisfy, "subordinates needs and preferences, such as displaying concern for subordinates' welfare and creating a friendly and psychologically supportive work environment" (p. 326). Adopting a supportive leadership style improves team member self-confidence and satisfaction with their work (Farhan, 2018).

Achievement-oriented leadership behaviors include continuously setting challenging goals to maximize team member performance and increase confidence. Achievement-oriented leadership is most appropriate when team members are high-performers who are self-driven to succeed (Byrd, 2019; MacDonald, 2013). According to House (1996), these behaviors are, "directed toward encouraging performance excellence: setting challenging goals, seeking

improvement, emphasizing excellence in performance, and showing confidence that subordinates will attain high standards of performance" (p. 327). Leaders adopting achievement-oriented behaviors have high expectations and standards for their teams (Farhan, 2018).

Participative leadership creates greater autonomy for team members. Participative leadership is appropriate when team members collaborate to make work-related decisions (Byrd, 2019; MacDonald, 2013). According to House (1996), these behaviors include, "consulting with subordinates and taking their opinions and suggestions into account when making decisions" (p. 327). Empowering employees to work together and share information allows team members to learn from the experiences of others and improves satisfaction and performance (Farhan, 2018).

According to Bickle (2017), when leaders define goals, clarify the path to complete goals, help remove obstacles, and support tasks, they motivate their team members to achieve project goals while improving job satisfaction. As explained by MacDonald (2013), the path-goal theory is a situational leadership theory, meaning, no one leadership style is universally applicable. Instead, the most effective leadership style, capable of motivating team members and producing optimal work performance, depends on the leader, the employee, and the task. In this research, leaders positively influenced team performance by adapting their leadership to the virtual work environment. In addition, applying leadership skills effective in the collocated environment will be different than those applied in the virtual project team situation.

Transformational Leadership Theory. The transformational leadership theory describes the process of change or transformation in a team and has featured heavily in the leadership research of the last several decades (Mysirlaki & Paraskeva, 2020). As defined by Bass (1985), transformational leadership improves group performance by focusing on four

components: charisma or influence, inspirational motivation, intellectual stimulation, and individualized consideration.

According to Bass (1985), charisma is the most influential component of transformational leadership and separates true leaders from ordinary managers. Team members are proud to associate with charismatic leaders. Followers trust their leader can overcome any obstacle and have faith they will succeed. When leaders use charisma or influence, they become role models for their teams. Their behaviors are both admired and imitated by their followers (Bass & Riggio, 2006). Charisma evokes emotional responses from followers and can lead to exceptional performance, especially in difficult situations. However, truly charismatic leaders are hard to find in organizations. Similarly, when leaders use inspirational motivation, they inspire their followers by providing meaningful and challenging work (Bass & Riggio, 2006).

Leaders employ intellectual stimulation when they encourage their followers to question assumptions and reframe problems (Bass & Riggio, 2006). Followers increase their awareness of problems and consider their potential solutions. Intellectual stimulation does not evoke an immediate emotional response, such as with charism and inspirational motivation. Rather, it causes reflection, and the systematic analysis of threats and opportunities (Bass, 1985).

Finally, when leaders apply individualized consideration, they personally act as a mentor to each follower (Bass & Riggio, 2006). Leaders exhibiting individualized consideration focus on the development of their team members (Bass, 1985). Not only will these leaders focus on their followers' strengths and weaknesses for their present responsibilities but evaluate their potential for future assignments as well. Individualized consideration requires leaders to spend time with their followers, grooming them to take leadership positions in the future.

According to Paolucci et al. (2018), transformational leaders increase their team's commitment, ability to work together and improve the overall team experience. Transformational leadership contrasts with transactional leadership, which involves a leader providing primary motivation through rewards and punishment, and often follows 'a management by exception' philosophy (Bass, 1985). Transformational leaders garner higher levels of performance and dedication from their followers and achieve more significant results.

The literature shows transformational leadership has a positive impact on the performance, satisfaction, and cohesiveness of virtual project teams (Hoyt & Blascovich, 2016). Mysirlaki and Paraskeva (2020) also identified transformational leadership as a key determinant of the effective performance of virtual teams. In another study of 200 project managers in Ethiopia, researchers concluded transformational leadership directly influenced project success (Aga et al., 2016). Leaders can learn to apply transformational leadership behaviors to the benefit of their teams. Purvanova and Bono (2009) observed when leaders focused on increasing their transformational leadership skills, their team's performance improved. Thus, it is essential for project managers to learn to employ transformational leadership skills is a proven critical success factor for successful virtual project managers. A review of the professional and academic literature section contains additional examples of transformational leadership in the current body of knowledge.

Actors

Several groups of people are integral to this research: MITRE Corporation, Project Managers, Project Team Members, and the Human Resource Department.

MITRE Corporation. MITRE Corporation comprised the organization for this case study research. MITRE is a non-profit organization whose mission is to, "solve problems for a

safer world" ("MITRE: About," 2021). Operating as federally funded research and development centers (FFRDC) and public-private partnerships, MITRE works with national and local governments to, "tackle challenges to the safety, stability, and well-being of our nation" ("MITRE: About," 2021). MITRE was an ideal location for the case study as its work focuses on multiple large projects, their corporate culture embraces virtual project teams, and they are a leader in flexible working arrangements.

Project Managers. Project managers leading virtual project teams at MITRE use their leadership skills to plan, integrate, and execute projects, and were key interview subjects for this case study. These managers lead projects of various scopes and durations and work with the human resource department at MITRE for recruitment, placement, and training. The skills these project managers possess, and the skills they lack were the focus of this study.

Project Team Members. Project team members provide integral functional expertise and specific knowledge to identified projects. The project team members on virtual project teams at MITRE provided valuable insight into 'what works' on successful projects. The group of team member's formed additional interview subjects to enhance the feedback from project managers and offered clarification on the project manager's skills and their impact on virtual project team success. Project team member feedback was key to triangulation, ensuring case study validity.

Human Resources Department. The People and Corporate Strategy Office performs the duties of a human resource department at MITRE Corporation. The office holds responsibility for, "leading and shaping the organization's talent and people programs, strategic communications and brand, and directing the corporate strategy in alignment with the organization's mission and vision" ("MITRE: Leadership," 2021). The department provided insight into the selection process for project managers and their placement on virtual project

teams, and the essential skills and training required to successfully lead teams. The human resource department also assisted the researcher in determining the appropriate virtual project teams to include in this research.

Relationship Between Concepts, Theories, and Actors

As indicated in the Conceptual Framework depicted in Figure 1, the concepts, theories, and actors work together to frame this research. First, project management and leadership skills influence the success of project managers in the traditional, collocated project environment. Two theories, the path-goal theory, and the transformational leadership theory, directly influence the project manager's leadership skills. In addition, two concepts of project management, skills and experience and the definition of project success also directly impact the project manager. However, when the project manager leads a project team in the virtual environment, they face additional challenges. Virtual project managers need to focus on the concepts of facilitating trust in their virtual teams and establishing open communication within their project teams to positively influences project success. The effectiveness of the project manager to incorporate these virtual team challenge concepts influences the experience of the project team members, and overall virtual project success.

Summary of Research Framework

Two leadership theories (path-goal and transformational leadership), and two concepts covered in the literature (project management and virtual teams) guided this research. House's (1996) path-goal theory and Bass's (1985) transformational leadership theories addressed Research Question 1 (RQ1: What are the causes for the lack of skills among project manages to lead teams in a virtual environment?). Specifically, they explain why the skills project managers successfully utilize to lead their teams in the traditional, collocated setting, is different from

those that are successful in the virtual environment. The first concept concerning the challenges of virtual project teams addressed Research Questions 3, and its sub-questions 3b and 3c (RQ3. What specific leadership skills do project managers need to uniquely contribute to virtual team success?; RQ3a: What project management skills encourage trust on a virtual project team?; RQ3b. What project management skills encourage open communication on a virtual project team?) and suggested project managers should focus on building trust and open communication on their project teams. Finally, the project management concept concerning project management skills affecting project success addressed Research Questions 2 and 2a (RQ2: What project management skills support the leading of collocated teams? RQ2a: What project management skills support the leading of virtual teams?), and the traditional method for defining successful projects addressed Research Question 3c (RQ3c: How does the application of these skills influence the ultimate success of a virtual project team?). Together, these theories and concepts, depicted in Figure 1, aligned with the Research Questions, and served as the conceptual framework for this research design.

Definition of Terms

The following definitions provide a common understanding of the terms used in this research.

Co-located (or collocated): The term co-located refers to the traditional project team arrangement. All team members work at the same geographic location where they can collaborate and communicate face-to-face (Krasnokutska & Podoprykhina, 2020). Efimov et al. (2020) added these teams are based on presence and direct interaction. Collected, or physical are other terms for these work arrangements (Mehta & Shah, 2019).

Face-to-face communication: The term face-to-face communication refers to traditional, in-person interactions where individuals are physically present together at one time and can view facial expressions and body language in addition to listening to spoken language (Schulze et al., 2017). Face-to-face communications allows for the, "simultaneously sending and receiving [of] verbal and nonverbal messages in real time" (Tang & Bradshaw, 2020).

PMI: The Project Management Institute (PMI) is a global professional organization for project managers (Larson & Gray, 2018). The PMI represents 3 million project professionals and provides certification for project managers (Project Management Professional, or PMP), and standards as published in the Project Management Body of Knowledge (PMBOK). The PMI also provides training and supports research (PMI: Learn about PMI, 2021).

Project: The PMI defines a project as, "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2017, p. 4). A project focuses on delivering superior results based on covering the right scope of deliverables, on time, and within a defined budget (Badewi, 2016).

Project Manager: The Project Manager is the leader of the project team, providing direction, coordination, and integration to a diverse group to complete projects (Larson & Gray, 2018). The project manager is responsible for creating a high-performing team and held accountable for the delivery of project objectives (Larson & Gray, 2018). According to the PMBOK, project managers apply knowledge, skills, tools, and techniques to meet project requirements. Project management covers five stages: initiating, planning, executing, monitoring, and controlling, and closing (Project Management Institute, 2017).

Project Team: The project team is an interdependent group temporarily formed to complete a specific project, and share a common goal (Dube & Robey, 2009; Larson & Gray,

2018). Project team members may support a project on a full-time basis, or a part-time basis if they support additional projects, or retain functional job responsibilities. According to the PMBOK, the project team encompasses all individuals working on a project from start to finish and are under the direction of the project manager (Project Management Institute, 2017).

Teleworking: Teleworking is an alternative working arrangement allowing employees to use information and communication technology to carry out their work in a location other than their primary workspace (Biron & Van Veldhoven, 2016). Beham et al. (2015) added telework occurs, "outside of the traditional office setting," but, "is connected to it via computer and telecommunication technology (para. 1). Teleworking often uses a temporary location aimed to provide work flexibility to support work-life balance as enacted by the U.S. Congress 2010 Telework Enhancement Act (Bae et al., 2019). There is no common definition of teleworking, but generally assumes employees work outside of their employer's premises, and thus, excludes the self-employed (Aguilera et al., 2016).

Virtual Project Team: Also referred to in the literature as remote, scattered, dispersed, diverse and distributed teams or individuals (Makarius & Larson, 2017). The virtual team has at least one team member, and perhaps all, who are geographically separate (Pullan & Prokopi, 2016). Cascio and Shurygailo (2008) made the distinction that remote, or virtual teams have multiple permanent office locations, whereas teleworkers share one permanent office location. Virtual project teams rely on technology-supported communication methods and rarely or never meet face-to-face as a team (Larson & Gray, 2018). While teleworkers are usually remote on a temporary basis, virtual workers use their remote workspace on a more permanent basis. Tan et al. (2019) referred to teams covering large geographic distances and cross time zones as global virtual teams.

Assumptions, Limitations, Delimitations

Assumptions in the research design are ideas researchers accept as true. If these assumptions are incorrect, it will negatively impact the research results and conclusions. Limitations are potential weaknesses of the study the researcher must understand but cannot control. Delimitations are intentional boundaries set by the researcher to define the research. In this research, the delimitations included the definition and bounding of the case study. The following sections provide a description of the assumptions, limitations and delimitations potentially impacting this study.

Assumptions

Case study research relies on the ability of the participants to provide thick, rich descriptions of their experiences (Creswell & Poth, 2018). In qualitative research, open-ended questions asked through personal interviews most often provide this data (Creswell, 2016). One assumption of this data collection technique is the interviewer is skilled in creating an atmosphere conducive to collecting the participant's experiences and is fully capable of following up on open-ended questions to ensure completeness and the validity of the data (Creswell, 2016). Another assumption of this technique is the participant is willingly participating, understands the questions, and provides complete and truthful responses. While there is risk in these assumptions, thoughtful preparation before the interview, and practice can improve the ability of the researcher to identify when and if the participants violate these assumptions (Creswell, 2016). A final assumption of this research lies in the definition of virtual teams. The research presented here operates under the definition of a virtual teams as having at least one, and potentially all team members working in geographically separate locations. Thus, the distinction of a virtual team is dichotomous, they are either virtual or collocated. New

research indicates the possibility leadership differences may occur based on the 'degree of virtuality' (Foster et al., 2015; Liao, 2017; Purvanova et al., 2020). Thus, they argue virtual teams may lie on a continuum of connectedness, often described as low, intermediate, and high degree of virtuality. However, this research assumed the traditional, dichotomous definition of virtual teams.

Limitations

While the case study research design is appropriate for this proposed study, it does have certain limitations and inherent risks. The first limitation concerns time and financial resources (Creswell & Poth, 2018). Specifically, case study research requires in-depth analysis and multiple data collection procedures over time (Creswell, 2014). The research occurred in the fall of 2021; thus, this timeframe serves as a boundary for the analysis of the case study. A second limitation of the study is researcher bias. While there is inherent risk for personal bias in all qualitative studies, the researcher must ensure the analysis solely rests upon the participant's experience, and minimize researcher influence (Robson & McCartan, 2016). In this research, the focus rested upon the experiences of virtual project teams at MITRE Corporation. These teams comprised the case study as a representative group to study the lack of leadership skills of some project managers to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success.

Another potential limitation of the study is the timing. The case study research examined the experiences of virtual project teams at MITRE Corporation during the global COVID-19 pandemic of 2020-2021. The COVID-19 disease brought unprecedented change to employees and organizations across the globe and undoubtedly impacted the virtual project teams involved in this case study.

Delimitations

Case study research requires identification of the case under study and placing boundaries around the case (Yin, 2018). Setting these boundaries requires defining and describing parameters for the case, including the specific location where the case is located and the timeframe when the research occurs (Creswell & Poth, 2018). For this research, MITRE Corporation, headquartered in McLean, VA provided an appropriately bounded case for study. MITRE has implemented flexible working arrangements, including the widespread use of virtual project teams ("MITRE: Working at MITRE," 2019), and is committed to continual professional development ("MITRE: Professional Development," 2019). The human resource office at MITRE identified successful virtual project teams to study. The researcher ensured the specific teams were accessible, available, and willing to participate in the research. The case study had a time boundary, with data collection focused druing the fall of 2021.

Significance of the Study

Virtual project teams are increasingly common in the current business environment. However, while there is much research concerning the skills project managers successfully employ in traditional, collocated environments, there is much less concerning the real-life application of these skills in the virtual environment. Thus, this research filled a gap in the literature. Specifically, this research addressed the problem that some project managers in the government contracting industry lack the leadership skills to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. In addition, this research integrated a biblical worldview, which shaped the design of the study as it seeks to reflect God's love and righteousness to the world. The themes discovered through this qualitative case study provide benefits to business in general, and specifically to the field of

project management. The lessons learned can improve the training and selection of project managers for future virtual project teams and has implications for industries inside and outside of the government contracting industry. Finally, this case study explored the workings of virtual project managers and virtual project teams during the COVID-19 pandemic. Capturing these experiences may provide foundational data to future researchers as they examine the impact of reduced travel and face-to-face communications during the pandemic. COVID-19 not only disrupted business in the United States and abroad, but exponentially increased the number of employees working on virtual teams and may have initiated a heightened transition of the global workforce (Hitt et al., 2021; Zaharie, 2021).

Reduction of Gaps in the Literature

The existing body of knowledge contains a great depth of literature examining the project management skills that lead to successful projects in collocated team environments. However, while the research involving virtual teams has increased remarkably over the last several decades, research in key aspects of virtual team management is lacking (Olaisen & Revang, 2017). The rise of the virtual work environment and its supporting technologies creates an exciting realm of research possibilities that can greatly transform and improve organizational effectiveness in this era of changing work dynamics (Colbert et al., 2016). Gilson et al. (2015) conducted a thorough literature review on virtual team research in the previous decade and concluded, virtual teams, "provide great promise to organizations, and the field continues to be rich with research opportunities for the coming decade(s)" (para. 1).

One area of agreement in the current body of knowledge surrounding virtual project teams identifies trust as an essential challenge and key determinant for success (Cascio & Shurygailo, 2008; Dixon, 2017; Killingsworth et al., 2016; Liao, 2017; Zuofa & Ochieng, 2017).

Yet, while there is extensive research examining the leadership skills which positively affect trust in traditional environments, the literature has not analyzed with any depth what skills leaders can employ to build trust in a virtual work environment (Flavian et al., 2019). Training programs for virtual team leaders could improve virtual team project success, yet the literature lacks a solid base of research to influence these decisions (Ford et al., 2017; Purvanova et al., 2020). In addition, much of the research specifically covering virtual project management skills comes from research conducted in a laboratory setting (Gibbs et al., 2017; Newman et al., 2020; Purvanova et al., 2020). Thus, there is a gap in the literature concerning the real-life application of project management skills in the virtual environment. The case study research fills a gap in the current body of knowledge by providing an in-depth analysis of the skills virtual project managers successfully employ, specifically in the government contracting industry.

Implications for Biblical Integration

The case study research project addressed the project management skills required to successfully lead virtual project teams and reflected the biblical worldview of the researcher. The gospel serves as a lens through which Christian researchers view the world, and "will have all kinds of influence – profound and mundane, strategic and tactical – on how you actually do your work" (Keller & Alsdorf, 2012, p. 164). Christian researchers seek to glorify God through their work and fulfill Jesus's greatest commandments. "Love the Lord your God with all your heart and with all your soul and with all your mind and with all your strength. The second is this: 'Love your neighbor as yourself.' There is no commandment greater than these" (New International Version, 2011, Mark 12:30-31).

The case study research project aimed to improve how project managers lead their virtual project teams. Project managers must focus on trust and open communication to build a strong,

cohesive team (Liao, 2017; Olaisen & Revang, 2017; Purvanova & Kenda, 2018; Zuofa & Ochieng, 2017). Developing strong teams is essential to project and corporate success (Moran & Youngdahl, 2014). Scripture supports the importance of teamwork, for it is through teams that we share God's love. Paul highlights how Christians can achieve more for the glory of God when they combine their individual talents and create a stronger body, or team. "Just as a body, though one, has many parts, but all its many parts form one body, so it is with Christ" (New International Version, 2011, 1 Corinthians 12:12). Thus, project management and team leadership benefit from a biblical worldview.

Flexible working arrangements, including the implementation of virtual project teams, allows employees to manage their work-life balance, enhancing their ability to simultaneously serve God, their family, their community, and their employer. While some argue flexible work arrangements have a negative effect on profitability, the evidence suggests organizations who focus on their employees improve their bottom line (Hardy, 1990). Supporting employee's flexible work arrangements allows corporation to, "take an interest in them as people and invest in their whole lives, not just their productive work capacity" (Keller & Alsdorf, 2012, p. 223). The Christian viewpoint allows organizations to reflect God's love to their employees.

As Christian researchers, while we must uphold all applicable legal and ethical guidelines, we must also hold ourselves to an even higher standard, that of God himself. Paul admonishes Christians to, "Serve wholeheartedly, as if you were serving the Lord, not people" (New International Version, 2011, Ephesians 6:7). As Christians, our research represents God to the world, so every interaction we have with participants and fellow researchers must reflects God's love and the highest standards of integrity. Our ultimate goal is to share the gospel of Christ with others, so we must ensure our research honors God, and does not cause anyone to

stumble on the path to salvation. “Be careful, however, that the exercise of your rights does not become a stumbling block to the weak” (New International Version, 2011, 1 Corinthians 8:9).

As Christian researchers, we are privileged to use our research, our work, to honor God by loving our neighbor (Keller & Alsdorf, 2012). The biblical worldview guiding this qualitative case study research allowed the researcher to share God’s love with employees, follow a scriptural example of teamwork, and conduct research with the highest ethical standards to reflect God’s righteousness to the world.

Benefits to Business Practice and Relationship to Cognate

According to the United States Bureau of Labor Statistics (2019), the number of employees working in a virtual environment continues to grow. The number of U.S. workers operating in a virtual environment increased from 19% in 2003 to 24% in 2015 (United States Bureau of Labor Statistics, 2016). In addition, “New challenges, such as those presented by COVID-19, has increased the number and the size of virtual working teams exponentially” (Mysirlaki & Paraskeva, 2020, para. 60).

The flexible, case study research presented here contributes to the existing body of knowledge on virtual project management skills in the real world. Specifically, this research describes the real-world experiences of successful virtual project team managers at MITRE, a government contracting organization located in the United States. MITRE Corporation is uniquely qualified to provide the case study for this research due to its widespread use of virtual project teams in the government contracting industry. The outcome of this research is an in-depth description of the case under study at MITRE, highlighting the lessons learned from successful project managers and their teams. These lessons describe the project management skills successfully employed to build trust and open communication within virtual project teams. These

experiences may transfer to other government contracting organizations and influence training and staffing decisions in the government contracting industry. These lessons learned may eventually facilitate the success of future virtual project managers and the virtual teams the lead. The research may also contribute to virtual project management across a broader range of industries.

Team leadership provided by project managers directly impacts the probability of project success (Moran & Youngdahl, 2014). Traditionally, project management skills focused on leading collocated project teams, but current market trends favor more virtual project teams. Thus, understanding the skills unique to successfully managing project teams in the virtual environment is beneficial to the field of project management and to business practice in general.

Summary of the Significance of the Study

The qualitative case study research presented in this study examined the problem the lack of leadership skills of some project managers to lead teams in the virtual environment may result in reduced project efficiency, productivity, and overall success. The research helps fill a gap in the current body of knowledge, by providing a thorough examination of successful virtual project managers in a real-world setting. In addition, this research incorporated a biblical worldview, and aims to share God's love by serving others, building up the body through teams, and upholding the strictest ethical guidelines to reflect God's righteousness. Finally, this case study research described successful virtual project teams in the government contracting industry. Lessons learned from these teams may influence the skills employed by future virtual project managers and the success of their project teams.

A Review of the Professional and Academic Literature

The following section presents a review of the current literature relevant to the business practices, problem statement, concepts, theories, and studies connected to the phenomenon of virtual team project management. The literature review is an imperative step as it provides a frame of reference around the research and connects the study to the existing body of knowledge (Creswell, 2016). The literature review includes results from published studies whose topics closely align with the research (Creswell, 2014). The literature is, "what is already known, and written down, relevant," to the research presented (Robson & McCartan, 2016, p. 52). The literature review includes existing research published in peer-reviewed, scholarly journals and books, focusing on seminal works in the field, and generally published within the last 5 years. Included in this review are existing studies, both supporting and contradicting the problem statement, to ensure the presentation of multiple and varied points of view, and to provide a balanced overview of the current body of knowledge. The literature review includes the following sections: business practices, the problem, concepts, theories, and related studies. Also summarized are the anticipated and discovered themes from the literature.

Business Practices

The problem studied in this research focused on a business practice prevalent in the current workplace environment. Specifically, business is facing an exponential growth of its employees working in the virtual environment. The trend toward virtual work, and detaching work from a traditional, fixed workspace, often referred to as 'spatial revolution,' is a predominant workforce theme of the 21st century (Felstead & Henseke, 2017). Business practices describes the prevalence of the business practice, the benefits associated with the practice, and the challenges it presents. In addition, the massive number of work-from-home orders issued

across the world to reduce the spread of the COVID-19 virus, further accelerated this trend in an extraordinary way. According to Ferreira et al. (2021), the main causes of the trend toward the increase of remote work include economic reasons, competitive advantage, and pandemic response.

Virtual teams have become the norm for organizations whose members work across disparate geographical locations, relying primarily or exclusively on communication technology to complete common goals (Bhat et al., 2017). Advances in technology, especially in telecommunications and internet connectivity, in conjunction with the transition to a global, knowledge-based economy have supported the adaptation of flexible work arrangements and geographically diverse project teams (Kaplan et al., 2018). “When effectively managed, global virtual teams amplify the benefits of teamwork and possess greater innovation potential than traditional, face-to-face teams” (para. 2).

Fundamental changes occurring in the employment market make it harder for organizations to find the employees they need to implement their strategies and gain a competitive advantage in the market (Eckhardt et al., 2019). To face the mounting competition for key employees, corporations are adapting virtual working arrangements as a means to recruit and retain employees. “Moving forward, the overall success of organizations will depend on teaching and enabling employees working remotely to collaborate across different locations, time zones, and schedules” (Eckhardt et al., 2019, p. 20). However, this practice involves more than changing the work location of employees but represents a fundamental shift in the recruitment and training of employees. Mehta and Shah (2019) boldly predicted, “The future belongs to dispersed (virtual) teams; collocated teams (physical) will be [a] thing of the past” (p. 8).

The United States government is one of the nation's largest employers, and a supporter in the shift to increase remote work and use of virtual teams for its employees. Congress passed the Telework Enhancement Act of 2010 to encourage implementation of telework arrangements throughout the federal government (Cabaniss, 2020). In its annual follow-up report to Congress following the act, Cobert (2016) credits teleworking with improved recruitment, retainment, productivity, employee attitudes, emergency preparedness (and keeping government working during emergencies), reduced energy use, reduced real estate costs, and reduction in commuting miles. An impressive 51% of eligible federal employees currently participate in telework, and these numbers continues to rise (Cabaniss, 2020).

The growth of virtual employees is not only continuing to accelerate within the United States, but across the globe as well. According to Elldér (2019), there is particular growth in the United Kingdom, Denmark, Luxembourg, and Sweden. Elldér (2019) noted in Sweden the number of employees eligible to participate in flexible work arrangements has increased as the information technology and communication advances align with the changing workforce dynamics and employer acceptance. "We found that a significant increase in telework eligibility can be observed in all labour market sectors and in almost all categories of workers" (Elldér, 2019, para. 30).

Walker and Lloyd-Walker (2019) examined multiple reports based out of Australia and the United Kingdom concerning the future of the workforce and specifically, the field of project management. The 'Fourth Industrial Revolution,' defined by increased digitalization and automation of work, presents a radical change in the workplace environment (Hirschi, 2018). One of the main trends involves the continued improvement of communication technologies allowing individuals to work virtually, from anywhere around the world. In addition, immersive

communication technologies and virtual reality interactions more closely match traditional, face-to-face interactions. These trends encourage the implementation of virtual project teams around the world, and project managers who have the virtual collaboration and communication skills necessary to successfully lead these teams (Walker & Lloyd-Walker, 2019).

The COVID-19 pandemic and subsequent work-from-home orders issued around the globe to reduce the spread of the disease radically increased the number of employees working virtually during 2020-2021. Ipsen et al. (2021) conducted a quantitative study to document the experience of these workers, and the advantages and disadvantages they faced working from home offices. The subjects of this study were 5,748 professional and managerial knowledge workers from 29 European countries. Performing a factor analysis, the authors identified six factors that defined the common denominator of how people experienced working in virtual environments. The three advantages included work-life balance, especially among the 18-30 age group, improved work efficiency, and greater work control. The three disadvantages included home office constraints, work uncertainties, and inadequate tools, especially among those workers over 50 years old. While the researchers concluded the experience of their subjects was predominantly positive, they also point out these factors need replication in the post-COVID-19 environment. Ferreira et al. (2021) conducted a similar study of 129 remote workers and discovered cost reductions and work-life balance were the most popular benefits of working remotely, and identified communication, technology, and management issues as the main challenges. These authors also confirmed most employees reported more positive than negative effects from working from home during the pandemic. While many believe virtual workers will continue to work from home after the COVID-19 pandemic (Lister, 2020), the lasting effects are not yet known.

Benefits Associated with the Growth of Virtual Employees. There are a multitude of benefits identified in the current body of knowledge associated with businesses increasing the number of employees working in a virtual environment. These benefits include the categories of advantages for the employer, advantages for the employee, and advantages for the environment.

Virtual workers provide multiple benefits for their employers. Studies show offering flexible working alternatives to its employees improves productivity, employee retention, loyalty, reduces real estate costs, reduces the need to relocate employees, and enlarges the applicant pool for key positions (Mello, 2019). In addition, virtual work teams, "offers businesses greater flexibility and adaptability in coping with new market challenges" (Guinalíu & Jordán, 2016). Of particular interest to many corporations is the cost reductions incurred for remote employees. Global Workplace Analytics (2019) conservatively estimates employers save approximately $11,000 per part-time telecommuter per year. Their research identifies primary sources of savings include increased productivity, lower real estate costs, reduced absenteeism and turnover, and better disaster preparedness. According to Lister (2020), the office space of employees around the world is unoccupied 50-60% of the time, creating a valuable opportunity to reduce real estate costs.

As competition increases for skilled workers, employers use flexible working arrangements as an incentive to recruit and retain talented workers (Milligan, 2017). The United States federal government uses teleworking as a non-monetary incentive to recruit and retain valued government employees (Cobert, 2016). In return, the annual review of the governmental teleworking policies states federal agencies adopting telework cite improved worker productivity, partially due to a reduction in distractions (Cobert, 2016).

Virtual work opportunities improve the ability of employers to find and retain the most talented people with the highest skill sets wherever they reside, without the need to incur relocation expenses (Pullan & Prokopi, 2016). While time and expense often preclude organizations from hiring worldwide experts for traditional, face-to-face project teams; hiring these experts becomes feasible in the virtual project team environment (Liao, 2017). In addition, hiring experts for virtual project teams avoids the complicated international relocation issues caused by global political upheaval and constantly changing visa requirements (Maes & Weldy, 2018).

Some manager's fear their virtual employee's work performance will suffer compared to their in-office peers, or their physical absence will harm the working relationship among their teams. However, many studies suggest virtual employees provide improvements in these areas (Gajendran et al., 2015). While some experimental studies produced negative virtual team results, most case studies, conducted in real-world business settings, cite remarkably positive performance outcomes (Purvanova, 2014). For example, Dulebohn and Hoch (2017) determined virtual project teams have both improved project effectiveness and exhibited higher innovation levels partially due to their ability to assemble teams that maximize functional expertise while sharing knowledge across organizational units and geographic boundaries. Working on virtual project teams enhances productivity and improves customer service (Zuofa & Ochieng, 2017). However, not all studies of virtual employees yield positive results. One study by Mehta and Shah (2019) questioned the ongoing loyalty of virtual employees.

Employer benefits of virtual employees exist around the world. For example, Japan implemented virtual work arrangements to increase labor productivity and the availability of workers (Kazekami, 2020). The author affirmed telework increased employee's general life

satisfaction, which improved labor productivity. Workers who traditionally commuted more than one hour to their conventional office gained significant productivity when working from their virtual office. The gain in productivity is significant for a country like Japan, where a declining population is causing them to face a labor shortage. Adopting flexible working arrangements encourages women and the elderly to enter or re-enter the workforce as it allows these employees to strike a better work-life balance.

The benefits of remote working arrangements are especially significant for employees. Research shows virtual work improves employee work-life balance, decreases, or eliminates commute time, and reduces stress (Mello, 2019). Improvement in work-life balance is especially significant to employees and is, "a key catalyst to high performance" (Mello, 2019, p. 181). In addition, workers, "greatly value firms who see employees not just as physical input to generate output but accept their other roles" (Omar & Asif, 2016, para. 1). The rise of high-speed and mobile communication technologies, along with the increasing expectations for employee availability outside of the traditional workday, has blurred the line between business and personal time, increasing the importance of maintaining work-life balance (Omar & Asif, 2016).

Work-life balance is equally valuable for federal government workers. Bae et al. (2019) surveyed 376,577 federal employees who accepted teleworking to improve work-life balance following Congress' passage of the 2010 Telework Enhancement Act (TEA), and President Obama's issuance of the Presidential Memorandum entitled, 'Enhancing Workplace Flexibilities and Work-Life Programs.' The researchers revealed support from leadership and diversity management improved workers willingness to accept teleworking arrangements. In the State of Remote Work (Global Workplace Analytics, 2020), 80% of employees cited elimination of commuting as the main reason they wanted to continue to work from home. According to the

report, the average employee could gain 40 minutes per day by eliminating their commute to work (Global Workplace Analytics, 2020). Time is so valuable to employees, that one in four workers would accept a 10% pay cut to maintain their virtual employee status. In addition, 72% of employees who responded to the survey agreed working remotely reduced stress, and 77% reported an improvement in their ability to manage work-life balance. Working remotely during the COVID-19 pandemic highlighted employee benefits to virtual work arrangements, beyond the health benefits of disease-avoidance. In the State of Remote Work 2020, 123% more employees wish to work from home permanently after the pandemic (Global Work Analytics, 2020). According to Turesky et al. (2020), the increases in the numbers of employees working from home during the COVID-19 pandemic simply hastened a trend that was already in progress.

Mental health is another benefit of virtual working conditions. In the Biron and Van Veldhoven (2016) study of 77 remote participants, part-time teleworkers experienced better emotional and motivational outcomes on days they worked from home as compared to days they worked from the office, even with high demand jobs. Participants also noted an increased ability to concentrate when they teleworked. In addition, their need for recovery, defined as their need to recover from work stressors, was lower on teleworking days. Overall, "office days are more stressful than home days" (para. 62). One reason workers are more satisfied with workdays where they telecommute is their ability to set their own goals (Müller & Niessen, 2019).

In one study based in Finland, Nurmi and Hinds (2016) showed although virtual teams provided significant challenges, workers reported finding virtual work more motivating and satisfying than working on collocated teams. The researchers performed 78 qualitative interviews with engineers, and 515 quantitative surveys of knowledge workers. The study concluded the

increased job complexity provided by working on global virtual teams provided more learning opportunities, which improved employee innovation, satisfaction, and engagement.

Another benefit of virtual work relates to employees with disabilities. Virtual work arrangements are a, "reasonable accommodation" for employees with disabilities (Mello, 2019, p. 228). Working from home allows employees to privately deal with health issues that provide challenges in office settings. Virtual working conditions support employees requiring frequent breaks, assistance from medical or therapeutic equipment, or who deal with recurring medical appointments, or unpredictable flare-ups (Schur et al., 2020).

> Employers are not the only party to save money with virtual work arrangements. We estimate that employees save between $2,500 and $4,000 per year by working at home half the time. Those savings are primarily due to reduced costs for travel, parking, and food. They are net of additional energy costs and home food costs. (Global Workplace Analytics, 2020)

In terms of time, a half-time telecommuter saves the equivalent of 11 workdays per year in time they would have otherwise spent commuting; and extreme commuters save more than three times that amount. These estimates assume a 75% reduction in driving on telework days.

Another prime benefit of virtual work is its positive impact on the environment. Reducing commuting helps employers around the globe comply with local regulations for the reduction of pollution and environmental impact (Mello, 2019).

> Eliminating or reducing commuter travel is the easiest and most effective way for a company or individual to reduce their carbon footprint. Based on our estimates, if those who have a work-from-home compatible job and a desire to work remotely did so just

> half the time, the greenhouse gas reduction would be the equivalent to taking the entire New York State workforce off the road. (Global Workplace Analytics, 2020)

Olaisen and Revang (2017) studied four virtual global project teams in Scandinavia and observed encouraging, “working greener” by adopting social technology platforms for knowledge sharing, resulted in a travel reduction of 50–70%.

In California, environmental sustainability is a profound motivator for reducing commuting due to pollution concerns. The successful implementation of virtual work arrangements depended on the full support of organizations (Kwon & Jeon, 2017). The state of California, encouraged by politicians, expects their cities to implement teleworking programs in an effort to protect the climate (Kwon & Jeon, 2017). They believe telework can reduce greenhouse gas emission pollution by reducing commuting, fuel consumption, and office energy usage.

Aguilera et al. (2016) conducted a teleworking study in France based on results from three surveys. The French responses indicated there was a low implementation rate of telework in France. Neither employers nor employees believed the costs of teleworking outweighed the benefits. Specifically, employers maintained their work was not conducive to telework, and did not believe it could create an increase in productivity. Employees did not believe there was an improvement in work-life balance, nor a reduction in commuting. These authors speculate external factors, such as governmental policies addressing environmental concerns or increased fuel costs, could tip the scale in favor of future teleworking arrangements.

Melo and de Abreu e Silva (2017) investigated the implications of teleworking on traffic in Great Britain. Optimistically, teleworking potentially reduces or reschedules commuting, eases congestion on public transport, and reduces vehicle emissions, especially in urban areas.

While many believed teleworking would reduce the number of miles traveled by employees and their households, the authors failed to associate conclusively the implementation of telecommuting with a reduction in household weekly commuting distances nor a general improvement in traffic congestion. Reasons offered included relocation of employee's homes to more desirable locations away from the office location, which contributes to urban sprawl. A similar study by Cerqueira et al. (2020) confirmed the increase in telework in the United Kingdom has resulted in longer average commutes from more remote residential locations and may negatively impact pollution and emission levels. The desire to move residences while working remotely also occurred in the United States during the COVID pandemic. According to the State of Remote Work 2020 (Global Workplace Analytics, 2020), one out of every two workers who worked from home during the pandemic stated they would move if they could permanently work from home.

Challenges Associated with the Growth of Virtual Employees. As noted in the literature review above, the increase of employees working in a virtual environment provides many benefits. However, the literature also offers examples of many challenges. The most widely described challenges include generational differences, cultural differences, employer challenges, and employee challenges.

Differences between the generations of employees currently in the workforce create specific challenges to virtual work arrangements. Two new generations of employees are currently entering the workforce, Generation X, born between 1960 and 1980, and New Millennial, born after 1980 (Kwon & Jeon, 2017). Some authors also refer to Gen Z, which includes those born between 1995 and 2010 (Burton et al., 2019). Workers from these new generations tend to have more non-traditional families and consider work-life balance, and

flexible working arrangements more consequential than previous generations (Berman et al., 2016). Henderson et al. (2016) believed a generational shift is looming. While baby boomers prefer face-to-face interactions, the newer generations are more comfortable creating a virtual presence over communication technology, and often eschew face-to-face interactions. Walker and Lloyd-Walker (2019) believed this shift in demographics, and the fact that four generational cohorts are now working together, require managers to focus on blending their individual strengths for organizational effectiveness. Beattie et al. (2014) believed there are differences between the generations, stating:

> Although something of a generalization, it could be argued that Baby Boomers will be reluctant to [work] virtually given their preference for face-to-face communication. While by contrast GEN Y learners will be comfortable with such an approach given, they have grown up with technology and engage in many of their relationships virtually, through social media such as Facebook and Twitter. (para. 23)

While older generations faced challenges when learning and accepting new technologies, younger generations, often referred to as 'digital natives,' are more comfortable using technology aided communications (Schmidt, 2014). In addition, Gen Z is especially comfortable integrating both virtual and in-person experiences (Burton et al., 2019). These younger generations also place a premium on work flexibility. While 44% of Gen Y placed great importance on flexibility, 79% of Gen Z desires this flexibility (Mello, 2019). Gilson et al. (2015) argued the Millennial generation places a greater value on work-life balance, and thus may prefer the flexibility of virtual team arrangements.

In a literature review conducted by Gilson et al. (2015), the majority of research identifying communication challenges with virtual teams relied on data collected from older

generations. The authors believe when the Millennial generation and beyond enter the workforce, their acceptance of technology will make the existing barriers obsolete. Younger generations may consider virtual teams normal and face-to-face teams an exception. Future leaders will have an advantage in virtual project team management as they have more experience with technology although they will not have the same authentic work experiences of previous generations (Iorio & Taylor, 2015).

Zhang et al. (2020) reported workers attitudes towards teleworking depended on their family-life stage. Their research revealed three patterns. First, parents were less likely to telework than workers with no children. Second, for employees with no children, single workers were more likely to telework than married employees, and males more than females. Third, for employees without children, married workers were more likely to telecommute than those who were single, and females more than males. These patterns are relatively complex, but influential.

While cultural differences provide challenges to virtual work arrangements, they also improve team innovation and creativity (Han & Beyerlein, 2016). According to Adamovic (2018), cultural differences can create interpersonal problems, stress, and misunderstandings among global virtual team members. In addition, different dominant languages and combining cultural norms can delay the development of effective teams (Paul et al., 2016). Acceptance and implementation of flexible work arrangements also vary by country and culture. For example, flexible work arrangements often have a negative connotation in Europe, where employees view it as a means for employers to avoid employment regulations that would limit their work hours (Messenger, 2019). However, workers in the United States view flexible work arrangements favorably, as it provides employee options for completing their work in time, manner, and location.

Numerous research studies confirm cultural intelligence is positively associated with work success in the collocated environment (Fang et al., 2018; Ott & Michailova, 2018; Rockstuhl & Van Dyne, 2018 Schlaegel et al., 2018). Henderson et al. (2018) expanded these studies into the virtual environment. These researchers collected survey data from 218 global virtual project team members working in a multinational company with operations in Europe, Asia, North America, Brazil, Russia, India, and China. The authors examined the effect of 'cultural intelligence' on satisfaction and team performance. Cultural intelligence is the capability of an individual to function in a globalized world and includes an individual's awareness and knowledge of other cultures, their motivation to interact with individuals from other cultures, and their ability to adapt their communication behaviors to different cultures (Fang et al., 2018; Henderson et al., 2018). The authors concluded cultural intelligence significantly moderated the alignment of communication norms and role clarity, which positively impacted project satisfaction and project performance. The authors argue organizations should focus on training its global team members on cultural intelligence to improve ultimate team global virtual team performance. The cultural training is paramount when teams are forming norms and clarifying team roles.

Peters et al. (2016) studied 1,577 corporations across 18 countries and determined national culture influences the positive integration of telework. The authors contend the *strength* of the nation's culture had a greater impact than its disposition toward collectivism or individualism. Individualistic cultures focus on personal satisfaction and competitiveness (Zaharie, 2021), and traits supporting telework include self-direction and the need for status, achievement, power, and stimulation. Collectivist cultures focus on community responsibility

(Zaharie, 2021), and traits supporting telework include the importance of benevolence, tradition, and conformity.

In Germany, a cross-industry survey of 208 German managers revealed the effective implementation of teleworking arrangements was heavily dependent on formally outlining and enforcing a set of rules (Beham et al., 2015). However, these rules could not overcome a lack of trust between supervisor and employee, especially when managers expressed productivity concerns, or when employees work was highly interdependent with the traditionally located work group. They also concluded when managers had previous telework experience, they were more likely to accept telework for their self-managing employees.

While employees benefit from working remotely, they also face additional challenges. Remote employees often feel a sense of isolation which complicates the ability to build trust and effective communications (Chang et al., 2013). Virtual work conditions can also lead to health issues for virtual leaders, due to psychological stress (Efimov et al., 2020). Also, many employees fear being away from the central organization may reduce their chance of promotion or training opportunities (Schur et al., 2020). While many workers experience frustration with technologies that connect them to their work at all hours, most believe the benefits far outweigh the challenges (Messenger, 2019). “Although the feeling of being ‘always on’ is frequently cited as a negative, it is mitigated by the benefits, such as reduced work-life conflict, increased autonomy, feeling trusted and empowered, and avoiding commuter travel” (Messenger, 2019, pp. 128-129).

Purvanova and Kenda (2018) described several paradoxes of virtual work. First, the paradox of technology dependence results in touch tension, data tension, and task tension. Touch tension is evident in the fact that although virtual communication is impersonal, it is also less

biased. Data tension examines the positive effects of data richness with the feeling of data overload. Task tension examines the motivational aspect of virtual work with work overload. These paradoxes highlight the double edge sword of virtual work on employees.

Employers must accept several challenges of virtual work arrangements to take advantage of its benefits. Virtual employees require managers to "exercise tight organizational and operational control to ensure coordination and communication" (Mello, 2019, p. 189). Employer challenges include creating an effective performance measurement system, providing remote equipment for employee use, and training for the supporting managers of virtual employees (Mello, 2019). In addition, corporations must consider security and compliance issues (Mehta & Shah, 2019).

The Problem

The general and specific problem statements for this research rely on the idea that the leadership skills of project managers in a collocated environment are different than those needed to successfully lead in the virtual environment. Project leaders cannot simply transfer traditional leadership skills that were successful in the collocated environment. While partially developed in the extant literature, this case study research helps to fill the gap in the current body of knowledge surrounding real life case study applications.

Leading project teams in virtual environments requires competencies that traditional managers may lack (Purvanova & Kenda, 2018). "Virtual leadership differs from traditional leadership not in what leadership is, but in how leaders apply leadership functions and behaviors to address the unique challenges they face in their virtual environment" (para. 37). Unfortunately, leaders of face-to-face teams cannot simply transfer their leadership skills to the virtual team environment. "It has been shown that classic leadership concepts applied in

traditional team structures cannot simply be transferred to virtual leadership" (Efimov et al., 2020, para. 2).

Advances in information and communication technology support a shift to virtual teams. Gilson et al. (2021) believed, "Technology now freely enables team members to work at anytime from anywhere and with everyone, thereby blurring the boundaries between physical and electronic space" (para. 6). However, this new work arrangement creates unique challenges for practitioners and researchers because traditional team effectiveness factors do not universally apply in the virtual team environment (Alsharo et al., 2017). While information technology improved virtual team efficiency, it also creates new challenges including, "time difficulties, feedback delays, misinterpretation, cultural barriers, scheduling conflicts, lack of communication and delayed responses (para. 12). Additionally, trust is key to team success and building trust among virtual teams is complex. "Virtual team members are reliant upon on different behaviors, unique to virtual settings, to assess trustworthiness and compensate for the lack of physically observed behaviors" (para. 4).

In one case study of two virtual teams, the virtual team leaders did not perform well because they, "lacked the required leadership competencies" (Maduka et al., 2018). Virtual teams communicate using technology, and this fact makes virtual team leadership different from traditional team leadership. The difference often leads to a scarcity of effective virtual team leaders, which increases the potential for project failure.

Van Wart et al. (2019) conducted a mixed-methods case study to examine the competencies unique to e-leadership. The researchers defined the term e-leadership as, "the effective use and blending of electronic and traditional methods of communication. It implies an awareness of current [Information and Communication Technologies (ICTs)], selective adoption

of new ICTs for oneself and the organization, and technical competence in using those ICTs selected" (para. 9). E-leadership is critical for all leaders and requires the blending of traditional and technology-supported communication methods. The authors identified six main competencies for successful e-leadership in the virtual environment: e-communication, e-social skills, e-team building, e-change management, e-technology skills, and e-trustworthiness. According to Van Wart et al. (2019), the leadership skills required for success in virtual environments are different from traditional leadership skills, and understanding the difference is key to overall success or failure.

Virtual project managers need to approach their projects differently than leaders of collocated teams, highlighting the establishment of trust and open communication (Verburg et al., 2013). Project managers can learn behaviors to mediate the challenges of ineffective communication and lack of trust in virtual project teams (Zuofa & Ochieng, 2017). Project managers can learn to understand the internal processes within a virtual team to maximize the chance of success of virtual projects (Flavian et al., 2019). Project managers that are successful in a collocated environment may need training and support to obtain the skills on top of the traditional leadership skill set to be an effective virtual leader and obtain successful results in a virtual project team arrangement (Byrd, 2019, para. 25).

One Danish study examined the real-world experience of 1053 employees and 290 managers of knowledge workers during the COVID-19 pandemic. The work-from-home orders forced these employees into virtual work arrangements although they had limited prior experience working in this environment. The authors determined the managers found the transition to the virtual work environment more challenging than their employees. While the employees benefitted from additional flexibility in their workday and reduced commuting time,

managers reported working more hours and feeling overworked and overwhelmed. The lessons learned included the distance leadership style requires change from existing skills and experience. Managers need to adapt their traditional style and learn new ways of leading to ensure their teams perform successfully in the virtual environment.

Concepts

Concepts contains a detailed discussion of the four major concepts identified in the research framework. The first two concepts arise from the existing literature that points to the critical components of trust and communication on the success of virtual project managers. The current research on these topics includes both traditional, and potentially more challenging, virtual environments. The third concept focuses on the impact of the project manager's prior experiences on project success, while the fourth concept examines the use of the iron triangle as the primary indicator of project success. The literature indicates establishing trust and building effective communication strategies are at the heart of successful virtual project team success (Killingsworth et al., 2016; Liao, 2017; Moran & Youngdahl, 2014).

Facilitating Trust in Virtual Teams Positively Influences Project Success. The current literature extensively covers the importance of trust in virtual project teams (Gilson et al., 2015). In one literature review, researchers identified 124 multi-disciplinary articles focused on the topic of trust in virtual teams (Hacker et al., 2019), and after a thorough review determined trust is the most promising solution for overcoming the challenges associated with virtual teams. However, while the current body of knowledge focuses on the challenges of leading virtual teams, there is little research in the literature concerning the tactics leaders employ to positively influence virtual team performance (Turesky et al., 2020).

One widely adopted definition of trust offered by Schoorman et al. (2007) described trust as, “the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (p. 712). The definition focuses on trust between two individuals, namely a trustor, and a trustee. However, a team is a collection of multiple individuals, so team trust is an aggregate of these individual trust relationships. Breuer et al. (2016) adapted the definition provided by Schoorman et al. (2007) to define ‘team trust’ as:

> the shared willingness of the team members to be vulnerable to the actions of the other team members based on the shared expectation that the other team members will perform particular actions that are important to the team, irrespective of the ability to monitor or control the other team members. (p. 1152)

Dinh et al. (2021) suggested trust has both a cognitive and affective component. “Cognitive trust involves reliability and dependability in the performance of tasks” (p. 1). Cognitive trust builds over time through experience with team members. Dinh et al. (2021) further defined the more personal and emotional aspect of trust, “affective trust refers to interpersonal dynamics, including that of familiarity and co-identification” (p. 1).

Trust itself is a psychological state, and not a set of behaviors (Pretorius et al., 2017). However, according to Schoorman et al. (2007), trust manifests itself in risk-taking behaviors. These risk-taking behaviors require team members to accept vulnerability and exhibit trusting behaviors including the sharing of confidential information, asking for help when needed, providing, and accepting feedback, addressing conflicts, reducing defensive control, and openly admitting and discussing mistakes (Breuer et al., 2016). Using a meta-analytic methodology, Breuer et al. (2016) reviewed data sets from 52 previously conducted studies (using data from

12,615 team members across 1,850 teams) and confirmed team trust encouraged behaviors that positively influence team effectiveness, and overall performance. Additionally, this analysis concluded the relationship between team trust and team performance was stronger in virtual teams rather than in traditional, collocated teams. Another meta-analysis performed by De Jong et al. (2016) corroborated these findings using data from 112 prior studies. These researchers also determined team trust has a strong impact on team performance, especially in virtual teams.

Breuer et al. (2020) conducted a qualitative research study to examine team trust. The authors conducted 55 exploratory interviews with German professionals with both face-to-face and virtual team experience. Based on Schoorman et al.'s (2007) model, the authors confirmed the three antecedents of trust: ability, benevolence, and integrity. In addition, the researchers extended Schoorman et al.'s (2007) model by identifying two new antecedents of trust, transparency and predictability. The authors also categorized the consequences of trust into three risk-taking behaviors: disclosure, reliance, and contact seeking. Breuer et al. (2020) believe team leaders can use these behaviors to identify the development of trust in both face-to-face and virtual teams.

The literature contains many studies connecting trust with improved virtual team performance in the United States and across the globe (Verburg et al., 2013). A Romanian study involving 498 university students with prior virtual team experience concluded trust positively impacted virtual team performance (Zaharie, 2021). Specifically, trust that team members will reciprocate work efforts and not exploit their team members was essential for cooperation, especially when teams had a low number of direct interactions. The researchers determined trust in team members is an "influential component for the performance" of virtual teams (para. 15). Another study by Tan et al. (2019) confirmed team performance depends on the level of trust

among virtual teams. The researchers completed a quantitative analysis of virtual teams in Malaysia and determined trust was crucial to team performance. More recently, Garro-Abarca et al. (2021) performed a quantitative study with 1,200 software engineers and confirmed trust had the largest effect on virtual team performance.

Multinational virtual project teams face even more difficulties developing trust. Not only do they face the same difficulties as all virtual project teams, but they also add the element of cultural differences. In the absence of the "typical factors contributing to team success, such as a close physical location, common experiences, and shared cultural backgrounds," the element of trust takes on more prominence (Han & Beyerlein, 2016). Javidan and Zaheer (2021) interviewed over 700 managers across the globe and determined national culture directly impacts the perception of trust. While most Americans associated trust with performance and results, other nations focused on first impressions, personal connections and cultural fit. The authors conclude that while the impact of trust work outcomes is universal, "the meaning and the bases of trust across national cultures are highly idiosyncratic" (Javidan & Zaheer, 2021, p. 7). A Nigerian study of 20 virtual team members supports this finding and concludes that to develop trust in virtual project teams, team members must display at least a reasonable level of cultural awareness (Zuofa & Ochieng, 2017).

In one international study, Cheng et al. (2021) performed a mixed-methods longitudinal study of 120 undergraduate students in China. The authors examined how trust influences group efficiency in multi-national virtual teams over time. The authors determined trust relates to openness and reliability. Reliability-based trust allows team members to have confidence their team members will predictably meet their needs and behave in a predictable manner (Cheng et al., 2016b). Openness-based trust is apparent when team members openly share information and

communicate freely, which encourages collaboration (Cheng et al., 2016b). Cheng et al. (2021) concluded team leaders can overcome trust issues and improve multi-national virtual team efficiency by encouraging the reliability and openness of their team members. Specifically, leaders should encourage team members to regularly report their actions through an online communication platform that documents and stores the interactions. In addition, Cheng et al. (2021) noted the level of trust changes over time and team leaders should ensure team members continue to communicate with each other to maintain a level of trust among the team, which encourages a continued high level of group performance.

In another multi-national study, Cheng et al. (2016b) studied virtual teams made up of Chinese and Netherlands university students. These researchers determined seven factors influence the development of trust over time: willingness to risk vulnerability, confidence, benevolence, reliability, competence, honesty, and openness. The willingness to risk vulnerability recognizes team members are interdependent and trusting each other involves a level of risk. Confidence implies team members believe there are benefits to trusting their peers. Benevolence refers to the belief that team members will not harm each other but will protect each other's interests. Reliability is the predictability and consistency of team member's actions. Competence is the trust that team members have the knowledge and skills to complete assigned tasks. Honesty is the belief that team members have the character and integrity to be truthful. Openness is the capacity of team members to reveal and share information and not withhold valuable information from the team. Together, these factors reveal the level of trust of virtual teams over time.

Paul et al. (2016) investigated the relationship between trust, coordination effectiveness and team cohesion on the team performance of global virtual teams with two distinct subgroups.

These researcher's-controlled study involved 112 business students, representing 14 global virtual teams from the United States and India. Global virtual team performance is essential for business success as they collaborate across international borders to solve global problems (Paul et al., 2016). The author's study examined three components of trust, ability, benevolence, and integrity. Ability refers to the belief that team members have the skills and expertise to complete their work effectively. Benevolence allows team members to rely on each other's goodwill. Integrity is a determination a team member conducts themselves with moral principles. According to Paul et al. (2016), trust starts on an individual level and then works its way up to teams and organizations. The research determined trust and team cohesion significantly influenced team performance. Thus, the authors conclude coordinating across virtual teams is critical for establishing trust, developing team cohesion, and enabling optimal global virtual team performance.

"Trust is difficult to establish in virtual project management" (Larson & Gray, 2018, p. 401). Geographical separation prohibits the informal social interactions that are indispensable when building camaraderie among team members of collocated teams. The authors provide three suggestions for project managers to facilitate trust in their project teams. First, project managers should encourage sharing personal background information to allow team members to understand their strengths and make connections. Second, project managers should set clear roles and responsibilities for each team members and communicate with the entire team. Finally, project managers should display enthusiasm for the project, as an example for the team to emulate. Similarly, in a study of 29 global virtual teams that communicated only by e-mail, teams with the highest level of trust focused on three things: social introductions prior to the initiation of work, clear definition of roles, and positive attitudes (Cascio & Shurygailo, 2008).

Turesky et al. (2020) conducted a qualitative, phenomenological study involving eight high-performing virtual team leaders in the United States and Canada. Collecting first-hand accounts through interviews they determined high trust environments are critical to virtual team performance. Specifically, the interviewee's descriptions culminated into three themes regarding trust. First, the foundation of high-trust climates between team leader and team members is essential to support exceptional team performance. Second, subjects agreed building trust in a team is more difficult in virtual settings and described innovative techniques they employed to encourage trust with team members, including video blogs, virtual lunches, social media applications, augmented with occasional face-to-face meetings whenever possible. Third, it is imperative to build trust with team members quickly, especially new hires. One other common theme in this study was the lack of training for managers to transition to the virtual environment. Turesky et al. (2020) believed training opportunities for managers can optimize virtual team performance in the future.

Trust builds over time, through positive experiences with team members. In a virtual environment, without the informal social interactions of traditional relationships, building trust includes setting clear expectations and consistently meeting or exceeding those expectations (Hunt & Weintraub, 2017). Trust is a dynamic process based on long-term interactions and is essential for the success of virtual teams (Cheng et al., 2016a). In one study of virtual teams made up of Chinese and American university students, researchers discovered time zone differences, language and cultural differences, communication, leadership, and task accomplishment affected trust development (Cheng et al., 2016a). However, team leaders can mitigate these factors and positively affect the building of trust over time.

Trust on virtual teams generally remains stable over time. One study of 71 multi-national student teams from Finland, Estonia, Latvia, and Russia examined the effect of team performance on team trust (Jaakson et al., 2019). The researchers documented a high initial level of trust on these virtual teams. The high level remained constant over the life of the project unless the teams received negative performance feedback. The researchers concluded trust levels on multinational virtual teams should remain high, especially if they receive at least moderate performance feedback. Thus, team leaders can encourage trust, and thus performance, on their virtual teams by creating opportunities for early team successes and positive feedback.

Trust strengthens the relationship between the effectiveness of team leader communications and team performance (Newman et al., 2020). Understanding the factors that influence the trustworthiness of a team leader results in greater organizational efficiency and contributes to the improvement of team results (Flavian et al., 2019). Mayer and Gavin (2005) surveyed 247 employees working in a Midwest United States manufacturing facility and discovered when managers garner trust from their employees, their ability to focus their attention on their work improves, and this focus improves performance within an organization. Cascio and Shurygailo (2008) similarly concluded teams with low levels of trust, "were less productive than high-trust ones" (para. 65). Mehta and Shah (2019) provided one explanation for a low level of trust resulting in lower team performance. "Without a significant level of trust, virtual teams often find themselves unable to effectively distribute workloads and may have poor efficiency because of duplicate effort or poor coordination" (Mehta & Shah, 2019, para. 13.).

A lack of trust between managers and employees can negatively impact the acceptance of remote work, and the implementation of virtual project teams. President Barak Obama signed the Telework Enhancement Act of 2010 into law with four main goals: foster the continuity of

service during an emergency, reduce costs, promote work-life balance, and increase employment opportunities for persons with disabilities (Brown et al., 2016). However, even with support from the highest office in the United States government, some managers remained reluctant to implement remote work. Brown et al. (2016) interviewed twelve managers in the federal government who prohibited their employees from participating in teleworking despite having full top-level support. They identified eight common themes, five of which addressed a lack of trust. First, all managers who prohibited teleworking had poor past experiences with its implementation. Second, each had at least one mentor who believed teleworking did not work. Third, after prohibiting telework, employees maintained their levels of productivity and accountability. Fourth, managers were unclear on the guidelines for the teleworking program. Finally, managers did not trust their employees to ensure reliable security nor maintain productivity.

Kirkman et al. (2002) investigated 65 virtual project teams at a company in the travel industry and examined how they faced five virtual team challenges: building trust, cohesion, and team identity, and overcoming isolation among virtual team members. The authors identified trust as the glue holding teams together and working virtually magnifies the importance of trust. Kirkman et al. (2002) connected trust on virtual teams to predictable performance, rapid responses to electronic communications, and consistent follow-through. Three additional practical ways to foster trust is to respond to communications in a timely manner, establish communication norms, and establish consistency around time (Kirkman et al., 2002).

Establishing strong, unifying values can serve as a foundation for trust on virtual teams: default to transparency, communicate with clarity, choose positivity, and show gratitude (Eckhardt et al., 2019). In addition, the lessons learned from the two companies in the authors

case study included the importance of offering virtual team members the opportunity for socialization in addition to task-oriented interactions. Interestingly, some managers mentioned the social connections among their virtual team members was stronger than those collocated team members, “because their casual conversations are deeper” (p. 28).

Bhat et al. (2017) surveyed 550 virtual employees in the Information Technology industry and identified eight prominent factors that helped virtual team members develop trust, information sharing and communication. They believe focusing on these factors increase the likelihood of creating effective and efficient virtual teams. These real-world identified factors include dependability on each other, dealing with time, concern for collaboration, information penetration, variety of information, reliability on technology, tools used for communication, and implementation of results.

The volume of research in the literature supporting the importance of trust on virtual team performance is overwhelming. However, some research, including a study by Alsharo et al. (2017) presented contradictory results. Alsharo et al. (2017) studied 193 subjects working on virtual teams in the information technology industry and reported although trust influenced virtual team collaboration, it did not significantly affect team effectiveness. The researchers revealed their surprise and the unexpected conclusion, and suggested additional research is necessary to explain this surprising lack of direct correlation between trust and virtual team performance.

Existing research also overwhelmingly supports the assertion that trust is more difficult to develop on virtual teams, which rely on communication technologies instead of face-to-face interactions. One study investigating the experiences of project management experts from academia and practitioners (Kanagarajoo et al., 2019) confirmed existing research showing the

development of trust in virtual project teams improves as team members work together more frequently. However, the researchers surprisingly stated trust might be easier to establish on virtual teams rather than collocated teams. They postulate when team members interact electronically, their, “differences in characters and idiosyncrasies do not impede trust development” (Kanagarajoo et al., 2019, para. 62).

In conclusion, the existing body of knowledge shows trust is essential for teams to function efficiently and perform optimally (Morrison-Smith & Ruiz, 2020). While the current body of knowledge agrees trust is paramount to the success of all project teams, its importance in virtual team development is even more critical. “At a fundamental level, all project teams, including virtual project teams, thrive on interdependence; thus, developing individual trust within teams is very crucial” (Zuofa & Ochieng, 2017, para. 30). The existing literature also shows this trust is more difficult to develop in virtual teams. However, research confirms the personal interactions required to formulate trust and encourage knowledge sharing is possible on virtual project teams, “through online technology platforms without offline social interaction” (Olaisen & Revang, 2017, para. 1).

Establishing Open Communication on Virtual Teams is Essential for Project Success. Communication lies at the heart of virtual project team success and supports the development of trust (Pretorius et al., 2017). Research confirms communication is one of the most valuable tools a leader can use to influence team member performance (Verburg et al., 2013). “Effective communication is critical to keeping the team working together toward a common goal” (Owens & Khazanchi, 2018, para. 2). In addition, the challenges of virtual teams, whose members cross geographic locations, time zones, and cultures, makes a focus on communication especially salient.

Open and honest communication is essential to team performance and is especially challenging with limited in-person communication in the virtual team environment (Chang et al., 2013; Hunt & Weintraub, 2017). Increasing geographic dispersion negatively affects team communication, and hinders team performance (Eisenberg et al., 2019). Zuofa and Ochieng (2017) interviewed 20 virtual project team members in Nigeria and identified several challenges to communication, including increased conflict due to greater opportunities for misinterpretations, and uneven participation among the project team. Research shows leaders who master communication technology are more likely to achieve higher levels of virtual team success (Newman et al., 2020). One study concluded leaders who predictably and frequently communicate to their teams positively impact team performance (Ford et al., 2017).

The lack of informal social interactions between virtual team members impedes the team's ability to trust each other (Fan et al., 2013). While trust and open communication develop organically in face-to-face teams, project leaders need to 'make-an-effort' to create situations to nurture these traits in virtual teams (Liao, 2017). The lack of physical cues and body language, fewer informal opportunities to collaborate with peers, and increased risk of isolation, warrants an in-depth understanding of effective strategies for virtual managers to develop strong indirect communication skills (Byrd, 2019). In one study of 100 virtual employees in a defense firm, occasional use of face-to-face team meetings had a positive effect on overall communications, and significantly reduced the chances of miscommunication (Blenke et al., 2017).

Specific communication tools and techniques are critical in overcoming the challenges of leading virtual teams: communication frequency, predictability, responsiveness, clarity, and mode (Marlow et al., 2017). Marlow et al. (2017) reviewed the literature and identified five elements of communication: communication frequency, communication quality, communication

timeliness, closed-loop communication, and communication content. Communication frequency is the number of times a leader communicates, using any method. A high frequency of communications has a positive impact on virtual team effectiveness (Ford et al., 2017; Henderson et al., 2016; Morgan et al., 2014), but if the frequency is too high it may overwhelm team members, especially in the virtual environment. Communication quality refers to the clarity, effectiveness, accuracy, and completeness of communications. While quality and frequency often correlate, the quality of communication contributes more to shared understanding in a virtual team than frequency. The quality of a leader's communications to team members positively affects team performance (Henderson et al., 2016; Verburg et al., 2013). Communication timeliness concerns how quickly a leader responds to team members' questions or concerns. Communication timeliness has a large impact on virtual teams which are more apt to communicate asynchronously, and delays may have a larger impact on team performance. Predictability and timeliness together improve a leader's relationship with team members, which positively affects team performance (Ford et al., 2017). Closed-loop communication refers to sending, receiving, and confirming understanding of the original communication. Closing the loop on communication can reduce or eliminate the misunderstanding posing a greater challenge to virtual team performance. Face-to-face communications can rely on tone of voice and physical gestures to clarify meaning. Communication content refers can be either task or relationship oriented. Relationship oriented communications improves trust in virtual teams. Multiple studies have proven each of these categories positively influence team effectiveness (Newman et al., 2020). Newman et al. (2020) studied 458 virtual team members across 68 virtual teams in a large, global human resource consulting and outsourcing company and concluded the combination of all five key

communication tools and techniques highlighted by Marlow et al. (2017) had a positive impact on virtual team performance.

According to Cascio and Shurygailo (2008), virtual teams do not need to burden themselves by relying solely on documented, written communication. Verbal communications can also be extremely effective. However, team members should ensure they receive appropriate training on all information communications technologies employed by the team and learn when each is most effective. For example, email is appropriate for group communication, especially when gathering information, or discussing formal or complex ideas. Voicemail is more appropriate for one-on-one communication, especially when the message is short, urgent, or needs to express a certain tone, like an apology. Group video or telephone conference calls are appropriate for problem solving, and face-to-face meetings are most appropriate for idea generation, fundamental decision-making, and when conflict arises (Cascio & Shurygailo, 2008; Dube & Robey, 2009; Tan et al., 2019).

Henderson et al. (2016) conducted a mixed methods study, surveying 218 global project team members from 33 distinct virtual project teams, and interviewing 18. They reported frequent and clear team leader communication had a positive impact on virtual team relationships, information exchange, and overall team effectiveness. In addition, it is essential virtual teams establish norms surrounding communication at project initiation to encourage team members to develop role clarity and trust. Communication is a challenge on global virtual teams. However, Henderson et al. (2016) believed there are more changes to team communication in the future:

> In less than a century, we have moved from face-to-face and mail communication to the telephone, to email and desktop computing, to IM and text, and now to web-based video

> communication. It is highly probable that a new dominant technology will create a more realistic face-to-face feel, one that has a less negative impact on human empathy, thus creating the potential to greatly enhance GPT performance. (p. 1728)

Because face-to-face interactions are uncommon on virtual project teams, leaders can make use of electronic communication tools (e.g., chat, video conference, email) to interact with team members in an empathic way to build trust (Flavian et al., 2019). Interestingly, as the quality of information communication technologies improves and employees increase their technological literacy, the richness of content perceived from virtual technologies grows. Employees are, "able to perceive many of the nonverbal signals and a richness of content that years ago would only be possible through traditional communication channels" (Flavian et al., 2019, para. 47).

To alleviate virtual team communication problems and enhance project team performance: use internet scheduling to store team members' calendars; develop a system to distinguish urgent messages from those with longer time frames; establish clear norms and protocols for surfacing assumptions and conflicts; use electronic video technology to "show" work; and rotate meeting times and preferences (Larson & Gray, 2018, pp. 402-403). In addition, giving and receiving frequent and consistent feedback among team members enhances team performance (McLarnon et al., 2019).

Several studies have indicated the use of a range of communication methods may improve virtual communication and performance (Foster et al., 2015; Morgan et al., 2014). "There is some evidence that using multiple media modes (e.g., face-to-face, telephone, email, etc.) improves team communication regardless of geographic dispersion" (Foster et al., 2015, para. 26). Leaders may choose when synchronous communication modes (occur at the same

time, such as conference calls) or asynchronous modes (occur at separate times, such as e-mails) are most appropriate (Newman et al., 2020). Prasad et al. (2017) studied 403 global virtual team members across 44 teams and representing 15 organizations. They determined the use of electronic communication is significant to team performance. Specifically, they acknowledged the teams under study benefitted from using an integrated mix of technologies. In addition, they discovered team leaders should not impose the communication tools team members employ but allow the team to adopt a mix of tools that fits their needs.

Geissler et al. (2014) determined a lack of visual cues in communication inhibits the development of trust, however, they "feel that this deficit can be compensated by the enhanced concentration on dialogue itself" (p. 185). "In the absence of social interaction, everything needs to be put into words. This takes extra time and extra work. It requires thought and clarity" (Hunt & Weintraub, 2017, p. 301). Without the richness of information provided through facial expressions and body language, the clarity and quality of written and oral communications gains importance to avoid unintended misinterpretations. Non-verbal communications, such as shrugs, smiles, and pauses can change the meaning of words alone (Mehta & Shah, 2019). In addition, it is hard to convey and identify sarcasm in text-based communications. Henderson et al. (2018) contended global project teams are moving away from e-mail-based communication in favor of more synchronous communication channels. The shift to synchronous channels will make certain behaviors, such as, "pauses and silences, rate of speaking, non-verbal behavior and facial expressions," more relevant (p. 965).

An increase in team communication can help build trust on a virtual team (Mehta & Shah, 2019). "Virtual teams typically communicate less frequently than face to face teams" (para. 12). Increasing the quantity of communications between team members can improve trust.

Team leaders can support this by planning for regular and frequent discussion among virtual team members. According to Breuer et al. (2016), documenting communication is easier on virtual teams where the communication media (e.g., e-mail, shared databases) keeps a documented and re-processable record of interactions team members can access. Their study reveals, this documentation of communication either reduces the need for trust on a team or improves trust on a team.

Future communication improvements will change the effectiveness of communication on virtual project teams. Owens and Khazanchi (2018) studied seven teams using the technology of virtual worlds. The avatars in the virtual worlds communicated nonverbally, mimicking face-to-face interactions, through proximity, eye contact and gestures. The authors declared the use of the avatars increased both trustfulness and trustworthiness in virtual teams. They suggest the potential use of avatar-type characters in the workplace may improve communication and thus, trust and team performance.

Kanagarajoo et al. (2019) conducted a Delphi Study and follow-up interviews to collect unbiased opinions among 32 project management experts from across the globe to determine the potential beneficial uses of social media in the virtual team project management. The subjects reported social media tools significantly improved communication on project teams, to the point that relationship development and communications approached that of collocated teams. “In a virtual environment, team members rely on [social media] tools to generate impressions and build camaraderie, within a project team” (Kanagarajoo et al., 2019, para. 17). In addition, these experts identified several benefits of social media use, including, improved synergy, enhanced trust, faster communication, and improved response times. According to their subjects, these advantages enhanced team performance. However, the social media tool chosen to support

individual team communication needs affects the effectiveness of the virtual team. One pitfall of social media usage is the potential for the indiscriminate broadcasting of information to unintended parties. Thus, project teams need to set policies and procedures to tighten security surrounding their confidential information.

Social media has evolved into a new type of communication method (Kwahk & Park, 2018). Although a unified definition is still elusive, social media is a group of internet-based communication applications that facilitate profound social interactions and the development of communities between diverse users through the creation and exchange of user-generated content (Kapoor et al., 2018; Kwahk & Park, 2018). Social media improves the ability to form the human networks individuals use to acquire knowledge and information and heighten transactive memory. Transactive memory is the shared memory system that forms through interactions between individuals and allows individuals to access the distributed knowledge and expertise of others (Cao & Ali, 2018; Kwahk & Park, 2018). Kwahk and Park (2018) studied 225 workers and established a causal relationship between transactive memory capability and the job performance of individuals and teams. According to Kane (2017), an evolving technological infrastructure supports social media, and improves the ease and speed of communication and knowledge sharing in novel ways. While social media started with cloud technology, and evolved into mobile technologies, there are still emerging technologies (e.g., artificial intelligence, virtual reality, and augmented reality) that will continue to change communication patterns in organizations (Kane, 2017). Thus, understanding the influence of social media on virtual team performance is a significant area for future study.

Aritz et al. (2017) studied 75 teams of 304 undergraduate students to examine communication in virtual teams. These researchers discovered well-coordinated teams

anticipated the usefulness of social networks earlier than less coordinated teams. These rich communication channels supported the development of trust in the project teams. Team members identified rich and social channels as more effective than traditional communication tools, such as email. These authors believe email is inefficient for virtual teamwork, and favor the richness of newer, social, interactive, collaborative tools to improve team productivity. The researchers questioned the assumption that Millennials prefer social and rich channels of communication for virtual teamwork. These researchers contend even though this generation grew up understanding the importance of social media tools in their personal lives, they needed experience to transfer them in the virtual workplace.

In summary, good communications are essential to the success of virtual projects. "Without effective communication, teams are likely to have a harder time exchanging depth of knowledge and ideas necessary for greater team performance" (Eisenberg et al., 2019). However, communication is more difficult on a geographically dispersed team, and is frequently listed as one of the major challenges, and crucial skill in virtual project management (Eisenberg & Krishnan, 2018; Gupta & Pathak, 2018). Morrison-Smith and Ruiz (2020) conducted a literature review of 255 relevant virtual team studies and determined it is necessary for new technologies to provide the benefits of face-to-face conversations, including richness of discourse and spontaneity of communication. These new, more informal communication channels, can positively influence the level of trust on a team and ultimately, improve the level of team performance.

Skills and Experience Influence Project Success. The literature suggests past experience leading project teams in the virtual environment is a good indicator of successful performance in leading virtual project teams in the future. "Selecting a manager who has

experience in managing virtual teams and has demonstrated success in leading such groups to successful project completion" is crucial (Ford et al., 2017, para. 17). Not only does prior experience improve the ability to lead virtual teams in the future, but it also signals to the team the importance of its mission to upper-level management.

Iorio and Taylor (2015) studied four virtual project teams and confirmed that prior experience, even a short three-month experience, significantly improved the engagement of project team leaders. Project team leaders were better prepared to lead virtual teams when they had previous experience with virtual teams, regardless of the technological mediums employed by their teams. The influence of prior experience may impact the importance of leadership training for project managers, especially virtual team leadership.

Maduka et al. (2018) believed a skillful virtual project team leader is often the best predictor of project success or failure. The skilled project manager should have experience in leading virtual, rather than simply collocated, project teams and adopting a transformational leadership style that influences the creation of a high-performing team. Trust is one of the basic virtual leadership competencies and is more difficult to develop without face-to-face interactions. Another core competency is effective communication. The authors believe experience in the quality and quantity of communication of virtual project teams is invaluable to building and maintaining trust on a virtual team. Project managers in the future will need experience to gain proficiency in new communication and collaboration technologies (Colbert et al., 2016). According to Arup (2017), it is less essential to find employees to fill a virtual team, but paramount to find leaders experienced in communication and team management skills to lead a virtual workforce.

Another indicator of the importance of experience in project manager success lies in the recruitment field. According to Ahsan et al. (2013), managers seeking successful project managers correlate the importance of experience first, and education second to signify the competency of a project manager. The competency of a project manager is indispensable in the selection process because competency is correlated to project success (Alvarenga et al., 2019). In identifying the competency of a project manager, Bredillet et al. (2015) concurred knowledge, skills, and abilities of a project manager are a result of experience, which is a valuable indicator of future project management success. Practical experience also allows project managers to hone the soft skills required for success as a team leader. Chipulu et al. (2013) confirmed project manager experience is related to project success. The authors list experiences in several areas, including industry-specific experience, project management experience, managerial experience, and project management methodology experience. In a more recent study, Sankaran et al. (2019) identified previous experience related to the project at hand in combination with social skills, knowledge working in teams, motivation to work on the project and the ability to learn are all vital characteristics. Lutas et al. (2020) added experience in managing people is more critical than technical experience when selecting a successful project manager.

The Triple Constraints, or the Iron Triangle, Indicates Project Success. While projects are instrumental in successfully executing organizational strategy, it is often challenging to identify project success (Meredith & Zwikael, 2019). Academicians and practitioners alike discuss project success, yet agreement is still illusive (Cullen & Parker, 2015). However, the triple constraints, or the iron triangle, as defined in the Conceptual Framework, has been the most widely acceptable method since the 1970s. According to Pollack et al. (2018), project managers employ the iron triangle across industries and among projects of multiple levels of

complexity as it is a, “simple, unambiguous, and reassuringly simple measure of performance” (para. 5).

The iron triangle remains a commonly accepted measure of project success. There is almost no dispute concerning the first two vertices, cost and time. However, project manager practitioners and academicians alike often replace the third component, scope, with quality or performance (Badewi, 2016). Others have added the stakeholder’s definition of quality, as a fourth component, to the center of the triangle (Cullen & Parker, 2015). However, while time and cost are objective measures, quality is mainly a subjective measure, and open to interpretation (Pollack et al., 2018). Thus, scope is the most commonly accepted third vertices of the iron triangle.

According to Aga et al. (2016), while traditional project management success criteria focused on the iron triangle of time, cost, and scope, newer researchers include measures of relevance, efficiency, effectiveness, impact, and sustainability which may be harder to quantify. These authors define relevance as the, “extent to which the project suits the priorities of the target group, the recipient, and the donor” (Aga et al., 2016, para. 9). They define efficiency as the ability of the project to meet its goals with the lowest costs. They define effectiveness as the ability of the project to meet its identified objectives. They define project impact as the overall changes produced by the project. Finally, they define sustainability as the ability of the project to continually offer benefits after project completion. Ika (2015) surveyed 178 project supervisors at World Bank and determined project success is multi-dimensional, including not only project management success, but project impact as well.

Meredith and Zwikael (2019) accepted the iron triangle are a short-term indicator of project management success. However, they believe it may overlook longer term organizational

success factors such as, “newly-acquired skills and capabilities, the utilization of a project’s outputs by its users, client satisfaction, commercial success, satisfaction by stakeholders, project team impact, safety, effectiveness, and reduced conflicts” (p. 128). Badewi (2016) agreed an overly strict focus on the output-focused iron triangle is insufficient to measure project success and may overlook the element of customer satisfaction.

The iron triangle, or triple constraints, represents the traditional project management standard for defining project success or failure (Pollack et al., 2018). However, many academicians and practitioners believe the iron triangle is overly simplistic and needs adaptation to represent additional project success factors (Oppong et al., 2017). While no universally accepted criteria for measuring project success exists, current project management practices still include the iron triangle, but include additional factors such as the quality of project outputs and stakeholder satisfaction.

Theories

Theories contains a detailed discussion of the two major team theories identified in the research framework. These theories provide project managers with an understanding of the impact team leaders have on the performance of their project teams. The leadership provided by project managers directly impacts the effectiveness of their project team and the overall success or failure of the project they manage (Drouin et al., 2018).

Path-Goal Theory. Some leadership theories postulate leadership behaviors and styles are universally effective in all environments. Others, referred to as situational leadership theories, believe leadership behaviors and styles are more effective in certain situations (Tyssen et al., 2013). Path-goal is a situational leadership theory. The path-goal theory developed by House (1996) and described in the conceptual framework provides an understanding of how

leaders situationally work with their team members to positively influence performance to achieve a goal.

According to Byrd (2019), path-goal is, “an approach in which the leader considers the employee and the task of focus when selecting the best manner in which to motivate employees to accomplish their goals. Bickle (2017) believed the path-goal theory allows leaders to face team challenges, respond to changes in project goals, and meet individual team member needs. According to Drouin et al. (2018), project manager’s leadership styles vary according to their project’s characteristics, their personality, and the conditions they face. Path-goal theory describes four main leadership styles: directive, supportive, participative, and achievement-oriented. The most effective leadership style varies according to the task and follower needs (Bickle, 2017).

The directive leadership style is most effective for complex or ambiguous tasks, and when followers need clear guidance concerning task performance and expectations (Bickle, 2017). According to Saide et al. (2019), behaviors indicating a directive leadership style include:

> leader lets subordinates know what is expected of them; leader informs subordinates about what needs to be done and how it needs to be done; leader asks subordinates to follow standard rules and regulations; and leader explains the level of performance that is expected of subordinates. (p. 557)

The supportive style supports mundane tasks, and followers who are unmotivated or dissatisfied (Bickle, 2017). Behavior statements that indicate a supportive leadership style include, “leader maintains a friendly working relationship with subordinates; leader does little things to make it pleasant to be a member of the group; and leader say things that hurt subordinates’ personal feelings” (Saide et al., 2019, p. 557).

The participative leadership style is effective for tasks requiring collaboration, and for followers who prefer autonomy in decision-making (Bickle, 2017). Saide et al. (2019) identified the following participative leadership behaviors, "leader consults with subordinates when facing a problem; leader listens receptively to subordinates' ideas and suggestions; leader acts without consulting my subordinates; and leader asks for suggestions from subordinates concerning how to carry out assignments" (p. 557).

The achievement-oriented style is most appropriate for tasks with challenging goals with high expectations and supports team members who have a desire to succeed (Bickle, 2017). Statements of achievement-oriented leadership behaviors include, "leader lets subordinates know that leader expects them to perform at their highest level; leader sets goals for subordinates' performance that are quite challenging; leader encourages continual improvement in subordinates' performance; and leader has subordinates' ability to meet most objectives" (Saide et al., 2019, p. 557).

Together, these four leadership styles: directive, supportive, participative, and achievement-oriented, form the core of the path-goal theory (House, 1996). Path-goal theory is a situational leadership style, relying on leaders to adapt their leadership style based on the employees they lead and the task at hand (Byrd, 2019). The path-goal theory is foundational to the study of virtual project team leadership since project managers must alter their leadership style to positively virtual team success, as opposed to the leadership style they found effective in the traditional environment.

Transformational Leadership Theory. The transformational leadership theory defined by Bass (1995) and described in the conceptual framework describes an approach for team leaders to improve overall team engagement, cohesiveness, and performance. Bass (1985)

compared and contrasted two types of leadership styles, transactional and transformational. Transactional leaders rely on their followers meeting expectations to gain a reward or avoid a punishment. Transformational leaders, on the other hand, inspire their followers to perform and offer support and encouragement. Followers emotionally identify with their transformational leaders, placing their trust and confidence in their goals. Followers of transformational leaders go to extraordinary efforts to achieve shared goals. A transactional leader focuses on tasks, while a transformational leader focuses on interpersonal relationships (Iorio & Taylor, 2015). Project managers often employ transformational leadership in complex projects, and transactional leadership in straightforward projects (Müller et al., 2018). Research by Ding et al. (2017) in the Chinese construction industry revealed transformational leadership significantly influenced team member engagement on temporary project teams.

Aga et al. (2016) surveyed 200 Non-Governmental Organizations (NGO) implementing diverse development projects in Ethiopia and stressed project managers' use of transformational leadership had a statistically significant contribution to project success. The transformational leadership style of project managers inspired team cohesion, encouraged the open exchange of ideas, and emphasized the development of the individuals on their teams. Transformational leadership caused their team to continually perform beyond expectations to achieve project success (Aga et al., 2016). Kirkman and Stoverink (2021) found a project managers application of transformational leadership style improved a virtual project team's ability to cope with future uncertainties. In addition, Zheng et al. (2019) surveyed 217 Chinese employees working in the construction industry and observed the transformational leadership style supported more innovative behavior on virtual project teams.

The literature agrees idealized influence, intellectual stimulation, inspirational motivation, and individualized consideration, often referred to as the 'four I's,' form the main dimensions of transformational leadership (Aga et al., 2016; Paolucci et al., 2018). When a team leader exhibits idealized influence, there is an emotional connection and strong identification with team members that generates trust and respect. Team members are proud to be a part of the team. The leader is a role model, demonstrating high standards and avoids using power for personal gain (Passakonjaras & Hartijasti, 2019). Inspirational motivation occurs when team leaders inspire their team members with an inspiring vision and challenges them with assignments and increased expectations. Inspirational motivation leads to a deep commitment to a shared vision from team followers (Passakonjaras & Hartijasti, 2019). Team leaders provide their teams with intellectual stimulation by identifying problems and encouraging innovative and creative problem solving, without fear of criticism (Mittal & Bienstock, 2019). Finally, team leader's show individualized consideration when they take a personal interest in supporting and encouraging their team members, and team members perceive their leader cares for their well-being. Individualized consideration encourages a coaching relationship with open communication (Passakonjaras & Hartijasti, 2019).

Purvanova and Bono (2009) studied 39 team leaders who lead 115 team members in face-to-face as well as 118 team members in virtual team environments. They reported the most successful team leaders increased their transformational leadership styles in the more ambiguous communication conditions created by using information communication technologies in virtual teams. They also determined transformational leadership style had a greater impact on team performance in virtual teams. They concluded transformational leadership is more imperative in

virtual environments, and virtual team leaders can improve team performance by increasing their transformational leadership behaviors.

Maduka et al. (2018) believed transformational leadership is better suited to virtual project team leadership than transactional leadership. Transformational leadership encourages trust, loyalty, admiration, and respect. Transactional leadership, or leadership by exception, reward, or punishment, does not produce results in a virtual setting (Maduka et al., 2018). Studies also reveal a positive relationship between a transformational leadership style and the life satisfaction, or work-balance, of followers (Mittal & Bienstock, 2019).

Mysirlaki and Paraskeva (2020) studied 500 Massively Multiplayer Online Games (MMOG) players. They indicated leaders who exhibited transformational leadership behaviors positively impacted virtual team member satisfaction and overall virtual team performance. However, their research highlighted a difference in how males and females viewed transformational leadership styles. Females reported greater team effectiveness when leaders demonstrated high emotional intelligence and practiced transformational leadership.

Passakonjaras and Hartijasti (2019) studied the influence of ethnicity on leadership style preferences. These researchers conducted a survey among 425 alumni of the University of Indonesia and determined ethnicity did affect leadership preferences. However, followers preferred leaders who practiced a transformational leadership style. Subordinates believed transformational leaders performed at a higher level than transactional leaders.

Hoyt and Blascovich (2016) investigated the use of transactional and transformational leadership styles in both virtual and face-to-face work groups in a laboratory setting. They concluded, “transformational leadership was associated with decreases in quantitative performance but increases in qualitative performance, leadership satisfaction, and group

cohesiveness" (para. 1). Hoyt and Blascovich (2016) also concluded virtual technologies do not limit the effectiveness of leadership styles. However, not all researchers fully support the importance of transformational leadership on virtual project teams. "Studies on transformational leadership in virtual teams show inconsistent results regarding effectiveness" (Efimov et al., 2020, para. 2). In a related study, Guinalíu and Jordán (2016) examined surveys from 241 people who regularly work on virtual teams to prove trust in leaders is foundational to the success of virtual teams. They described the leader's degree of attractiveness, empathy, and perceived justice affected subordinate's trust of a virtual team leader. The authors hypothesized transformational leadership style would influence trust, and thus performance, but their data did not support this assertion. Although empathy is a part of transformational leadership, transformational leadership was not as meaningful to the development of trust in virtual teams as collocated teams.

Some studies have shown transformational leadership is not enough to overcome the challenges associated with geographically dispersed teams. Eisenberg et al. (2019) studied the moderating effect of transformational leadership on the relationship between team communications and team performance. The authors studied 53 real world innovation teams working under different levels of virtuality, or geographic dispersion. They discovered transformational leadership was more effective on improving the performance of collocated and low dispersion teams, and less effective on highly dispersed teams. The authors postulate the influence of transformational leadership on virtual team performance decreases as the level of dispersion increases. Transformational leadership behaviors (idealized influence, inspirational motivation, individualized consideration, and intellectual stimulation) may not translate as authentic in the virtual environment but require face-to-face interactions. Thus, high virtuality

teams may need a different leadership approach to achieve communication and team performance improvements. Lin et al. (2019) added although the overwhelming research on transformational leadership indicates benefits for leaders and followers, detrimental consequences for leaders can occur, including emotional exhaustion which can lead to leader turnover.

Related Studies

Related studies contains a detailed review of the research in the current body of knowledge most related to this research. Some studies corroborate the researcher's views, and some provide a contradictory point of view. Together these studies provide a landscape of the current research in the area of virtual project management.

Blaskovics (2018) conducted a study to examine the effects of virtualization on project managers. The author studied eight project managers leading virtual project teams for a multi-national firm based in Hungary and determined virtuality both supports and hinders project managers. The research revealed the three main benefits for the project managers were communication, team management and document storage. The chief disadvantage was the lack of direct contact with stakeholders. The research concluded project managers need to find new ways to successfully apply project management skills, especially the soft skills associated with face-to-face communication, and most needed on complex projects, or those with high levels of conflict.

"Degree of virtuality" may affect research (Purvanova et al., 2020). These authors study of students, half in a lab setting and half in the real-world environment of the classroom studied the characteristics of emergent leaders in different degrees of virtuality. They concluded ascription characteristics (extraversion, conscientiousness, and cognitive ability), impact which

team members emerge as leaders in low virtuality contexts. In high virtuality contexts, achievement characteristics (action and monitoring behaviors) influenced leader emergence. The authors made no clear conclusions in the medium virtuality contexts. The study also questioned the ability of a team to self-describe their level of success.

One case study involving two virtual project teams in a plastics company in Africa identified leadership competencies required to effectively support virtual project success (Maduka et al., 2018). The study determined the two virtual project team leaders in the case study did not possess the skills necessary to support organizational and project success. The authors believe identifying a set of virtual project team leader competencies will aid organizations selection of managers to lead high-performing virtual teams. These leaders can enhance project and organizational success.

A quantitative study in Malaysian investigated the factors impacting virtual team performance. They identified six factors affected virtual team performance: coordination, communication, relationship building, cohesion, and trust (Tan et al., 2019). The authors believe future qualitative studies may provide a more in-depth analysis of virtual team performance and uncover hidden behaviors.

Whillans et al. (2021) interviewed 51 knowledge workers to identify lessons learned during COVID-19 pandemic as collocated teams transitioned to virtual teams. The authors captured the lived experiences of these workers during this novel period of a sudden shift from collocated to virtual work and document their insights and adjustments. Findings included how some team activities were more effective, including the ability to focus on tasks. However, the authors also identified ways in which virtual team interactions were less effective, and how newly virtual teams adapted technology to improve these.

Eckhardt et al. (2019) performed a case study with two corporations who successfully adopted a virtual work force. Based on a series of in-depth interviews and analysis, this case study provides lessons learned that form a three-stage blueprint for future organizations to follow. In order to obtain the benefits of virtual work, organizations must ensure their workers are able to face the challenges of mental readiness, technology readiness, and relationship readiness. In addition, corporations should be aware of the stress virtual workers face with a high exposure to technologies.

Anticipated and Discovered Themes

Based on the current body of knowledge, and presented above, the researcher anticipated the study would reveal the following themes. First, facilitating trust in virtual teams positively influences project success. Second, establishing open communication on virtual teams is essential for project success. Third, including opportunities for face-to-face interactions positively improves virtual project team performance. The concepts section above, cites the literature supporting the first and second anticipated themes, thus, this section focuses on the literature supporting the third anticipated theme.

Face-to-face meetings between virtual team members help to develop relationships and trust (Eckhardt et al., 2019). Based on a case study involving two corporations who successfully implemented virtual workforces, Eckhardt et al. (2019) reported every interview subject mentioned the importance of occasional face-to-face meetings between team members, and the wider organization. These meetings helped to build or maintain trust and develop relationships. They determined these successful companies believed the costs of face-to-face meetings were worth the costs. Schawbel (2018) explained, “two-thirds of remote workers aren’t engaged and

over a third never get any face-time with their team — yet over 40% said it would help build deeper relationships" (para. 2).

The lack of face-to-face communications reduces the level of trust on virtual teams (Chang et al., 2013; Fan et al., 2013). However, having an initial face-to-face meeting may improve the effectiveness of project teams (Gilson et al., 2015). An initial face-to-face meeting between all team members helps generate initial trust and reinforces the trust building process (Flavian et al., 2019). Cascio and Shurygailo (2008) agreed project managers should arrange face-to-face kick-off meetings, if possible, for team members to meet before starting work. Nicolas and Steyn (2017) agreed the best way to build trust on a virtual project team is through face-to-face contact. They argue project managers should have at least one meeting with each team member, ideally more.

The use of occasional face-to-face meetings can promote relationship building, especially when the relationships initially form (Hunt & Weintraub, 2017; Paul et al., 2016; Purvanova, 2014; Rhoads, 2010). However, these meetings come at a cost and each organization must determine if the potential relationship-building benefits outweigh the costs associated with time and travel expenses. Even infrequent (annual) face to face meetings can solidify trust among virtual teams and are worth the travel expenses (Mehta & Shah, 2019).

Several theories suggest explanations why technology-aided communication is less effective than face to face communication (Rhoads, 2010). First, media richness theory, developed by Daft and Lengel (1984), placed communication modes on a continuum between 'rich' and 'lean.' Face to face communications represent the richest form, followed by video conferencing, then telephone, and finally, text-only communications are the leanest form. However, researchers argue experience with leaner communications can generate a richer

exchange (Rhoads, 2010). Second, media synchronicity theory, created by Dennis and Valacich (1999) extended media richness theory to account for the efficiencies of modern technologies. Media richness theory suggests virtual teams may communicate more efficiently than with face-to-face interactions. For example, existing technologies can allow team members to communicate simultaneously and gives team members equal opportunities to provide input (Rhoads, 2010). In addition, different communication technologies can provide different advantages. Finally, socially dynamic media theories argue the efficient use of communication technologies depends on training and acceptance of organizations. Given time for teams to adequately adapt to new technology, teams may reach the richness of face-to-face communication.

Paradoxically, several studies have shown virtual teams require a physical presence (Dube & Robey, 2009). Based on their interviews with 42 virtual team members in 26 different organizations in Canada, these authors propose four coping mechanisms to address this paradox. First, have team members physically come together for a face-to-face kick-off meeting. Second, they should learn which technologies are appropriate for certain tasks. Third, hold regularly scheduled meetings, either technology-driven, or face-to-face. Fourth, gain proficiency in developing relationships through information technology. Blenke et al. (2017) added in-person team gatherings not only promote relationships but are one of the simplest ways to reduce feelings of isolation.

Summary of the Literature Review

The literature review provided a framework for this research and its connection within the current body of knowledge. While much of the existing literature focuses on “what” skills are effective in the virtual environment, little addresses “how” managers can adapt and improve their

collocated project management skills for the virtual environment (Byrd, 2019). Groen et al. (2018) argued the current body of knowledge lacks a description of how managers can best prepare to face the challenges of virtual project teams. In addition, Maes and Weldy (2018) believed there is a gap in the current literature regarding the best practices for developing the soft skills necessary to ensure productive virtual teams. Also, much of the current virtual team research uses student populations rather than real-life case studies (Gibbs et al., 2017; Gilson et al., 2015; Liao, 2017). Thus, this research not only builds upon the existing research but fills a gap in the current literature by providing an in-depth examination of a real-life application of virtual project management.

Summary of Section 1 and Transition

Section 1 presented the foundational information necessary to frame this qualitative case study research project. Structural knowledge is essential before transitioning into the research process. The background of the problem suggested project managers need to adopt new skills to build trust and open communication on virtual project teams to improve overall team performance. The background culminated with the specific problem statement that there is a lack of leadership skills among some project managers in the government contracting industry to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. The purpose statement of this research sought to understand the reasons contributing to this lack of project management skills specific to the virtual environment and fill a gap identified in the literature. The identified research questions guided this study and directed the exploration of the problem. The nature of the study section reviewed four researcher paradigms, three research designs, and five flexible design methods. For this research, the pragmatic researcher design and problem statement influenced the selection of the flexible case

study research design. The graphical and narrative presentations of the conceptual framework solidified the connection between concepts and theories from the literature. The definitions of terms, and the assumptions, limitations, and delimitations provided boundaries for the study and formed a baseline for understanding the research. The significance of the study highlighted the potential implications for the study, including the reduction of gaps in the literature, and addition of real-life applications of the problem. The study reflected a Christian worldview and may influence future project manager selection and training. Finally, an exhaustive review of the professional and academic literature examined the recent, peer-reviewed research impacting this study. The review of the existing body of knowledge covered the business practices, the problem, concepts, theories, and related studies. A discussion of the anticipated and discovered themes completed this section.

Section 1 presented the essential information required to understand the research, and served as a transition to Section 2. Section 2 describes the project under study in much greater detail and focuses on how the researcher conducts the study outlined in Section 1. The main sections include role of the researcher, research methodology, participants, population and sampling, data collection and organization, data analysis and reliability and validity. The role of the researcher delineates how the researcher approaches the study. The research methodology discusses the appropriateness of the chosen design, method, and approach to triangulation presented in the foundation of the study. Sections covering the study participants, population, and sampling describe the approach the researcher will follow to select individuals to serve as research subjects. The data collection and organization section details the researcher's plan to collect and organize data, including the instruments chosen for data collection. The data analysis section provides a roadmap for interpreting the collected data and identifying emerging themes.

Finally, a section addressing the reliability and validity of the study is necessary to ensure the credibility of the research. Thus, in total, Section 2 prepared the researcher to complete the qualitative case study research described in Section 1.

Section 2: The Project

Conducting a qualitative case study to examine the research problem required careful planning and design. Specifically, the qualitative case study research problem in this project addressed the project management skills successful in leading teams in the virtual team environment. In qualitative case study design, it is essential to plan for efficient data collection and analysis to ensure the themes identified in the research findings are of the highest quality. Section 2 builds upon Section 1 to provide an in-depth description of the methodology employed in this specific case study research. Section 2 re-iterates the purpose statement from Section 1 and includes: a description of the role of the researcher, the research methodology, the participants included in the study, the population and sampling method, the data collection and organization plan, the data analysis plan, and how the researcher addresses the reliability and validity of the project.

Purpose Statement

The purpose of this flexible design case study was to understand the reasons contributing to the project manager's lack of skills to lead projects in the virtual environment, and the effect it has on project efficiency, productivity, and overall project success. Unfortunately, while the current research identifying tools and methods to develop effective co-located project teams is plentiful, there is little research concerning the best practices to ensure effective and productive virtual project teams (Maes & Weldy, 2018). Thus, there is a gap in the literature concerning the leadership skills project managers should incorporate in their virtual project teams to encourage the trust and open communication necessary to improve project efficiency, productivity, and overall project success. This research extends the existing body of knowledge through an in-

depth study of virtual project management to understand the skills project managers effectively employ in the government contracting industry, as guided by the identified research questions.

Role of the Researcher

Qualitative researchers are intimately involved in all aspects of the qualitative study. The researchers are the key instrument in data collection, "examining documents, observing behavior, and interviewing participants" (Creswell & Poth, 2018, p. 43). They design their instruments through the use of open-ended questions (Creswell & Poth, 2018). Qualitative researchers aim to reduce the distance from their participants; however, since the researcher is a co-participant in data collection interviews, it is a complicated relationship (Råheim et al., 2016). According to Creswell and Poth (2018), prior to undergoing qualitative research, researchers must commit an extensive amount of time to perform fieldwork and data collection, commit extraordinary amounts of time for data analysis, write detailed and persuasive passages, embrace dynamic research procedures, and anticipate and enforce ethical concerns. Yin (2018) described five attributes of effective qualitative researchers. Qualitative researchers must ask good questions, be good listeners, stay adaptive, have a firm grasp of the issues under study, and conduct research ethically (Yin, 2018, p. 82). Each of these attributes assists researchers when interviewing. When meeting with participants, the researcher must be flexible and respectful, encourage their willingness to openly share their experiences, follow up with thoughtful questions, and always maintain confidentiality (Pagan, 2019).

In this case study, following approval from the Institutional Review Board (IRB), the researcher's first goal was to select, define, and describe the bounded case for study. Next, the researcher designed the data collection procedures, wrote the interview questions, and personally conducted participant interviews until saturation. After data collection, the researcher organized

and coded the data to identify themes. The researcher then wrote and reported the findings of the study.

Personal bias is a critical area every qualitative researcher must consider. One method a researcher can use to identify personal experiences in order to set them aside is bracketing. According to Creswell and Poth (2018), bracketing encourages researchers to focus solely on the experiences of research participants and minimize, or eliminate, the influence of their personal experiences. Moustakas (1994) described the importance of epoché, or bracketing, in the phenomenological data analysis process, where researchers set aside their preconceived ideas and life experiences to better understand the experiences of their research participants. According to Nicholls (2019), bracketing is a practical skill necessary for qualitative researchers to hone and apply. Roberts (2019) stated that successful bracketing allows the researcher to, "perceive the unfolding world afresh" (p. 397). Unfortunately, while bracketing is a goal for qualitative researchers to reduce their judgment and bias, it is often impossible to eliminate the impact of personal experience (Gregory, 2019). In this study, the researcher reflected on remote and virtual work, government contracting, and the MITRE Corporation prior to data collection. According to Yin (2018), this reflection is necessary to minimize the effect of potential interviewer bias during data collection. Without prior reflection on the interview topics, the researcher may inadvertently influence the participant's responses. "You may not be able to overcome the threat fully, but just being sensitive to its existence should allow you to do better case study interviews" (Yin, 2018, p. 120).

The researcher plays a substantive and intimate role in qualitative research. After identifying a research problem, presenting a foundation of the study, and receiving approval from the IRB, the role of the researcher is to collect, interpret, analyze, and report data they

collect in the field (Creswell, 2014). In this case, the researcher identified the potential lack of leadership skills of some project managers to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. The researcher developed a foundation for the study, the nature of the study, and a thorough review of the extant literature. The researcher identified and reduced the impact of their personal bias through bracketing to promote keeping an open mind during interviews and reducing researcher bias in data collection and analysis.

Research Methodology

A qualitative case study research design addressed the problem and research questions presented in this study. A flexible, qualitative research design is appropriate since the research aims to understand why some project managers may lack the leadership skills to lead projects in the virtual environment. Specifically, the single case study method supports an in-depth understanding of the problem in a real-world setting. Triangulation allows the researcher to improve the quality of the study by incorporating multiple sources of data. Thus, a flexible, qualitative single case study focused on data and methodological triangulation in data collection address the problem statement and research questions of this study.

Discussion of Flexible Design

Research designs are either fixed or flexible. Fixed research designs begin with a theory and a firm design prior to data collection to understand the quantitatively measured variables (Robson & McCartan, 2016). The flexible research design provides researchers with the freedom to make adaptations throughout the study, particularly during data collection. Generally, researchers adopt qualitative methods to capture data in flexible studies (Robson & McCartan, 2016).

Qualitative research aims to *understand* human behavior, while quantitative research aims to *explain* human behavior (House, 2018). Quantitative research emphasizes measurement and analysis to determine causal relationships between variables. Quantitative research aims to develop generalized rules and relationships based on the experiments performed under manipulated conditions and controlled environments (House, 2018). Thus, quantitative research seeks to *explain* human behavior. On the other hand, qualitative research is non-experimental and focuses on processes instead of variables and the situational, social impact of reality. According to Denzin and Lincoln (2011), qualitative research requires an intimate relationship between the research and the researcher, while quantitative research is value-free. Qualitative researchers use various methods to, "study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2011, p. 3). Thus, according to House (2018), qualitative research requires the researcher to empathize with human participants to *understand* human behavior.

A flexible qualitative research design is most appropriate for this study. The problem statement sought to understand the potential lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in potential reduced project efficiency, productivity, and overall success. The flexible, qualitative design allowed the researcher to conduct in-depth interviews to capture the rich experiences of project team leaders and participants in their natural settings. Themes evolved, meanings interpreted, and patterns emerged during data collection and analysis. According to Creswell and Poth (2018), qualitative research is appropriate when the research calls for a "complex detailed understanding of the issue" (p. 45).

Discussion of Case Study

According to Creswell and Poth (2018), there are five main methods for conducting flexible, qualitative research: narrative, phenomenological, grounded theory, ethnographic, and case study. Narrative research explores the life of an individual, capturing individual's stories and experiences to address the research problem. The narrative method provides meaning to personal experiences over time (Carless & Douglas, 2017). Phenomenological research seeks to describe the essence of a phenomenon based on the common, lived experiences of several individuals. Phenomenological research allows researchers to understand the deeper nuances of a phenomenon in the field (Paul, 2017). Grounded theory research aims to move past description and consider an alternate theory grounded in data collected from many participants in the field who have experienced a specific process or action. Researchers involved in grounded theory research collect volumes of data through diverse methods, analyze the data through a multi-level coding process to develop emergent theories, and continues until the developing theory requires no additional changes (Flynn & Korcuska, 2018). Ethnographic research attempts to describe and interpret complex, shared patterns of an entire culture-sharing group. While traditionally focused on participant observation, other data collection techniques can capture the complicated patterns of social behavior that help researchers, "understand people on their own terms" (Walle, 2016, para. 1). Finally, case study research aims to develop a rich description and analysis of one or more cases to provide an in-depth understanding of an issue in the specific case in a real-life setting. Case study research is a flexible method used across a broad variety of disciplines to develop "comprehensive and in-depth insight into a diverse range of issues" (Harrison et al., 2017, p. 15).

The case study was the most appropriate method for this research because it most closely aligned with the research problem that sought to understand the potential lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in potential reduced project efficiency, productivity, and overall success. Addressing this research problem required developing an in-depth description and analysis of a bounded case (Creswell & Poth, 2018). The appropriateness of case study research increases the more the research questions seek to explain a contemporary circumstance (Yin, 2018). In this study, the contemporary circumstance was the global increase in remote employees and virtual project teams. According to Creswell and Poth (2018), the case must describe boundaries of time and geography. The boundaries of this case study included virtual project teams in the government contracting industry, within the MITRE Corporation. Additionally, this case study included time boundaries, with data collection interviews confined to the fall of 2021. While the multiple case study format provides several advantages, the single case study provides successful results and is less time consuming and expensive (Yin, 2018). According to Yin (2018), a single case study is appropriate if the case is critical, unusual, common, revelatory, or longitudinal. This single case study was both common and revelatory. This case highlighted the potential lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment. While this is a common occurrence in the current, global business environment, it is more revelatory given the effects on project teams during the COVID-19 pandemic. Thus, the single, bounded case appropriately aligned with the research purpose, research questions, and the flexible, qualitative design.

Discussion of Methods for Triangulation

Researchers can improve the quality of their qualitative research by incorporating triangulation techniques (Abdalla et al., 2018). According to Yin (2018), the use of triangulation, providing an opportunity to use multiple sources of data to counter the inherent bias of any one source of evidence, is a strength of case study research. Case study research, with its in-depth analysis in a real-life setting over time, allows for the collection of multiple sources of data, and converging lines of inquiry (Yin, 2018). Converging evidence strengthens the construct validity in a case study, increasing confidence that the case accurately captured the phenomenon under study (Yin, 2018).

Denzin (1978) described four types of triangulation: data, investigator, theory, and methodological. Data triangulation encourages collecting information from multiple sources to support the theme or perspective with corroborating evidence (Creswell & Poth, 2018). Data triangulation encourages a richer, more detailed description by using different sources, different time periods, or moments, different places, and different individuals (Abdalla et al., 2018; Denzin, 1978). In qualitative case studies, data triangulation includes interviewing multiple subjects, at different times, or in different contexts (Farquhar et al., 2020). Investigator, or researcher triangulation encourages the involvement of two or more diverse researchers in a study to contribute their differing perspectives to the analysis (Abdalla et al., 2018). These varied observations allow for discussions, comparisons, and bias reduction (Farquhar et al., 2020). Theoretical triangulation encourages the exploration of multiple theories to interpret data (Abdalla et al., 2018). Finally, the most common form of triangulation, methodological triangulation, involves using multiple methods (e.g., interview, observation, document analysis) to provide richer descriptions of the phenomenon under study (Abdalla et al., 2018).

Data triangulation improves the quality of this qualitative case study research. Interviewing different subjects on a project team allowed themes to develop based on converging perspectives. Not only did the project manager and project team members hold different viewpoints, additional project teams provided additional confirmation of identified themes. Methodological triangulation also provided additional validity to this study. While interviews provided the largest source of data, observation and document analysis provided richer descriptions of successful virtual project management skills.

Summary of Research Methodology

A flexible, qualitative single case study appropriately addressed the problem identified in this research. The flexible, qualitative approach allowed the researcher to examine and understand the lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. A qualitative case study provided a platform to study the problem in a real-life context, providing an opportunity to form an in-depth understanding, and generalize the findings for project management application in business. The researcher improved the quality of the research by incorporating data triangulation, including multiple sources of data for analysis.

Participants

The participants of this study included project managers and team members assigned to virtual project teams at The MITRE Corporation. The researcher created a set of criteria, or eligibility requirements, to use in the selection of participants, highlighting the phenomenon of successful virtual government contracting project teams. These inclusion criteria included employees over the age of 18 who experienced successful project teams in both the virtual and

traditional project environments, as either project managers or project team members; their accessibility; and their willingness to participate in the research. The criteria omitted any demographic information such as race, education, or age. The researcher presented these criteria to the human resource department (HRD) at MITRE, who identified several potential project team leaders for this case study as critical examples of successful virtual project teams. Final selection of the participating project team members occurred immediately following IRB approval for this project. In addition, the HRD approved researcher access to the participants, and in an abundance of caution, ensured the cases did not involve classified information. Due to the geographic dispersion of virtual teams, and the current COVID-19 pandemic restrictions limiting in-person contact, the researcher interviewed participants through videoconferencing, and by telephone.

Ethical research standards require researchers to respect their participants, gaining their consent and ensuring their privacy; maintain concern for their welfare, minimizing any potential negative impacts to participants, and not engaging in deception; and justice, ensuring equitable treatment among all participants (Creswell & Poth, 2018). The researcher made every effort to treat the participants of this study in an ethical manner. This included providing each team member the opportunity to accept or decline participation in the research and ensuring privacy and anonymity by only referring to each participant by an assigned number, never using their name or description. Each participant signaled their agreement through a consent form signed before data collection. In addition, approval from the IRB preceded any data collection for this research.

Population and Sampling

This research sought to understand the potential lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in potential reduced project efficiency, productivity, and overall success. It was impossible to interview all project teams in the government contracting industry to gain a thorough understanding of the phenomenon, thus this project focused on a sample of the population. Researchers take a sample, or a smaller selection of the population, to highlight the phenomenon under study (Robson & McCartan, 2016). This research incorporated a case study at The MITRE Corporation as its sample among the population of all virtual project teams working within the government contracting industry. Interviews with virtual project team managers and virtual team members sufficiently identified emergent themes, as confirmed by data saturation.

Discussion of Population

The population of a study includes all possible cases (Robson & McCartan, 2016). Asiamah et al. (2017) defined the research population as a "group of individuals having one or more characteristics of interest" (para. 2). The population determined by this research problem included all virtual project teams within the government contracting industry. The researcher narrowed down the population to virtual project teams within The MITRE Corporation. The MITRE Corporation is a large government contracting business ranked 24th in the top 100 government contractors in the year 2020 (Washington Technology 2020 Top 100, 2020). MITRE employs approximately 8,200 scientists, engineers, and support staff, with main work locations in McLean, Virginia and Bedford, Massachusetts (The MITRE Corporation, 2018). MITRE has a long history of supporting work-life balance through flexible work arrangements and

telecommuting and has received numerous awards and recognition from multiple organizations ("MITRE: Working at MITRE," 2021). While MITRE did not disclose the exact number of virtual project teams operating within their organization, they did agree to grant the researcher access to successful virtual teams as a case study. Details of the available project team leaders were made available to the researcher prior to data collection and following IRB approval.

Discussion of Sampling

The approach to sampling in qualitative research is vastly different from the goal of sampling in quantitative research. In fixed, or quantitative research, the sampling approach focuses on obtaining a representative sample of the population to ensure accurate statistical generalization (Robson & McCartan, 2016). The smaller number of participants carefully chosen as a sample in quantitative research allows generalization to the larger population (Ishak & Bakar, 2014). Thus, the sample frame is based on the theory of probability and referred to as probability, or random sampling (Ishak & Bakar, 2014).

Creswell and Poth (2018) contrasted quantitative research and its probability sampling focused on making statistical inferences to a population, with the purposeful sampling of qualitative design. Purposeful sampling is a non-probability sampling technique that allows researchers to use their judgment to intentionally choose subjects to best inform the researcher about the research problem and research questions (Creswell, 2014). Since qualitative research does not include statistical analysis of hard, numerical data, a purposive or theoretical sampling is adequate. According to Yin (2018), it is not appropriate to apply probability sampling logic to case study research, as the goal is not to assess the prevalence of a phenomenon in a population, but rather, fully understand a case highlighting the phenomenon under study. "The primary purpose of sampling for a qualitative researcher is to collect specific cases, events, or actions that

can clarify or deepen the researchers understanding about the phenomenon under study" (Ishak & Bakar, 2014, p. 29).

This research incorporated purposeful sampling, selecting participants for the case study who were members of a virtual project team that experienced a shift from traditional to virtual project management. Specifically, this research adopted the critical case sampling technique, selecting a case that provided the most insight into the phenomenon and highlighted the research problem (Creswell, 2016). This technique allows the researcher to make some generalizations and maximize opportunities to apply information to other cases (Creswell, 2016). A critical case relates to the theoretical proposition and represents the precise set of circumstances described in the research (Yin, 2018). The critical case seeks to confirm, challenge, or extend the theory (Yin, 2018).

There are many other standard non-probability sampling techniques in qualitative research. Snowball, or chain sampling, is a recruitment strategy where interview subjects provide leads to additional participants who have experience with the research problem (Creswell, 2016). However, snowball sampling can quickly generate an overwhelming amount of data (Ishak & Bakar, 2014). Maximum variation sampling incorporates criteria to differentiate participants and selects those that have the greatest differences to present multiple perspectives (Creswell, 2016). Convenience sampling involves selecting participants for the study based solely on their availability, often asking for volunteers (Creswell, 2016). This technique saves time and effort but lacks credibility and can produce ineffective samples (Ishak & Bakar, 2014). While these non-probability techniques are common in qualitative research, they were not appropriate for identifying a critical case for this study.

Qualitative research does not require large sample sizes (Ishak & Bakar, 2014). According to Creswell (2016), the intent of qualitative research is to uncover rich, in-depth understanding from a few individuals. Thus, qualitative designs often rely on a small sample of cases with the most qualified participants rather than a large sample (Asiamah et al., 2017). This is different from quantitative research, where generalizing from a sample to a population requires larger sample sizes.

Qualitative researchers need to continually evaluate their sample. Sampling adequacy ensures the researcher collects enough data, while sampling appropriateness ensures the researcher collects from individuals who have experienced the phenomenon under study (Robson & McCartan, 2016). Data saturation confirms the adequacy of the sample size. If the sample is not appropriate, the researcher may need to seek out additional participants or a new study location. According to Creswell (2016), when participants begin providing the same data, and there is no new information gathered, the sample size is adequate, or saturated. Researchers stop collecting data, "when gathering fresh data no longer sparks new insights or reveals new properties" (Creswell, 2014, p. 189).

The challenge for qualitative researchers is to ensure the number of participants is large enough to fully describe the research phenomenon, however, the precise sample size, or the number of participants providing data to the study, finalizes during data analysis (Ishak & Bakar, 2014). According to Moser and Korstjens (2017), sample sizes in qualitative research is determined by data saturation and varies across each research project. The practical experience of researchers indicates 12 participants often leads to data saturation in homogenous populations, and most qualitative research reaches saturation by 30 interviews (Boddy, 2016). Thus, the

researcher interviewed 17 participants, and ensured the research met the requirement for data saturation.

A single, critical case study was adequate to study the leadership skills of project managers in the virtual project team setting at The MITRE Corporation. Creswell and Poth (2018) suggested a single case study is often preferable as the limited resources required to understand multiple cases often dilutes the depth of analysis of each case. Ishak and Bakar (2014) agreed that a single case study, with critical or classic characteristics is sufficient. In addition, Creswell and Poth (2018) believed the inclusion of multiple cases does not improve the quality of qualitative research. Since the goal of qualitative research involves developing a deep, rather than a broad understanding, single case studies, "can be of importance and can generate great insight" (Boddy, 2016, para. 22).

Summary of Population and Sampling

Data collected for a qualitative study is not meant to generalize to a larger population but to describe the phenomenon experienced by the case study participants (Ishak & Bakar, 2014). Thus, the non-probability, purposeful sampling method of critical case was appropriate for this study. This sampling method purposely identified a case of a successful virtual project teams at The MITRE Corporation from the population of all virtual teams within the government contracting industry. The MITRE Corporation granted the researcher access to this case study for data collection, including interviews with project team members and project managers. A single case was appropriate since it represented a critical case and provided a practical number of participants to provide the in-depth data necessary to describe the phenomenon. While the findings from this qualitative case study are not generalizable to the general population, the

insights developed through this research can provide lessons learned to other virtual project teams in the government contracting industry facing similar circumstances.

Data Collection and Organization

The qualitative research design occurs in a natural setting to allow the researcher to gather up-close information from the participants, in the location where the participants experience the problem under study (Creswell, 2014). While it is essential to develop a data collection plan, the flexible nature of qualitative research means the plan must remain unstructured and flexible (Moser & Korstjens, 2018). Interviews are one of the most popular instruments for data collection in qualitative research and allow researchers to gain an in-depth understanding of the participant's experience with the phenomenon under study. Thus, ethical considerations are of paramount concern. Researchers must protect the confidentiality of participants, masking the names of people, places, and activities in their responses, and safeguard the sensitive information of the corporation involved in the case study (Creswell, 2014).

Data Collection Plan

Data collection for this qualitative case study involved semi-structured, one-on-one interviews with participants. Interviews are flexible and adaptable, and provide rich, illuminating data (Robson & McCartan, 2016). The researcher planned to conduct these in-depth interviews in person, via videoconference, or as a last resort, via telephone. According to Creswell (2016), in-person interviews allow the researcher to, "watch the body language of the participant, hear directly the inflections of his or her voice, and establish a personal connection with the participant that may enhance his or her willingness to open up" (p. 127). It was important to conduct the interviews in a private location, and because of the ongoing COVID-19 pandemic, adhere to current safety protocols, including social-distancing and mask wearing, where

appropriate. Due to the geographic distance between the researcher and participants, and safety concerns from the participants, the researcher conducted 16 of the interviews by videoconference, and one by telephone, in private locations. Telephone interviews are quick and inexpensive to administer, but they were a last choice as they lacked the insight gained by observing facial expressions. When completing interviews in person, Creswell (2014) cautioned the researcher to respect the location and disrupt workflow as little as possible during the interview process.

The interview is a widely used data collection technique in qualitative research and involves asking open-ended questions to obtain the participants in-depth personal perspective on the research questions (Creswell, 2016; Robson & McCartan, 2016). Creswell (2016) observed that incorporating interviews during data collection allows participants to provide historical information, allows the researcher to exhibit control over questioning, encourages an open exchange, and is efficient in both cost and time. The goal of interviewing is to gain a thorough understanding of the meaning behind a participant's expression of their experience (Moser & Korstjens, 2018).

One-on-one interviews allow the researcher to ask follow-up questions or probe for clarification or elaboration. When conducted face-to-face, interviews offer the researcher the opportunity to modify their line of questions, ask follow-up questions, and interpret non-verbal cues (Robson & McCartan, 2016). However, this flexibility, and the lack of standardization it creates, can negatively affect reliability (Robson & McCartan, 2016). The qualitative researcher must also accept that the participant filters information through their viewpoint, the researcher's presence may bias the participant's responses, and participants have varying degrees of

articulation and perception (Creswell, 2016). Interviews are also time consuming, require careful planning, and interviewing is a skill that improves with practice (Robson & McCartan, 2016).

Robson and McCartan (2016) classified interview styles as fully structured, semi-structured, and unstructured. Fully structured interviews incorporate precisely worded interview questions, asked in a set order. Data gathered from a fully structured interview essentially mimics questionnaire or survey responses, providing limited information in a verbal format (Barrett & Twycross, 2018). Semi-structured interviews use a protocol with a list of core questions to guide the interview, but the researcher has the freedom to choose the exact wording, order, and the necessity of follow-up questions (Robson & McCartan, 2016). Unstructured interviews begin with a general area of interest, or a single question. The interviewer and interviewee engage in an informal, lengthy conversation with no pre-written schedule (Barrett & Twycross, 2018). Semi-structured and unstructured interviews are common in flexible and mixed-method designs, while structured interviews are common in fixed and mixed-method research designs (Robson & McCartan, 2016).

Creswell (2014) acknowledged that most qualitative interviews are either unstructured or semi-structured and include a few open-ended questions to allow the participants to provide insights into their experiences. Open-ended questions often start with what or how, while closed-ended questions allow for a simple yes or no response, and do not elicit the in-depth responses required for qualitative research (Creswell, 2016). In the semi-structured interview, the researcher creates an interview protocol, or guide, to include standard instructions to ensure the researcher conducts each interview with the same procedure; five questions, with probes to encourage participants to provide additional detail or explanation; a concluding statement or question, and a thank you statement to acknowledge the participant's contribution and express

gratitude (Creswell, 2014). Prior to the interview, the researcher must invite participants to a 30-minute interview and agree upon the time and location, ensure the location is private and free of distractions, and the audio-recording device is in working order. Taping the interview creates a permanent record of the interview and allows the researcher to focus on the interview and not capturing verbatim quotes from the participant (Robson & McCartan, 2016).

The researcher in this case study reached out to each participant to make introductions and schedule interviews following IRB approval. The researcher followed the interview guidelines described by Creswell (2016) above, and schedule 30 minutes for each initial interview. The researcher recorded the audio of each interview from two devices, a computer and a tablet for back-up, in case one failed during the interview. The researcher used the interview guide, located in Appendix A and discussed below, as the protocol for the semi-structured interviews. The interview guide also allowed the researcher to capture any notes made during the interview. Notes included observations of non-verbal communication patterns, cues, or general impressions of the interview. The researcher transcribed each interview and any field notes collected on the interview guide within 48 hours of the interview. Both the interview guide and audio recordings always remained confidential and secure with the researcher.

Member Checking. Member checking, also referred to as participant validation, involves returning to research participants to validate transcript data, and allows the researcher to test the trustworthiness of their data (Birt et al., 2016). Some authors suggest having participants check their raw transcript data is not as effective as having them check data analysis. They argue some participants will want to alter their earlier accounts rather than simply verifying the accuracy of their initial interview (Birt et al., 2016).

Stake (1995) believed these follow-up interviews with research participants can go beyond checking raw transcripts and seek validation or correction of the data analysis (Stake, 1995). Creswell (2014) defined member checking as returning to participants with research data to ensure the researcher accurately captured descriptions or themes (Creswell, 2014). Creswell (2016) cautioned if the participants do not agree with the analysis, the researcher should review the data and revise their themes. Lincoln and Guba (1985) believed member checking is critical to establish the credibility of the research. Stake (1995) added that in case studies, participants play a critical role in ensuring the researcher's analysis accurately captures their experience. This researcher employed member checking, returning to participants with the identified themes of the research to validate the research findings. The researcher did not employ member checking to validate transcripts as no questions arose from the audio files or field notes that required clarification from the participant. Rather, the researcher employed member checking during data representation to improve validity.

Follow-up Interviews. Moser and Korstjens (2018) advised researchers to prepare for revisions to their interview guide based on participant interviews. This is an iterative process. As researchers gain experience interviewing participants, certain changes to the line of questioning may occur. The researcher may need to add questions to the original interview guide. If this happened during this research, the researcher performed follow-up interviews with the original participants to append the interview. The follow-up interviews only included the new interview questions that arose from responses to the initial interviews. In addition, researchers can also request follow-up interviews with participants to give them an opportunity to comment on the themes and case analysis as part of member checking (Creswell, 2014). Creswell (2016) suggested researchers should request the opportunity to follow-up with each participant during

the interview and in a thank you note sent to each participant after the initial interview. This researcher included a request for the opportunity to follow-up with each participant as part of the interview guide, as well as repeating the request in a follow-up email thanking the interviewee for their participation.

Instruments

The qualitative research design encourages the researcher to personally collect data from participants, often employing an instrument, or protocol (Creswell, 2014). One of the most common instruments employed in qualitative research is the interview, as it provides, "the most direct and straightforward approach to gathering detailed and rich data regarding a particular phenomenon" (Barrett & Twycross, 2018, para. 2). Using a semi-structured, one-on-one interview format, the interviewer ensures the data captures key components of the research questions while providing enough flexibility to the participant to offer their perspective on the phenomenon.

Ideally, the data collection interview evolves into a conversation, or dialogue between the researcher and participant, and not a pre-determined set of question/answer responses (Moser & Korstjens, 2018). For this reason, the interview design included time at the beginning of the interview to build rapport and put the participant at ease. Following introductions, the protocol included ice breaker questions to encourage the participant to openly share their experiences and perspectives (Creswell, 2016). Creswell (2016) proposed that ideally, the main portion of the interview contains between five and ten open-ended questions. The researcher for this project chose five central interview questions. These questions encouraged participants to share their personal experiences. Follow-up questions ensured participants provided as much detail as possible and kept the interview on track to cover the research questions. Moser and Korstjens

(2018) suggested beginning with ‘what’ and ‘why’ questions and ending with ‘how’ questions. The researcher conducted a pilot test, to practice asking the questions, as interviewing skills improve with practice (Creswell & Poth, 2018). Also, the researcher needed to ensure they could ask the questions and receive thorough answers in the allotted time. In this case, within 30 minutes. Creswell and Poth (2018) reminded the researcher to remain respectful and courteous and practice active listening and speaking infrequently.

Interview Guides. The interview guide provides an essential structure to a semi-structured interview, ensuring the data collected from each interview consistently addresses the research questions. In addition, the guide helps the researcher stay on track, offering a general introduction to the study, and a general format for the interview. Moser and Korstjens (2018) warned the researcher to remain open-minded, revising the interview guide throughout the data collection process as they learn from their experiences with each research participant.

Appendix A contains the interview guide developed for this research study. The interview guide comprised three sections. The first section included background information concerning the participant, including verification that the participant signed the consent form, located in Appendix B, a review of the purpose of the study, and the amount of time assigned for the interview as suggested by Creswell and Poth (2018). The second section of the interview guide included questions for the researcher to ask the participant. Each interview question addressed a specific research question, as indicated in brackets following the question number. Follow-up prompts followed each question to encourage the participant to completely capture the intent of each question. The exact wording and question order on the interview guide was flexible, provided as a reference for the researcher to ensure complete coverage of the research questions. Each participant interview was unique. While the researcher ensured the participant

addressed each question, the interview resembled a conversation and not a highly structured interview. The interview guide also contained space for the interviewer to make field notes concerning the participants' responses, or general notes on emerging themes. The third and final section of the interview guide contained a sample of closing remarks, thanking the participant for their time and ensuring the confidentiality of their responses.

Section 2 of the interview guide in Appendix A contains 10 questions. Question 1, "How long have you worked at MITRE?" is an ice breaker provided to set a conversational tone between the researcher/interviewer and the participant/interviewee. Prompt a, "In what capacities?" provided the researcher with follow-up opportunities, if needed, to coax more information from the participant. Question 2, "Have you worked on both traditional project teams and virtual project teams?" sub-question a, "Which did you prefer?" and sub-question b, "Why?" sought general background information from the participant to understand the participant's previous experiences and continue to build an easy rapport.

Questions 3 through 9 specifically addressed the project's research questions. These research questions appear in brackets following each interview question listed in the Interview Guide in Appendix A. Question 3, "Did you feel a sense of trust on your virtual team?" addressed Research Question 3 (RQ3), "What specific skills do project managers need to uniquely contribute to virtual team success?" Question 3 also specifically covered Research Question 3a (RQ3a), "What project management skills encourage trust on a virtual project team?" The follow-up prompts provided guidelines for the researcher to ensure the participant fully answered the intent of the questions. Question 4, "How effective was the communication on your virtual team?" also addressed RQ3, and specifically covered Research Question 3b (RQ3b), "What project management skills encourage open communication on a virtual project team?"

The sub-questions of Question 3 and Question 4 ensured the participant addressed Research Question 2 (RQ2), “What project management skills support the leading of collocated teams?” and Research Question 2a (RQ2a), “What project management skills support the leading of virtual teams?”

Question 5, “Did you have any face-to-face interactions with your team?” addressed the degree of virtuality on this virtual project team, which may impact the participant’s experience with RQ3, RQ3a, and RQ3b. Question 6, “Do you consider this project a success?” and its sub-question addressed Research Question 3c (RQ3c), “How does the application of these skills influence the ultimate success of a virtual project team?” Question 7, “What were the greatest challenges you faced on the virtual project team?” and sub-question a, “How did your project manager address these challenges?” addressed RQ3c. Similarly, Question 8, “What were the greatest advantages to working on a virtual project team?” and its sub-question also addressed RQ3.

Question 9, “If you were the project manager, how did you prepare to lead in the virtual environment?” and its sub-questions, directly addressed Research Question 1 (RQ1), “What are the causes for the lack of skills among project manages to lead teams in a virtual environment?” Question 9 allowed project managers to reflect on their preparation and training for virtual project team management. In addition, the sub-questions covered RQ2 and RQ2b, focusing on the project manager’s perspective on the unique skills supporting collocated and virtual team environments.

The final question, Question 10, “Is there anything else you would like to add about successful project management in the virtual environment?” is a wrap-up question. Asked in closing, this question provided the participant the opportunity to provide any additional thoughts

or insights from their experience working on a virtual project team in the government contracting industry. This final question preceded the closing comments by the researcher and marked the end of the interview.

Data Organization Plan

Organizing large amounts of data from interviews is the first step in preparation for data analysis (Creswell & Poth, 2018). The large amount of data collected in qualitative research is unwieldy, thus, organizing into smaller, more manageable units for easy retrieval and review is critical for data analysis (Moser & Korstjens, 2018). The researcher transcribed each recorded interview verbatim, ensuring the accuracy of each word, and notating pauses and non-verbal utterances. The researcher labeled the transcription with a unique file name and saved it to the researcher's computer for reference and in preparation for uploading to the NVivo software to assist in data analysis. The transcribed interview file names provided for easy location and future referral. In this research, the transcribed interview file names followed the format 'ParticpantXInterview.doc.' The researcher assigned each participant a participant number in the order of their interview date. A Microsoft Excel spreadsheet notated the correlation between the participant number and participant name. No paper copies of this file exist, and the only purpose of this file was a reference for follow-up interviews, should the need arise, and member checking. An additional Microsoft Word document file, 'ParticpantXNotes.doc' contained all field notes made by the researcher on the hard copy of the interview guide during the participant interview. Microsoft Word is the premier word processing software used by individuals and corporations across the globe. Thus, transcribing the interviews and field notes onto this software allowed for easy editing and access to the information. Two Microsoft Word files exist for each participant. One for each transcribed participant interview, and one for the field notes from each

interview. For example, the researcher named the document containing the interview transcript from the first interview, 'Participant1Interview.doc' and the corresponding field notes, 'Participant1Notes.doc.' The researcher destroyed the hard copy of the interview notes within 48 hours of the interview, as soon as uploaded to the computer. The computer used in this research was password protected and kept in a safe location throughout the research project. The researcher plans to destroy these individual computer files, transcripts, field notes, and Excel spreadsheet three years after project completion. These steps ensure both the safety of the data collected and maintains the participant's privacy, confidentiality and anonymity.

The researcher used Microsoft Excel as a separate database of participant information. Microsoft Excel is a commonly used spreadsheet software used worldwide and across all industries to organize and analyze data. The researcher loaded confidential participant information, including name, participant number, email address, and telephone number into the Excel spreadsheet for future reference. If the participant agreed to participate in member checking, or if the researcher needed a follow-up interview, the Excel spreadsheet allowed for quick and secure access to correlate the participant number with the individual's contact information. This Excel document is highly confidential and kept in a secure location, on a password protected computer. The Microsoft Excel spreadsheet is the only document containing both participant number and individual name. To ensure privacy, the transcript data loaded into NVivo only contains a participant number.

The NVivo qualitative data analysis software assisted the researcher with data collection, data organization, and analysis. While the NVivo software has the capability to analyze text, pictures, videos, and survey data, in this project the software aided the researcher with transcript data. After transcribing each interview, the researcher uploaded the document to the NVivo

software. The first benefit to the researcher was keeping the files together in one location. The massive amount of data collected through interviews can overwhelm a researcher, but the NVivo software keeps the data organized and readily available. The software requires the researcher's input to assign codes, or nodes, to groups of transcript text. Once defined, the researcher can add new codes to the nodes as they read through additional participant transcripts. The software can then group the data by individual codes, gathering each instance of specific codes across all participant interviews. This coding assists the researcher in efficiently gathering codes and uncovering themes. The NVivo software also allows the researcher to add memos containing insights as they read and code each transcript. In addition, the NVivo software allows the researcher to quickly display the codes as a representative model or chart and import them into the presentation of findings. While the NVivo is widely accepted in practice, this researcher was a new user and improved through practice. Prior to data collection, the researcher watched online training videos on YouTube, and worked through the tutorial provided on the NVivo software. This training and practice hastened the learning curve necessary for the efficient use of the NVivo software.

Summary of Data Collection and Organization

Data collection and organization lay the foundation for data analysis in qualitative research and requires careful planning. One of the most common forms of data collection in qualitative research is the interview, which allows the researcher to gain insight directly from the study participants. This research project incorporated one-on-one semi-structured interviews as the primary instrument for data collection. Semi-structured interviews provided the researcher with valuable, in-depth, perspectives from the participants that addressed the research questions through open-ended, and follow-up questions. The interview guide created for this study served

as a protocol to act as a blueprint for data collection. Following the interviews, the researcher organized the data by transcribing the recorded interviews and field notes into readily available and accessible, yet confidential, documents that supported data analysis.

Data Analysis

In qualitative research, the data analysis process coincides with data collection and the writing of study findings. It is common for a researcher to begin analyzing one interview while conducting another and writing narrative for inclusion in the final documents (Creswell, 2014). Data analysis is not a distinct step beginning after data collection, but is part of an iterative process, "whereby you move back and forth between sampling, data collection and data analysis to accumulate rich data and interesting findings" (Moser & Korstjens, 2018, para. 29). Creswell (2014) identified six steps in the qualitative data analysis:

1. *Organize and prepare data for analysis*. This step includes transcribing interviews and typing interview notes. These notes remain organized by participant, and the researcher may upload these files to a qualitative data analysis software package, such as NVivo.
2. *Read through all the data*. This first reading gives the researcher an overall impression of the data and begin reflecting on overall tone and meanings. The researcher may make notes on observations or potential emerging themes.
3. *Start coding the data*. This involves organizing the large volume of data into chunks and labeling with a representative word. The researcher may have pre-identified codes based on previous research or identify codes as they arise from the interview transcripts.

4. *Generate descriptions of settings and people, and themes for analysis*. These descriptions help generate five to seven themes from the coded data. These identified themes represent the general findings of the research.
5. *Interrelate themes/descriptions*. The detailed description of the themes often incorporates significant quotes captured from the participant data. Researchers describe these themes in a narrative, or graphical representation.
6. *Interpret the meanings of themes/descriptions*. The researcher captures and presents lessons learned from the research. These lessons converge from the interpretations of the researcher and the existing body of knowledge. These findings may support or contradict previous studies and may suggest new research questions. (p. 197)

Figure 2

Data Analysis Spiral

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Creswell and Poth (2018) represented this data analysis process as a spiral of activities, shown in Figure 3, including organizing the data, reading and memoing emergent ideas, classifying codes into themes, developing interpretations and representing and visualizing the data. The following sections describe these concepts in more detail.

Emergent Ideas

Following data collection, transcription, and organization, Creswell and Poth (2018) suggest reading through the data to gain an overall understanding of the information provided by the participants. Reading through the interview transcripts and ensuring their accuracy allows the researcher to familiarize themselves with the data, develop initial coding, and begin to identify emerging themes (Turesky et al., 2020). Moser and Korstjens (2018) added, “You familiarize

yourself with the data by reading and rereading transcripts carefully and conscientiously, in search for deeper understanding (para. 31).

Memoing, or writing short notes in the margins of the transcripts and interview notes, guides this data exploration. These memos may contain a summary of overall findings, or detailed reflections on a specific aspect (Moser & Korstjens, 2018). While memoing begins with the first reading of the data, it continues throughout the data analysis process until the presentation of the findings. Creswell and Poth (2018) described three levels of memos. Segment memos relate to phrases in the data and help form initial codes. Document memos capture emerging ideas and help identify coding categories for developing themes. Finally, project memos are higher level comments that capture the integration of major ideas across the data. In addition to memoing about current themes, the researcher may also highlight noteworthy quotes.

In this study, the researcher captured the memoing notes electronically, notating each memo with the notation date. According to Creswell and Poth (2018), dated memoing helps track emerging ideas and, "lends credibility to the qualitative data analysis process" (p. 189). Memoing for emergent ideas prior to coding allows the researcher to gain an overall, high level sense of the data before focusing on the detail in coding (Creswell & Poth, 2018). Often, this memoing process provides evidence for initial codes.

Coding Themes

After reading through the data and memoing emergent themes, Creswell and Poth (2018) identify the next step in qualitative data analysis as describing, classifying and interpreting the data. The detailed description of the data is central to the analysis of qualitative research and includes creating codes to facilitate the identification of common themes. Creswell (2016) explained that coding involves making sense of transcribed interviews, observations, and

documents. “Coding is the process of analyzing qualitative text data by taking them apart to see what they yield before putting them data back together in a meaningful way” (Creswell & Poth, 2018, p. 156). There is no single, straightforward method to perform coding. Data analysis, and coding, varies for each researcher and each research project, and improves with experience (Elliott, 2018; Yin, 2018).

Coding creates evidence for developing themes. The researcher must decide which information to focus on, and which to disregard (Creswell, 2014). The first step is to prepare the data for analysis by transcribing the interviews. After transcription, the researcher reads through the data as an overview, and assigns descriptive codes to tag sections of text (Creswell, 2016). These codes consist of a one word, or short phrase coherently describing the content of a portion of text (Elliott, 2018; Linneberg & Korsgaard, 2019). The process of assigning codes to ‘chunks’ of data leads the researcher in developing a deeper appreciation of the data than possible through a simple reading of interview transcript (Linneberg & Korsgaard, 2019). Since qualitative research produces dense information, coding is essential to winnow down the rich data into a manageable amount of information that directly applies to the research (Creswell & Poth, 2018). Creating too many codes, or categories, makes developing themes unmanageable (Creswell & Poth, 2018).

Creswell (2016) proposed that most researchers initially start with 30-50 codes, and after delving into the raw data, consolidates this list to approximately 20 ‘lean’ codes. A codebook, including a description of each category and its boundaries, provides a reference during data analysis. The codebook is essential when multiple coders work on a research project to ensure inter-rater reliability. However, the codebook in this research project serves only as a reference as only one researcher coded the data. Qualitative data analysis software supports the coding

process by checking the frequency of words and organizing the codes into a codebook for reference (Creswell, 2016). However, Creswell and Poth (2018) cautioned against producing a count of the occurrence of each code in the data. This count is inappropriate for qualitative research, as the frequency of occurrence does not yield the same information as it would in quantitative research. Each instance of the application of a code may not provide compatible data. In fact, "the passages coded may actually represent contradictory views" (Creswell & Poth, 2018, p. 193).

The researcher aggregates similar codes together into categories to reduce redundancy and forms five to seven common themes (Creswell & Poth, 2018). These themes represent the findings of the research. The researcher describes these themes in narrative form, providing quotes from multiple interview participants as evidence. Linneberg and Korsgaard (2019) observed, "The process of teasing findings out of qualitative data requires craft and artfulness on the part of the researcher" (para. 3).

Qualitative computer data analysis software programs assist in organizing, sorting, and locating acquired data for coding and theme development (Creswell, 2014). These computer programs save time when working with the large amounts of data generated by qualitative research (Robson & McCartan, 2016). However, Elliott (2018) warned researchers not to let the ease of coding aided by qualitative data software lure them into a proliferation of codes that are hard to remember and understand. Researchers need to, "step back from the software" and conceptualize their codes (Elliott, 2018, p. 2858). Yin (2018) reminds researchers that qualitative data analysis software is simply a tool to assist the researcher. The researcher must study the outputs to identify patterns and themes from the data. The researcher for this project selected and incorporated the NVivo qualitative data analysis software to assist with coding and organization.

The NVivo software greatly improved the organization of interview transcript data and allowed the researcher to quickly access codes across all interviews to develop themes.

Interpretations

Interpretation in qualitative research involves identifying the lessons learned from the data, in a process known as naturalistic generalizations (Creswell & Poth, 2018). This process requires the researcher to find more significant meaning in the patterns, themes and categories generated from the data and allowing readers to transfer the lessons to similar contexts (Creswell & Poth, 2018). Robson and McCartan (2016) believed interpreting data generates meaning. Qualitative researchers make interpretations throughout the research process from planning, data gathering, analysis and presentation of the findings (Stake, 1995). The existing body of knowledge supports interpretations by finding connections between the current literature and the research data. Creswell and Poth (2018) suggested seeking peer feedback on initial interpretations, and articulating the patterns identified in the research. Diagraming may assist in representing the relationship among concepts.

According to Robson and McCartan (2016), assessing the quality of interpretations involves examining data quality, testing patterns, and testing the explanations. Examining data quality involves ensuring the data collected represents the sample, checking for researcher bias, employing triangulation, and considering the weight of evidence, considering data that comes first-hand from trusted participants. Testing patterns include understanding the meaning of outliers, following up on surprises, looking for negative evidence, or disconfirming data. One method of testing explanations involves member checking, asking the participants to evaluate and corroborate the research findings based on their first-hand experience with the phenomenon under study.

Data Representation

The final step of data analysis involves creating a visual representation that summarizes the interpretations (Creswell & Poth, 2018). Data representation helps the researcher, "tell the story of your data in a way which convinces the reader of the merit and trustworthiness of your analysis" (Robson & McCartan, 2016, p. 478). In addition, developing a visual display of codes, results, and findings, "eases the reading and increases the understanding" (Linneberg & Korsgaard, 2019, p. 267). Typical formats for this representation include matrices, tables, tree diagrams, charts, and boxed narratives. These representations include text instead of numerical figures and do not stand alone but accompany additional narrative descriptions to offer explanation and conclusions (Creswell & Poth, 2018). Robson and McCartan (2016) suggested representing data in tables or networks to present the patterns and relationships within the research data. Linneberg and Korsgaard (2019) proposed researchers use boxed displays to highlight narrative central to the analysis. The researcher employed both tables and charts to represent the data and key findings. Also, the researcher employed member checking as a validation technique, sharing the data representation with the research participants to obtain feedback.

Analysis for Triangulation

Triangulation, or using multiple data sources to justify project themes improves the validity of research (Creswell, 2014). Stake (2010) explained, "Evidence that has been triangulated is more credible" (p. 125). In case study research, performing an in-depth analysis of a phenomenon in a real-world setting requires collecting data from multiple sources (Yin, 2018). Thus, qualitative case study research relies heavily on triangulation of data, and "the need to use multiple sources of evidence far exceeds that in other research methods" (Yin, 2018, p. 127). For

example, quantitative experimental research measures and records actual behavior in a laboratory setting and does not rely on understanding or collecting verbal information from multiple participants (Yin, 2018). Validity in fixed research involves assessing the accuracy of a result, and does not require triangulation (Robson & McCartan, 2016). In addition, triangulation, in addition to bracketing minimizes the researcher bias inherent in qualitative research design (Stake, 2010).

Analyzing data from multiple case study participant interviews allows the researcher to develop themes based on converging, or corroborating experiences. “In qualitative research, triangulation naturally occurs during coding, in which the inquirer looks across different sources of information, such as documents, and finds evidence for themes” (Creswell, 2016). It is imperative that the themes and interpretations developed from this research project converge from data from multiple participants and supported by evidence, as identified during the coding process.

While triangulation helps to counter threats to validity in qualitative research, it also, “opens up possibilities of discrepancies and disagreements between the sources” (Robson & McCartan, 2016). However, examining disconfirming evidence, or exceptions to the theme, produces an honest and accurate view of the theme and often supports reader acceptance of the themes described in the research findings.

Summary of Data Analysis

Data analysis in qualitative research is an iterative process and often occurs simultaneously with data collection and report writing in the research process (Creswell & Poth, 2018). In addition, the data analysis process of qualitative research varies across researchers and research projects, and is, “more of an art than a science” (Robson & McCartan, 2016, p. 460).

Creswell and Poth (2018) outlined the central steps of qualitative data analysis to include memoing the transcript data for emergent themes, coding to describe and classify the data, interpreting these codes into broader themes, and then representing the data to explain the research findings. The ultimate goal of case study research is a thorough understanding of the phenomenon, including the common themes identified by the researcher from the research data. In addition, the conclusions of the case highlight lessons learned, also known as assertions, patterns, or explanations from the case (Creswell & Poth, 2018).

Reliability and Validity

Reliability and validity are traditional features addressing the research quality. The concept of reliability addresses whether the research results are reproducible, or how well the data produces the same results. The concept of validity addresses how well the data produces the correct answer. Social science research involves the imperfect study of human behavior, and "perfect" reliability and validity is, "neither theoretically possible, nor necessarily desirable" (McDonald et al., 2019, p. 4). However, qualitative researchers focus on the validity and reliability of their research to ensure they provide an accurate, high-quality understanding of their research problem.

Creswell (2014) provided eight primary strategies to ensuring qualitative research meets the highest quality standards (p. 201): triangulation; member checking; rich, thick descriptions; bias clarification; present negative or discrepant information (adds credibility); prolonged time in the field; peer debriefing (adds validity); and external auditor (adds validity). Using one or more of these strategies improves the reliability and validity of qualitative research. The following sections address these methods.

Reliability

In quantitative research, reliability focuses on producing consistent results over time (Golafshani, 2003). However, in qualitative research, reliability focuses on thoroughly, carefully and honestly carrying out the research methodology (Robson & McCartan, 2016). Unfortunately, while qualitative research is a powerful, widely respected method of understanding a research phenomenon, there is no consensus on how to measure reliability (McDonald et al., 2019).

Many qualitative researchers replace the measurement of reliability with the concepts of credibility, transferability, dependability, and confirmability (McDonald et al., 2019). Lincoln and Guba (1985) offer practical advice for adding these elements of reliability into qualitative research. To establish credibility in qualitative research, the authors advised that spending prolonged time in the field and adopt triangulation are two ways to establish. Thick, rich descriptions of the context of a case study improves the transferability of research findings to a reader's setting when they can identify shared characteristics of the setting and participants (Creswell & Poth, 2018). Dependability of the research findings means the results are not overly subject to change or instability. Confirmability of the research establishes the value of the data. Lincoln and Guba (1985) believed auditing the research improves both dependability and confirmability of the research.

Yin (2018) suggested researchers thoroughly and carefully document research procedures to improve reliability in their case study research. Creswell (2014) believed this consistency provides evidence for reliability. The researcher in this study provided a clear description of the procedure for data collection and data analysis to improve reliability.

Another way to enhance reliability in qualitative research is to ensure the completeness of field notes, the quality of interview recordings, and ensuring the accuracy of transcriptions,

including notating pauses and other speech details (Creswell & Poth, 2018). In this study, the researcher spent multiple hours listening to audio tapes and meticulously verifying the transcript data accurately captured every essence of the interviews. If any questions arose, the researcher implemented member checking, taking the transcripts back to interview participants to ensure the accuracy and completeness of the transcripts.

An Interview Guide, located in Appendix A, ensured consistency between the participant interviews in this research. The Interview Guide provided a general framework for each interview, guiding the researcher through introductions, questions, prompts, and concluding remarks. While each semi-structured interview resulted in a flexible, unique conversation between participant and researcher, the interview guide provided a common, consistent documented research procedure. Implementation of this interview guide improved the reliability of the data collected through participant interviews.

To improve reliability during coding, Creswell (2014) explained researchers should confirm the use of codes remain consistent, coordinate amongst coders, and ensure intercoder agreement. Reliability in qualitative research often focuses on intercoder agreement, or the stability of coding between multiple coders. Intercoder agreement starts with training, communication, and relies on the accurate development of a codebook for reference when analyzing transcript data. This research relied on one coder and one researcher, so intercoder agreement does not affect the reliability of this study. However, the researcher in this project created and referred to a codebook during data analysis. This codebook contained a complete and clear definition of each code, and ensured coding remained consistent across transcripts and remained stable over time.

Validity

Validity in qualitative research indicates findings are plausible, or accurate (Creswell, 2016). Implementing validity checks in qualitative research is crucial to ensure the research is, "more than simply the personal interpretation of the author" (Creswell, 2016, p. 190). Creswell and Poth (2018) stipulated validation strategies allow the researcher to assess the accuracy of their research from the perspective of the participants and the researcher. Validation is a 'distinct strength' of qualitative research due to the amount of time qualitative researchers spend in the field, the detailed descriptions they provide, and the closeness of the qualitative researcher with their study participants (Creswell & Poth, 2018). Creswell (2014) described eight primary validation strategies for qualitative research (p. 201): triangulation; member checking; rich, thick descriptions; bias clarification; present negative or discrepant information (adds credibility); prolonged time in the field; peer debriefing (adds validity); and external auditor (adds validity). Creswell and Poth (2018) presented these strategies as appearing through the lens of the researcher, the participant, or the reader/reviewer.

Validation strategies that support the researcher included triangulation, disconfirming evidence, and reflexivity. Triangulation, or including multiple sources of data, methods, theories, or investigators provides corroborating evidence to support a theme or perspective (Creswell & Poth, 2018). Robson and McCartan (2016) maintained, "triangulation can help to counter all of the threats to validity" (p. 171). This study incorporated triangulation during data analysis to identify common themes through the converging perspectives of case study participants. Disconfirming evidence involves the researcher providing evidence that does not necessarily support the theme but provides a realistic perspective of the phenomenon. Using multiple sources of data increases the chance of collecting contradictory data (Robson & McCartan, 2016).

Reflexivity, also known as bracketing (see next section), discloses the researcher's, "past experiences, biases, prejudices, and orientations that have likely shaped the interpretation and approach to the study" (Creswell & Poth, 2018, p. 261).

Participants of qualitative research assist in the validation strategies of member checking, prolonged field observation, and researcher-participant collaboration. Member checking seeks participant feedback to ensure the researcher accurately described the data and adds credibility to the research findings and interpretations (Creswell & Poth, 2018). Gaining participant feedback also provides protection against researcher bias (Robson & McCartan, 2016). Prolonged field observation allows the researcher to build rapport with study participants, and often begins prior to data collection as the researcher becomes familiar with the research site. Collaboration between the researcher and participant throughout the research enhances qualitative research findings.

The reader/reviewer also contribute to the validation strategies of external audit, rich, thick descriptions, and peer debriefing. An external auditor can review research to ensure the data supports the findings, interpretations, and conclusions of qualitative research. Providing descriptions of research participants and setting containing abundant details, supports the ability of the reader to transfer research findings to their similar settings. Finally, peer debriefings by someone familiar with the qualitative research, gives support to the researcher, and provides an honest assessment of the methods, findings, and interpretations. In addition, peers can offer guidance and support through the stresses of research (Robson & McCartan, 2016).

Creswell and Poth (2018) recommended employing at least two validation strategies in qualitative research. This study incorporated data triangulation, rich, thick written descriptions, and member checking to support the validity of the research. Creswell and Poth (2018) reported

these three strategies are not only the most popular qualitative validation procedures but are also both easy to administer and cost-effective.

Bracketing

The qualitative research design relies on the researcher to focus on the meanings that the participants place on the problem under study, and not skewed by the researcher's meanings (Creswell, 2014). The researcher in qualitative research must reflect on how, "their personal background, culture, and experiences hold potential for shaping their interpretations, such as the themes they advance and the meaning they ascribe to the data" (Creswell, 2014, p. 186). Bracketing allows a researcher to set aside their own experiences to study the research phenomenon with a fresh perspective (Creswell & Poth, 2018).

According to Creswell (2014), researchers should document these past experiences with the research problem, the participants, or the case study location that may create a bias. Prior work or educational experiences, culture, race, or gender may bias the researcher toward certain themes, or "look for evidence to support their positions, and to create favorable or unfavorable conclusions about the sites or participants" (Creswell, 2014, p. 188). Disclosing these inherent biases and experiences of the researcher early in the research process provides the reader a frame of reference for the researcher's position in the research (Creswell & Poth, 2018). In this research study, the researcher reflected on personal bias with the phenomenon during all aspects of the research. The researcher identified bias and previous personal experience with the phenomenon and notated their presence on ongoing research notes throughout data collection, coding and analysis.

Summary of Reliability and Validity

Validity and reliability are tools to establish and evaluate the rigor and integrity of research. The terms validity and reliability are often associated with quantitative research. However, while qualitative research often incorporates alternative terminology, the concepts of validity, or ensuring the findings accurately reflect the data, and reliability, or consistently applying analytical procedures, still appropriately reflect and establish research credibility (Noble & Smith, 2015). In this qualitative case study research, the researcher implemented specific techniques for improving reliability and validity. The researcher thoroughly documented research procedures, carefully transcribed interviews, implemented member checking, developed an interview guide, and created a codebook to improve the reliability of the study. Data triangulation, rich, thick written descriptions, and member checking supported the validity of the research. Together, these techniques provided evidence of reliability, or the stability of the research process and validity, or the accuracy of the research (Creswell, 2014).

Summary of Section 2 and Transition

The qualitative case study research problem in this project addressed the project management skills successful in leading teams in the virtual team environment. Careful planning for efficient data collection and analysis helped to ensure themes identified in the research findings were of the highest quality and fully addressed the research problem and research questions. Section 2 included: a description of the role of the researcher, the research methodology, the participants included in the study, the population and sampling method, the data collection and organization plan, the data analysis plan, and how the researcher addressed the reliability and validity of the project. Together, Section 1 and Section 2 prepared the researcher to successfully conduct this case study research. The researcher began data collection

following approval from the Liberty University School of Business and the IRB. The final section, Section 3, concludes the study and includes: an overview of the study, presentation of the findings, application to professional practice, recommendations for further study, and reflections.

Section 3: Application to Professional Practice

This qualitative case study research addressed the project management skills proven successful in leading teams in the virtual environment. Conducting this research required careful preparation. Section 1 introduced the research, identified and defined the elements of the research, and presented a thorough review of the current body of knowledge. Section 2 provided an in-depth description of the methodology employed by the researcher necessary to effectively conduct this case study research and ensure the highest quality results. Section 3 presents an overview of the study, the findings from this research, application to professional practice, recommendation for further study, and researcher reflections. This final section concludes this case study research study.

Overview of the Study

The problem statement for this research study identified the need to understand the potential lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment. A lack of virtual project management skills may lead to reduced project efficiency, productivity and overall success. To explore this problem, the researcher conducted a flexible case study analysis. This in-depth case study analysis expands the existing body of knowledge and fills a gap in the current literature by providing a practical application of the effect of trust and communication on virtual project management success.

This case study research explored the lessons learned from project managers at the MITRE Corporation, a government contracting organization based in Washington, DC. Examination of this case allowed the researcher to gain an in-depth understanding of the successful application of project management skills in a real-world, virtual setting. Semi-

structured interviews guided data collection. Semi-structured interviews allowed the researcher to capture the rich experiences of project team leaders and participants in their natural setting. The research questions from this study guided the development of the 10 interview questions located in Appendix A.

Following IRB approval, MITRE provided a list of emails for 10 potential project manager participants. Eligibility requirements included experience on both traditional and virtual project teams, and an 18-year-old age limit. The researcher emailed recruitment letters to each of these potential participants and implemented snowball sampling to gain an additional seven participants. Data saturation occurred after approximately 13 interviews, but the researcher exhausted all potential participant leads and completed 17 total interviews. The researcher followed all rules set forth by the IRB including gaining participant consent, ensuring participant confidentiality, and maintaining data security at all times. Due to COVID-19 concerns, the researcher conducted 16 of the 17 interviews via Microsoft Teams videoconference, but one interview participant chose to interview via telephone. The researcher recorded each interview and transcribed them verbatim. The researcher uploaded these transcripts to the NVivo software for data organization and analysis support. Through the iterative process of transcription, coding, and analysis, five themes emerged. A discussion of these themes follows in the discussion of the findings.

Presentation of the Findings

The researcher interviewed seventeen participants regarding their experiences as project managers or project team members on virtual project teams at the MITRE Corporation. Each semi-structured interview followed the 10 questions developed in the Interview Guide, presented in Section 2, and located in Appendix A. The researcher completed the semi-structured

interviews between August 10, 2021, and September 13, 2021. At the request of the research participants, 16 of the interviews employed MS Teams videoconferencing capability, while one research participant requested a telephone interview. None of the participants requested to meet in person, partially due to concerns surrounding the continuing COVID-19 pandemic, and partially due to the preference of the participants. Two identified participants, Participant 13 and Participant 17, dropped out of the study after repeated, unsuccessful attempts to coordinate interviews. Following the seventeenth interview, the researcher confirmed data saturation occurred as no additional information or insight came to light.

Table 1 provides an overview of the research participants highlighting the participant's gender, project team role, years at MITRE, and the interview mode. As shown in Table 1, 10 of the 17 participants identified their sex as male, and seven as female. Eleven of the participants described their experience as project managers, while six described their role as project team members. The participants worked at MITRE between 1 and 20 years, with an average participant tenure of 10 years. One participant worked on MITRE project teams for 11 years as a contractor. To preserve anonymity, no other distinguishing characteristics of the research participants appear in the Presentation of Findings. Any reference to the data collected in these interviews is attributed to Participant 1 – 19.

Table 1

Research Participants Overview

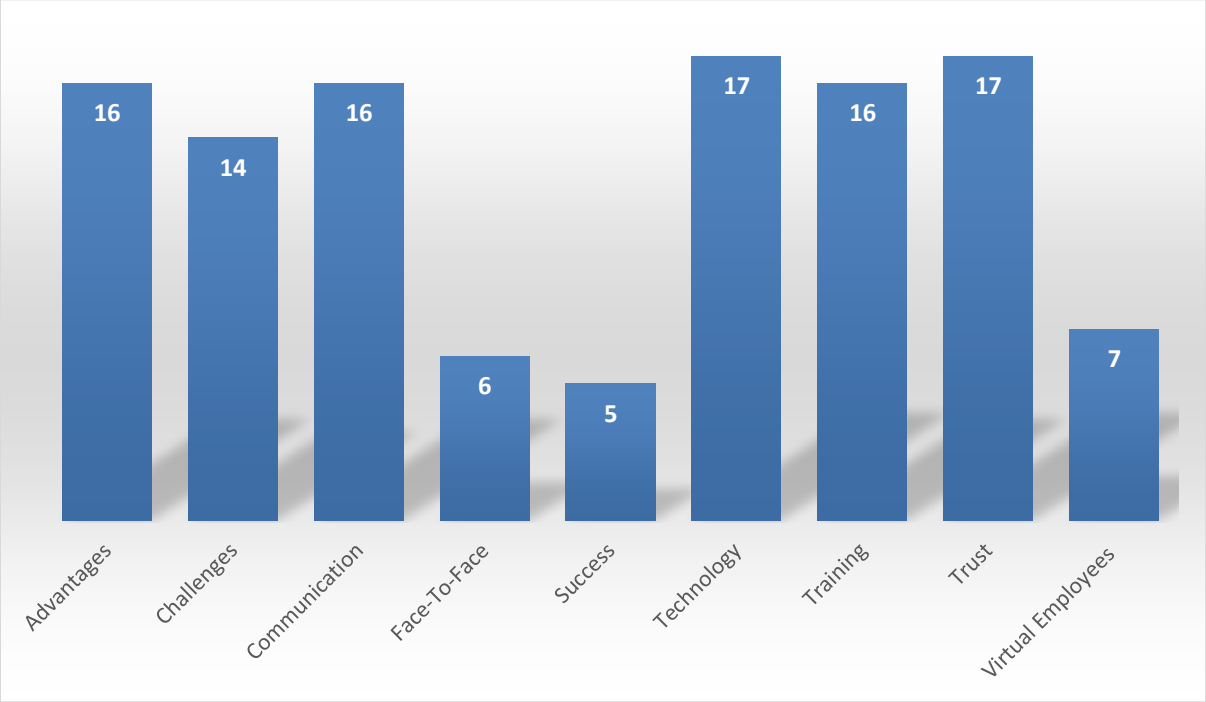
Participant Number	Male/Female	Project Team Role	Years at MITRE	Mode of Interview
1	M	Project Manager	2	Video
2	M	Project Manager	20	Video
3	M	Project Manager	16	Video
4	M	Project Manager	17	Video
5	F	Project Manager	6	Video
6`	M	Project Manager	10	Video
7	M	Project Manager	13	Telephone
8	F	Project Manager	11	Video
9	M	Project Manager	11	Video
10	F	Project Manager	1	Video
11	M	Project Manager	16	Video
12	F	Project Team Member	13	Video
14	F	Project Team Member	11	Video
15	F	Project Team Member	7	Video
16	M	Project Team Member	10	Video
18	F	Project Team Member	4	Video
19	M	Project Team Member/Contractor	11	Video

Themes Discovered

Following data collection, the researcher transcribed each participant interview and uploaded them to the NVivo software. The NVivo software facilitated the researcher's coding and analysis. The researcher defined nine high-level codes to the data: advantages, challenges, communication, face-to-face, success, technology, training, trust and virtual employees (pre-COVID). Figure 4 provides the number of participants who supported each high-level code, as demonstrated through quotes and references. From this information, themes began to emerge.

Figure 3

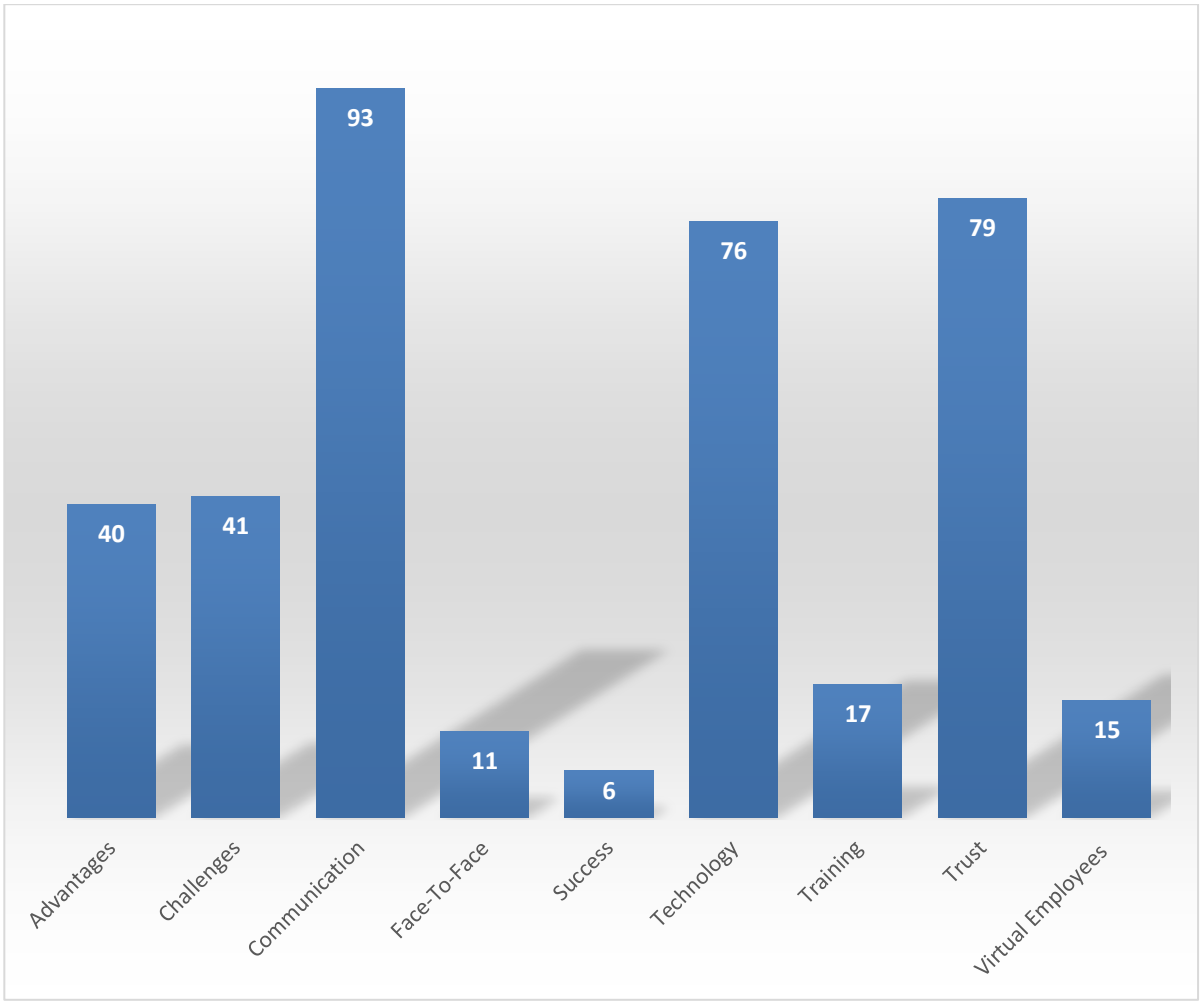
Number of Participants Supporting Each High-Level Code



To further refine these themes, the researcher re-examined the interview transcriptions to determine the total number of references to each high-level code made by the participants. Figure 5 presents the aggregated number of references for each high-level code. The incidence of these references contributed directly to the development of the final, overall themes of this study.

Figure 4

Number of References to Each High-Level Code



Five main themes emerged from the data through the iterative process of transcribing, coding and analysis. Table 2 encapsulates these themes. The first theme, the importance of communication to the success of project teams, includes three additional sub-themes: virtual project teams benefit from reliable and frequent communications; successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical to virtual project teams. The second theme, the importance of trust on the performance of virtual project teams, also breaks down into three

sub-themes: a video presence enhances trust on virtual project teams, trust on virtual project teams develops through performance over time, and availability and responsiveness improves trust on virtual project teams. The third theme identified from this research is the effective implementation of technology is foundational to the success of virtual project teams. The fourth theme to emerge from the research is virtual project teams create advantages. The fifth, and final theme identified from the research participant's experiences in virtual project teams provide challenges. All five of these themes highlight the major findings of the research and address the purpose of the study, to understand the successful project management skills in leading virtual project teams at the MITRE Corporation.

Table 2

Identified Themes

Theme	Description
1	Importance of Communication to the Success of Virtual Project Teams
1a	Virtual Project Teams Benefit from Reliable and Frequent Communications
1b	Successful Project Managers Intentionally and Purposefully Schedule Time for Personal Interactions in a Virtual Environment
1c	Defining Clear Roles and Responsibilities is Critical to Virtual Project Teams
2	Importance of Trust on the Performance of Virtual Project Teams
2a	A Video Presence Enhances Trust on Virtual Project Teams
2b	Trust on Virtual Project Teams Develops Through Performance Over Time
2c	Availability and Responsiveness Improves Trust on Virtual Project Teams
3	The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams
4	Virtual Project Teams Create Advantages
5	Virtual Project Teams Present Challenges

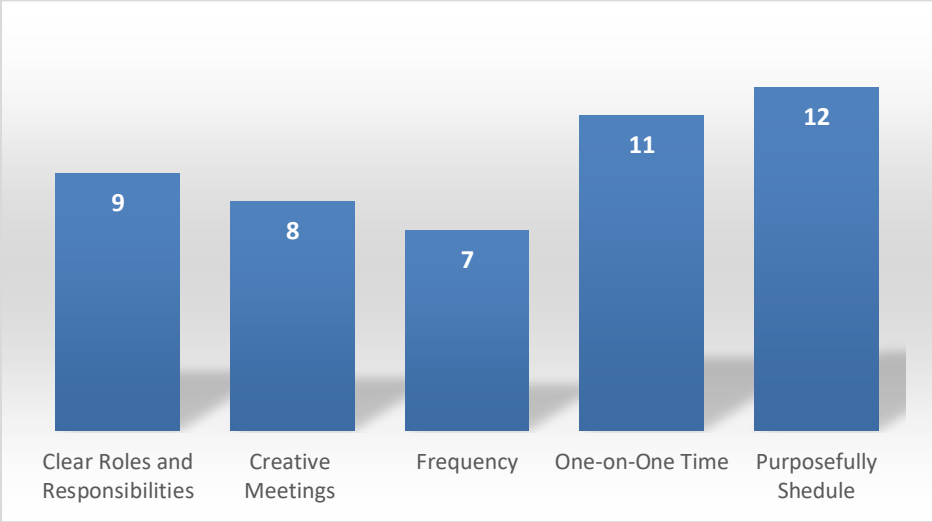
Interpretation of the Themes

Theme 1: Importance of Communication to the Success of Virtual Project Teams. Communication is a paramount concern for project managers leading any project team but is especially important when leading virtual project teams. Lee (2021) considered communication to be one of the key competencies for virtual project managers, and essential to the success of virtual projects. According to Participant 10, “I think the main thing is the communication and the connection ... a lot can get lost in translation in an online environment.” Communication forms the backbone of the virtual project team and also influences the ability of the team to build trust. Participant 3 noted, “You can’t build trust without it [communication]… So, it's the constant, constant communication.” When asked how a project manager builds trust in a virtual environment, Participant 4 concisely replied, “Communicate, communicate, communicate.”

When examining the importance of communication on virtual project teams, the researcher sub-divided the participants’ experiences into categories using five lower-level codes (clear roles and responsibilities, creative meetings, frequency, one-on-one time, and purposefully schedule). Figure 6 provides a bar chart showing the number of participants supporting each of these lower-level codes during their interviews. More participants provided support for the lower-level code of purposefully schedule than referred to frequency.

Figure 5

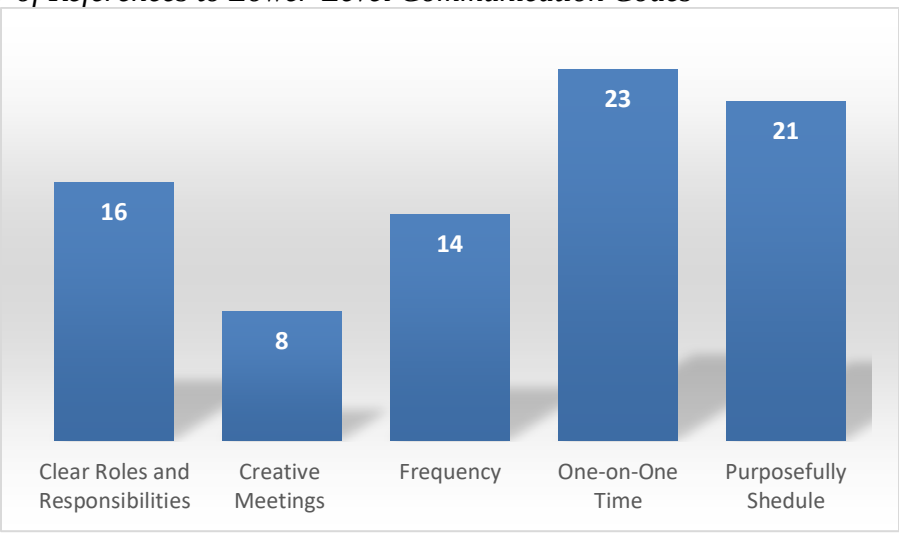
Number of Participants Supporting Lower-Level Communication Codes



While more participants spoke to the need to purposefully schedule meetings in the virtual environment, they spoke more often about the need for one-on-one time with their project team members. Figure 7 depicts the number of times the participants referred to each of these lower-level codes. Together, these graphs show that research participants most often expressed their experiences concerning both one-on-one time and purposefully scheduled meetings.

Figure 6

Number of References to Lower-Level Communication Codes



Upon further review of the participant references, the researcher combined two codes, purposefully schedule and one-on-one time, into one sub-theme, and eliminated creative meetings as a stand-alone sub-theme. Thus, Theme 1: Importance of Communication to the Success of Virtual Project Teams, consists of three sub-themes: the importance of setting a rhythm with frequent communications, successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical in virtual project teams.

The first sub-theme identified the importance of setting a rhythm with frequent communications. Seven of the seventeen participants stressed that creating this regular, dependable cadence, or drum beat, takes on additional weight when leading virtual project teams. Participant 1 remarked, “When people are remote you gotta focus more on keeping the team cohesion and keeping the team together, and just do that by regular communications.” Participant 7 suggested the increased frequency and importance of these virtual interactions on virtual teams is critical, “because you’re missing the in-person element.” Table 3 highlights other notable quotes from the participants on the importance of reliable and frequent communications.

Table 3

Frequency of Communications

Participant	Quote
1	Regular meetings. Um, kind of setting clear expectations, clear goals, and then just talking about them regularly so everyone kind of gets on the same wavelength, honestly. Um, frequency matters the most, I think. You don't have to like drive everybody into the ground with it, but just have a regular drum beat and so people feel like you know they're part of something. They know what it is, and they’ll work it.
5	Yeah, one is my regular touchpoint with my team leads, at least weekly with them. To make sure that we’re staying connected on what they're doing.

6	Define the cadence of when you're going to meet. I think that you have to be more prescriptive here, about, you know, how are we going to communicate, how are we gonna solve problems, should we use Teams, should we use email, or should we just have a meeting every time, or something, right. And maybe have more regular check-ins than if you were in person.
9	In my own team meetings, I tried to really get into a cadence where we had really two big meetings, and everybody else could kind of plan their time around that. So that, that helped, knowing that cadence helped plan appointments, you know, manage their own workload.
11	It's very easy also if you're in a weekly sync.

As reported by the research participants, when MITRE project team members moved to the virtual environment, they lost the opportunity for the random, informal, unscheduled meetings with team members that they enjoyed when collocated. Participant 7 lamented, "It's the accidental hallway meetings that also promote interactions that's lost in virtual." To replicate these in the virtual environment, project team leaders must purposefully, proactively schedule these meetings, also referred to as touchpoints, one-on-ones, or check-ins by participants. Fourteen of the seventeen participants explicitly mentioned the importance of these personal connections with their virtual team members. Figure 7 reported 11 participants supported the importance of one-on-one time, and 12 participants supported the importance to purposefully schedule meetings. However, when the researcher combined these codes, 14 of the 17 participants spoke to the new sub-theme. Participant 2 captured this sentiment, "because we've gone remote that check, that walk down the corridor and stick my head in has become a quick 15-minute check-in." Participant 12 echoes that sentiment.

> When you're physically here, in person, you're more likely to bump into someone in the corridor, stick your head in the door, you see them generally, and the conversation will be around different elements of what's happening along the way…when you're remote, you have to be more structured about making sure you have those check-ins. You schedule them.

Participant 6 adds these connections differ when virtual, "It has to be my purposeful and more often as well." Participant 12 added that these purposeful, personal connections carry over to improve future work interactions, and not only encourages honest communication but also builds trust.

> And so, when you now pivot to a project meeting, that is much more structured, and you talk about deliverables and timelines, and quality, and going through those things, they know I know them as individuals, and they know me as an individual, and we know each other as individuals, it's far easier to get people to open up and be honest about what's occurring and trust each other.

Thus, the second communication sub-theme is, successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment. Table 4 shows additional participant quotes for this sub-theme.

Table 4

Purposeful Personal Communications

Participant	Quote
2	One of the nice things about being back in the office is that what has happened over the last 18 months, 16 months is, the kinds of transactional business communications that we need to keep momentum on an activity, we could deal with, with the head through the door, 'hey did you see this, what if we do that', and what happened was we made those 15-minute meetings on the calendar, and so we've been crushed with calendar management for what ought to be transactional kinds of occurrences that the water cooler or head in the door would have fixed before. I have one-on-ones. I schedule it. I do, I put it on their calendar so that way they know they're going to step away.
3	But I found that that's been really important. Um, side conversations, after a meeting, some one-on-ones with people, that may be, get that sense in the call that needs a little more reinforcement of something or they have additional opportunity to air something out, I found that helps as well. Having that secondary touchpoint is what was really critical.
4	Being able to reach out proactively, just constantly keep those relationships
5	Because we are missing the 10-minute drive by where I could, you know, if we were sitting at [customer name], we could just do a quick check-in. Or if we had offices, like turn the corner like, hey what are you working on? What's that on your board? We don't have that anymore. I definitely connect with them one-on-one, whether it's the team leads, or even if it's not the team leads, I tried to develop a personal relationship with most people, you know. I know some people who had COVID during this time or were going through cancer treatments, and things like that. And so, connecting to them as a person first, and then talking about the work. And trying to make sure that the personal came before the work. I think it really is (trust) trying to keep those connection points when you can't be with them face to face. You know, spending the time at the beginning, to, like you would in a conference room. You're just chit-chatting before you get down to business as people are coming in, and you're you know, hey how was your weekend, and you know, and still trying to joke around with it… still just trying to make that personal connection when you're not in person, even when we're not on camera.

It was scheduled time, and I knew that I was always going to meet with them at a particular time, as opposed to the drive-bys, that I would have liked, you know, somebody would be like, you know, I gotta run to this other meeting, I don't have time to talk to you right now, we'll catch up later. Whereas, with set times, um, it's more structured.

6 If I'm in the office, my door is always open, people come in and we just chat, right. And I think we solve problems that way. But it is, it has been less often, that people have virtually tapped me and said, hey, I want to talk with you about something, right. Which doesn't mean the need has gone away, it's just that either it's not coming naturally to people to be able to do it virtually. So, I've had to go back, that's been a challenge to make sure I'm reaching out to everyone,

Obviously, find out how everybody is doing, you know, people come first. Establish those relationships. (Response to 'how do you encourage trust')

Just the other thing is check-ins, right. Check-in with everybody, including the remote folks.

7 It's just the ability to walk into someone's office is not there in a virtual setting.

I would have, in the previous period I would have walked into someone's office or run into them in the hallway, and that has gone down a little bit, so that is a loss, no doubt about it. So, it's maybe, if I had to put a number on it, a 20% loss, but the 80% is still intact with the regular meetings, or voice interactions, and so forth. The work gets done, but the 20% bonus, like running into them in the hallway, discussing ideas, that is a loss.

You can plan to talk to someone, you can't just run into people in the hallway. To me, that is a huge loss, because I do enjoy running into people and just seeing them.

8 It's just the human condition. The more you understand where somebody is coming from, um, there may be certain life issues that they have to work around, and then I have to be sensitive to that as a manager.

Absolutely it is more critical in the virtual environment because you can't walk down the hall.

9 So, in meetings, you know, we open up not going right to the work topic, but, you know, talking about what's on their minds, and how people are doing, and just checking in with them. They may have lost a loved one, you know, they

may have a, you know, a childcare problem, you know, you, and you can even see this with the customers.

Because a lot of times when you connect, it's kind of nice to connect, and you are kinda seeing what's on their mind, what's going on with your life.

But I would bump into other people, but you had that casual aspect where you, you just see a door open and you say hi, you know, and it develops into a conversation where you get some guidance, and you get some opportunities to get some insight, and you give insight. And so, you gotta think about, you know, you know, changing those potentially lost opportunities into opportunities, which, which you can.

10 It's like a double-edged sword because you need to have more touchpoints. It takes up more time, like running Teams, running projects virtually now, you lose that in-person interaction where you could stop by somebody's office and ask a question, or the team could come together really kind of quickly and have it come to a solution. or talk about the next task that will be working on here, I guess.

So, I tried to really meet with my team one-on-one.

I think one of the keys, one of the best things that you can do when you're working in a remote environment, with communication, is having reporting touchpoints.

And just by putting that regular touchpoint in place, really made the environment more collaborative and more trusting.

11 That that goes back to intention, right? They plan for those interactions, especially in a place like MITRE, where we do lack social skills, in general.

12 It's very important, for me, to have one-on-one time with individuals at the beginning. To get to know them personally. Just, connect with them, hear their ideas, listen to them.

It does make those check-ins more important. It's, whereas, you know, when they're in the corridor, you just pop down the corridor, stick your head in, and you know, say hi. So, you have to consciously schedule the time.

But, of course, when we were in person, I would do it in person, and now I consciously just will schedule one-on-ones with everybody

So, I have a lot of half-hour meetings now versus one-hour meetings and I don't hesitate to sometimes put in 15-minute meetings just to check in. So, it's not that obligation of having to prep for a one-hour session, it's just a 15 minute, just checking on you, hey, how are you doing.

	But somehow, because we've gone remote, that check, that walk down the corridor and stick my head in has become a quick 15-minute check-in with you. And people really appreciate it. I'll also just if I go for a walk, you know, if I need to stretch my legs or something, I'll just phone someone on my walk, and just do a check-in at that point. Just, hey, don't know if you're free or not, if you're free, just checking in if this is a good time.
14	Um, allowing for some banter, you know, personal chit chat, catching up, you know, if someone was on vacation, or whatever, you know, that sort of, you know, human interest, and need for connecting. I'm not walking down the hall and getting interrupted; I don't have people walking into the office interrupting me. Um, every communication has to be intentional, so I think it gives us a lot more control with our time
16	Proactively kind of connect with people.
18	But connecting with people is part of, you know, part of my job. And connecting with people is, in my opinion, easier to do in person.

In addition to these scheduled meetings, approximately half of the research participants, 8 out of 17, mentioned leading or participating in creative methods to schedule personal, non-work interactions to encourage informal conversations. These interactions allowed team members to get to know each other in a relaxed environment. For example, Participant 11 felt these online meetings helped, "to just build rapport." Participants reported these socially-oriented meetings positively impacted trust, rapport, and improved communication within the virtual project team. Table 5 lists some of these creative meetings.

Table 5

Creative Meetings

Participant	Quote
3	One of the things I started doing with my department at the beginning of this, I called it 'walk and talks.' Where I would build in these 15-minute meetings with each of my two groups. Team members of my two groups. Where I would just have a 15-minute time in the block, and I'd say grab your phone and go outside, if the weather was nice. We're gonna be on the phones are we're going to take a 15-minute walk. And it was how are things going, how

	are you doing, how's your family doing, maybe it was something about the project they're working on. It was kind of a no agenda thing, other than how are you doing and getting them away.
6	We played games like, you know, tell me two things that, or you know, list four things, and two of these are true or false. I think that builds a lot of trust. It's just the downtime to connect at a non-work level, right. Talk about things which are not work-related, I think that helps a lot.
7	We had a virtual happy hour with the sponsors. I showed them my glass of wine.
9	We had coffee talks and that, you know, time in the mornings, and where people just kind of share like, what we're doing right now.
11	We hired a bunch of kids virtually, and it was a good way to, to just build rapport. So, I think that's necessary, and we do it over camera, we had happy hours over playing Jackbox and drinking beer and that was very productive. Jack box in particular forces people to do stuff and it's not to stare at each other
12	If somebody's getting married, we'll do some fun games around, you know bridal shower-type things. If somebody's um … there are different people on the team, who'll just do one a session. It's usually just, something getting to you know you. So, today, they did unusual things about individuals. Like, they said, who on the team do you think does this, or had this experience, and you have to work through it and make a guess. Again, it's just to get that connection.
18	We've done, over the pandemic, some virtual happy hours where we will play like trivia games or something like that, and that kind of goes back to … building rapport and building trust. Having fun, and something that I have always done as the leader of that team is, you know, we make it at Happy Hour time, like 4:00 PM or later. I make sure that I have very openly have some sort of alcoholic beverage on my person, on video. You know, like, make it, OK, this is not work, we're not working, we're having fun now. Everyone have fun. And then people do turn on their videos. And it's different. And then we will, like, play around with Teams, and isn't this a fun background. It just is a really different feeling.
19	And so, I set up this thing, so our project was called [name], right, and so I called, I set up this [name] kitchen. Which is just like a lunchtime placeholder. So, you could just come in there and everybody could like, um, you know, shoot the stuff, as they say. Or just kind of hang out. It was fun for a while because we were pretty informal.

Nine of the 17 research participants believed setting and communicating a clear set of roles and responsibilities became more important in the virtual environment. Thus, the third subtheme is: defining clear roles and responsibilities is critical in virtual project teams. Participant 2 explained, setting clear roles and responsibilities is, **"**not unique to a virtual environment in any way, it's just there's a greater dependency in a virtual environment." Participant 9, Participant 10, and Participant 12 also explicitly stated the roles and responsibilities take on greater importance when the project team is virtual. Participant 18 claimed when all project team members clearly understand roles and responsibilities, there is no loss in productivity in the virtual environment. Table 6 presents other notable participant quotes on this theme.

Table 6

Clear Roles and Responsibilities

Participant	Quote
1	Setting clear expectations, clear goals, and then just talking about them regularly so everyone kind of gets on the same wavelength, honestly. The key was always communication, regular communication so everyone knew what the goals were, knew what expectations were, and knew there were going to be kind of held accountable to it.
2	And setting clear expectations.
8	You have to have, and I believe this is actually, they talk about this in terms of even keeping employees. Clarity around roles and responsibilities and communication, for sure.
9	This idea of like documentation being king. I think for project management, documentation has always been important, right? Charters, PMPs, risk registers, all that kind of stuff. So, documentation is important, especially on final decisions. However, it takes on even more importance (in the virtual environment).
10	Keep staying connected, having a road map, or guidelines in place, kind of expectations, that if you're working to an end goal or to finish a project,

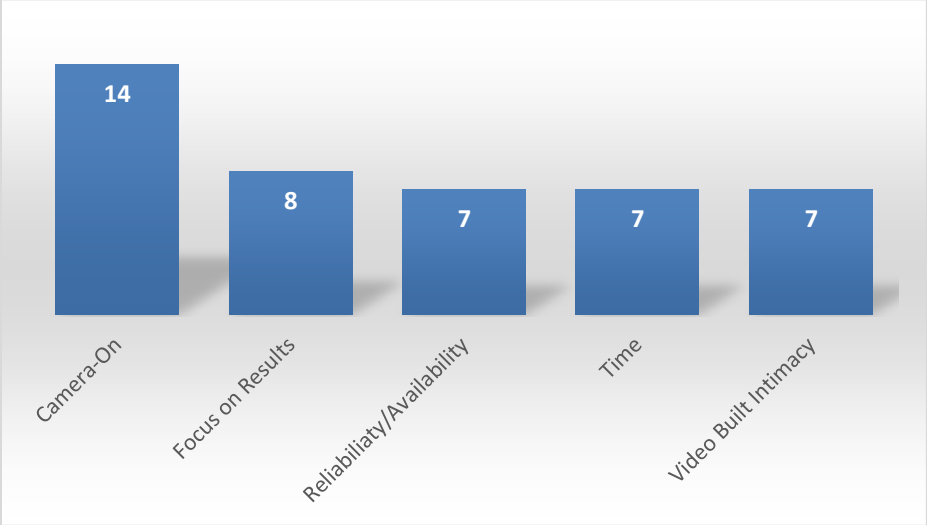
	everybody knowing what those timelines and deadlines are. I think from a virtual environment, that's very important.
11	Intentionally clear about roles and responsibilities and expectations. That comes down to comms, right? And I think, and I think, in that case, comms, when comms begin to breakdown, I think everything again has to be written down it has to be very clear as to what's going on. If it's just, he said she said, he said she said, and that dynamic isn't going to work in person or in a virtual sense. You need leadership to actually write down what it wants…Write it down. And if it's not written down, it's not a real idea. So that forces discipline and leadership, to say what it wants. And it gives some people, it gives people an anchor to go back and use.
12	Appropriate assignment allocation. So, being very clear on who's lead, leading a particular aspect, and if you've got a task lead who's got 14 members under them, then making sure that it's a very clear delineation of who's responsible for what. Making sure that the scope of responsibility is known that the timeline is known. I would argue that it's a little bit more important (in the virtual environment).
14	Having your goals or your desired outcomes set for that meeting, um, being clear on what the agenda is to get to that desired outcome.
18	We knew our roles and responsibilities for the most part. So, I don't think we saw a loss of productivity.

Theme 2: Importance of Trust on the Performance of Virtual Project Teams. Trust is important to the success of all project teams. In the words of Participant 7, "I think trust development is a must regardless of the method, whether it's virtual or not." Participant 9 emphasized the heightened necessity of trust in the virtual environment, "Trust, you know, I think it has been even magnified through this virtual interaction." Based on the data collected, the researcher sub-divided the participant's descriptions of their virtual experiences with trust into five lower-level codes (camera-on, focus on results, reliability/availability, time, and video

built intimacy). Figure 8 presents a bar chart representing the number of participants supporting each lower-level code during their interviews.

Figure 7

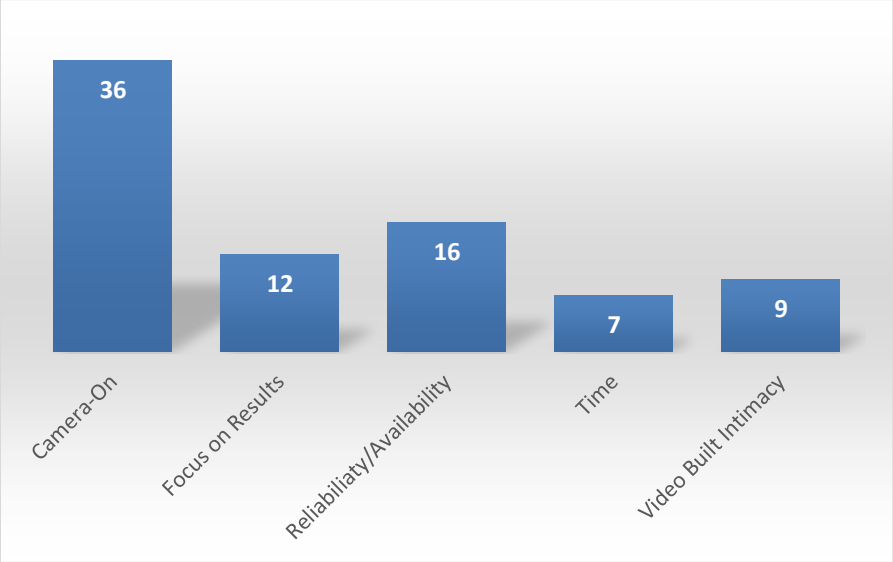
Number of Participants Supporting Lower-Level Trust Codes



Fourteen of the 17 participants offered support to the lower-level code, Camera-On. Similarly, the research participants made the most references, 36, to the Camera-On Code during their interviews. Figure 9 depicts the number of times the participants referred to each of the five lower-level trust codes.

Figure 8

Number of References to Lower-Level Trust Codes



During analysis, the researcher combined two of these codes, focus on results, and time into one sub-theme. In addition, the researcher did not include the video built intimacy code as a sub-theme, but rather as support for camera-on. Thus, the researcher sub-divided Theme 2: Importance of trust on the performance of virtual project teams, into three sub-themes: a video presence enhances trust on virtual project teams, trust in virtual project teams develops through performance over time, and availability and responsiveness improve trust on virtual project teams.

The first identified sub-theme is, a video presence enhances trust on virtual project teams. When asked about building trust on their virtual project teams, 14 of the 17 research participants mentioned the importance of turning ‘cameras on’ during Teams meetings, and this also represents the largest number of participant trust references in 10. Participant 3 stated simply, “Turning the camera on is really the way, I found, to build trust.” Several participants mentioned a negative connotation associated with virtual project team members who do not share their

image while on a video call. Participant 6 offered, “I always would request that please turn on your cameras, but you know, if someone is not turning on the camera, and is on mute, you pretty much know they have checked out.” Although most research participants discussed the benefits of turning their ‘cameras on’ during meetings in terms of building trust on virtual project teams, turning ‘cameras on’ also improves virtual communication. Participant 10 explained, “If people have their cameras turned off, then you can’t really read context clues and body language …. That, in my opinion, is one of the important things that you lose.”

While the vast majority of participants (14 out of 17) articulated that keeping ‘cameras on’ encourages trust, most did not believe it necessary to keep their ‘cameras on’ for every meeting. According to Participant 3, “I try to encourage people, not demand it, but encourage them to come off the camera so we can look each other in the eye.” Participant 2 added that norms need to be established, offering,

> You shouldn’t go more than three meetings without being on camera might be a reasonable way to start the process. But also, some grace about, that’s not a hard and fast rule, but something to create benefit for you and for the team.

However, the research participants had neither developed nor enforced hard and fast rules around ‘cameras on.’ Multiple participants mentioned modeling ‘cameras on’ to encourage its use without demanding it, including Participant 12. “So, it’s not a required thing, but by practicing it, I find that when I turn mine on, other people tend to turn theirs on.” Table 7 provides many relevant quotes from participants regarding the importance of video on building trust in the virtual environment.

Table 7

Video Presence Enhances Trust

Participant	Quote
2	When I had employees who even when I'm on camera will almost never appear on camera themselves. I'm working through what the right cultural norm messaging is about how to do that. I'll say in my own grad school, we sort of had, I think, an equivalent about how you make sure you're participating, but not stealing oxygen from the room. And so, our rule of thumb, litmus test, was in any given class, and as we moved around classes in the cohort, you should never be heard more than three times in any one class, but you should never go more than three classes without being heard. I will be on camera when I can, I will not expect everybody to be camera-ready all the time, those kinds of things. Yes, attending meetings on time, and not always off-camera, not necessarily always on-camera, but that sort of, I can predict how things will go.
3	People coming on camera, that I think, that made a difference. And that's what's going to carry forward. For example, you're seeing people expect to see someone when they're talking to them now. Right, I would say, hey is there a reason your camera isn't on today? Depends on the meeting, the time of day. If it's early, and I know they're like, taking their kids to daycare, I may wait till the afternoon to say that. I keep coming back to it but being able to see each other is what's made the difference on that. Talk about having people come on camera, talk about the benefit of meeting people on camera. And really explaining that, that's how you're going to build trust with this group. That's how you're going to build the connection. When you're looking them in the eye, you know, it's a camera, you can see each other, that's really important. And go into this with the mindset that I wanna establish a connection so that I can have a shared experience with this person, and we're able to rely on each other now.
4	I think the game-changer was the video experience. The majority of our meetings are always video.

	There's definitely a handful, not a lot, that don't like to be on camera. And then, when you're chatting with them, you're kind of like, how're things going, what are you working on, I think it's difficult.
5	Yeah, but I know there are definitely sometimes that people check out when they're on calls, and I'll be honest, you know I can see their name on the call, and I'm like, hello, hello? … you know, who knows where they went, they just stayed on the call but they're clearly not paying attention.
6	I am almost always on video, and I do encourage others to be on video. But it is not prescriptive, it is I think, everybody has their own comfort level, but that helps, having videos on helps, because you kind of, you know, one thing is I think as I read somewhere, 70% of all communications is nonverbal. And that is lost in a purely virtual, non-video communication. And those cues are lost. So, you know, we actually are only communicating 30%, at best, right. So, and again to your point of trust, if you are only communicating at 30%, you know, how, how effective are you, right. Video has been a challenge. Yeah, I think people are, you know, more conscious about turning video on. Being at home, they're probably more relaxed, they're tired, so they don't want to be on media, or they have distractions around them.
7	It's the inability to catch all of the body language. Often if you are virtual, you may or may not see the other person because you may be projecting something on the screen that blocks the other person's view, and the other person may be, uh, voice and not video so that makes a difference. Video is definitely better.
9	The video thing was something that everybody was slow to embrace because again, it's your personal home you're letting them into and the background noises. You still see people using the false background. I think that's an important aspect of communicating virtually, is having the camera on when you're talking.
10	Because some people really like being on video, and then some people just refuse to turn it on, and, and that's OK, right. Because if you don't have to dress every day for work, and, you know, some people just prefer staying off video because it makes them nervous.
12	I do encourage video. I didn't require it, because I also appreciate the fact that some people are in a situation where it is hard for them to be on video, depending on their home situation, and just in general, right. They don't feel well, they've had a bad hair day, they didn't have time to shower that morning. Whatever it is, right. So, it's not a required thing, but by practicing

	it, I find that when I turn mine on, other people tend to turn theirs on, right. So, it's, they get comfortable with the situation. And if I'm wearing a t-shirt and am scruffy one day, I'll still turn mine on, so they're comfortable to turn theirs on, right. Obviously, not with sponsors. *laughs* I never do video required unless it's a sponsor call. So, if our project team has a sponsor call, it'll be video required, or video ready, right, so people know to dress, right. But I think with COVID, it's normal being on camera all the time, has come into play. Whereas, before COVID, with the remote folks, they would not go on camera a lot of time, it would just be a call, so it was more distracted, and we didn't see their environment, we didn't see them in their usual, all the stresses that they are going through, right. So, in that aspect, we have built trust with them, in many ways through that mechanism.
14	Camera on. And it doesn't even matter whether someone is in their pajamas or, you know, has their hair in rollers, right. It's just being able to have the eye contact, the body language, and I think it helps to validate that someone is present and is listening. So, I think "camera on" builds trust, at least for me.
15	Turning on your camera builds trust. Because it's in many ways letting someone inside your personal space. Some people really fought that tooth and nail. But it was a requirement and they kind of had peer pressure if they didn't turn their camera on. You know everyone's like well what's going on. Turning on your camera builds trust. Yeah, they just like, won't do it, yeah. I just don't understand where they're coming from. I mean, you come into the office, you're there in a physical presence. I have a hard time understanding the personal resistance to it, but then you know you gotta give people some slack.
16	I think you can gain a lot by video! I think you can maybe lose something if you're on video too frequently... But on this video, you know, I can always see what I look like and how I am. So, I think there was a little bit of, there's a little bit of added work that goes on, you know, mental, you know, just you're always feeling like you need to be sort of "on" because you can kind of see yourself. And it's strange, because people, when they meet in person don't feel that way. So, I think there's something about the video that makes people feel like, you know, you're, you get tired of being on video calls all day long, yeah.

	And video is not going away when we're going back either. So, now we have this new dimension that allows us to see and work with people where maybe we wouldn't have been able to before, including this (indicating our video call). And, and it's also giving more people more flexibility to be able to work where they need to when they need to. When in the past that wasn't, that wasn't possible. So, it's, I think it's been a net positive, really.
18	I think video sometimes helps, but can also make it more awkward, because some people, you know, it's distracting. I'm distracted by my own video right now, you know. I still don't feel used to looking at a video. One other thing to mention with being on screen. I don't mind being on video for short periods of time. I find it tiring for long periods of time.
19	I do feel like video helps. Right, video communication. I feel like is much harder to, um, multitask. And you know, when you're not paying attention, when you're not engaged, when you're not, it's just, it's, it's, it's harder to … one, extend trust and then also, you know, get it back. If he wasn't paying attention, then that made me mistrust his leadership. And so, uh, you know, I feel like if I'm on video and they can see me actively engaged, then, you know, then it helps out. And same for me, like, I can extend trust to someone who is actively engaged, even if they're like not doing that great of a job, at least they're sort of like struggling through it, you know what I mean

When describing the importance of 'cameras on' in developing trust on a virtual project team, seven participants mentioned this video presence created a greater sense of intimacy between team members. Participant 8 described the greater intimacy achieved on a virtual project team.

> I've heard all kinds of people say oh, you're not rubbing elbows, so you're not connecting, and I'll tell you walking away after this year and a half I know so much more about the people that I work with. Because the cat walks by the screen, and the son comes in, and the daughter has to ask daddy a question. Just the actually being alive part of your colleagues. You don't see any of that at the MITRE offices. They come in and they do

their job, it's nice to see them, you ask about the weekend, but you don't see the weekend, you just see them. I actually think this has been a very personal experience.

Thus, a paradox noted in this research is that being physically separated from team members created a greater sense of intimacy. Table 8 provides further participant descriptions of video creating intimacy in virtual project teams.

Table 8

Video Creates Intimacy

Participant	Quote
1	MITRE is a unique place where when senior officers are in the room, people tend to get anxious or nervous and tend to freeze up a bit. Don't tend to do that when they're on a screen. Partly because we're not physically together. We're not in a, you know formal setting like the office, and they're in a more friendly setting like their house or somewhere. Because you can see people's faces up close just like you're together.
4	I think, they're [online distractions] positive. And I think that I think that helps with the trust. I think that helps with the, um … everyone's human.
6	And I think the biggest advantage has been it has humanized everyone, you know. Earlier we were like, you have two personas, we had a work persona and a home persona. Now it's melded together.
9	As you get into the virtual environment, it's a more intimate surrounding. Because I can see your background, and even with the customer, you see their backgrounds. You see them in T-shirts, you see, you see aspects of their personality you wouldn't see before. And there's a trust to let you into their living room, or their bathroom, or wherever.
12	I will say though, the one thing that I have noticed is, and this is kind of sweet, like people's kids, pets, dogs, cats, they all get in the frame. So, from that standpoint, I feel like we have gotten to know each other a lot better, in terms of, you know when they've got young kids, and it helps build empathy. But I have several team members who have little ones, and they're at home, and it's hard right, it's really hard for them to focus. You can't just shut the door on your 2-year-old, you just can't. So, they come and sit in your lap, and play with the stuff while you work, and so it does bring an intimacy to

	the group, that I think was missing before. I think we have learned things … it's all out there now, you know. I know exactly what types of dogs they have; I know whose cats like to sit on their keyboard, whose kids have got what, and it's nice, it's lovely, that level of intimacy, I think that's nice. I feel like I know them super well already because honestly, we video all the time.
19	I've learned a lot about people's personal lives, or like what's going on with their kids, who are like the same age as me because I work with a lot of people that are a lot older than me. But, yeah, we're talking about their grandkids, like we've all seen each other's dogs and kids like walking to the camera and stuff like that, and so I think there's something, you know, there's just that unavoidable recognition, like, hey we're all humans that exist.

The participants in this research also noted that in the virtual environment, trust builds over time, and on past performance. Surprisingly, eight participants reported they placed a greater emphasis on results in the virtual environment. According to Participant 3, "I'm a lot more interested in what people are contributing." Of course, building trust-based on performance requires time. Several participants mentioned the element of time directly. According to Participant 1, "Trust is something you kind of earn every day and the longer you're together, the stronger the bond of trust is." Participant 10 echoed this sentiment concerning the ability to build trust on a virtual project team, "it just took time." The second sub-theme combines the notion of time and past performance: trust in virtual project teams develops through performance over time. Table 9 contains further comments from research participants.

Table 9

Trust is Developed Through Performance over Time

Participant	Quote
1	People learn to respect what you do, your contributions, your commitment to the team, and that all goes to trust. Track record, past performance, quality of the people that work here and we tend to deliver high-quality work. No one tends to miss their milestones or miss their deliverables. (How do you build trust on a virtual team).
4	I mean it shows in their work. It really does show in their productivity. In their work, you know, the quality. You can quickly tell when someone's just giving you a quick yes and just kind of verbally telling you what you wanna hear, versus, really seeing it demonstrated in their work. (How do you build trust on a virtual team).
11	I can see the output, yeah. When there were output problems I acted, but when people were just doing their thing, I didn't feel the urge to watch somebody.
12	When we're remote, sometimes they'll, I won't find out about it until something goes wrong on a project, right. They'll miss something, or the deliverables are off, or it's not the usual quality or something like that. Then I'll start to put two and two together, that somethings happening beyond the work area, that's impacting, right. Sometimes that [trust] is an experience thing.
15	I think trust is built, um, or at least in my experience, it's built by going through some really difficult times together, right, as a team. Not everything goes according to plan with your customer. They have challenges and often have to take a step back and recast your plan. Do a pivot, so in some ways, the crisis forged trust because we were all in this together and having to figure out different virtual technologies, and what was compatible with our customers, and respecting that people had other things going on at home. So, I think there was that aspect of trust because everyone was going through the crisis together.
16	I see that people that were people are being proactive they're trying to help there you know where we're getting um, we're reaching milestones like we're supposed to, and we're kind of moving along together that to me helps to feel like I can trust other people very well.

	The focusing in on the milestones because it was virtual is a way of maybe just me subconsciously thinking about like that's how I built trust. But being able to see people in person and just knowing you know help the person is working through a situation in real life is, is, is very helpful.

Seven participants expressed that having dependable access to their virtual project members improved trust. According to Participant 6, "That's how I create a sense of trust in the culture within my group … always being available and being responsive to them." Thus, the final sub-theme is, availability and responsiveness improve trust on virtual project teams. Table 10 provides additional insights from research participants.

Table 10

Availability and Responsiveness Improves Trust

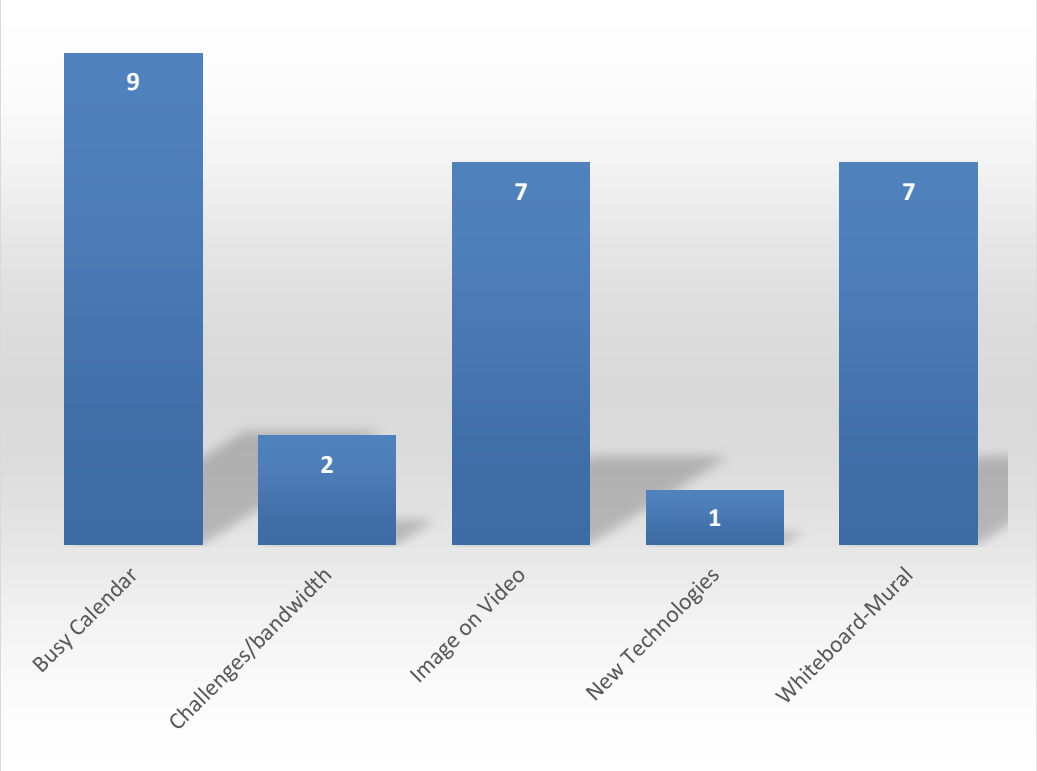
Participant	Quote
1	When my team members are consistently available, I know they are aligned and committed to the work and to the team. When there are gaps in availability that works to damage trust among the team.
2	So, I think dependability is, has been the number one foundation. And when that starts to waver, or if it isn't in place quickly, trust is really difficult to reestablish. So, if you're saying you're gonna be at place x, or get y done by a certain date if those things don't happen is really difficult to establish trust, and particularly for the feedback.
4	So, I think it's, it's always being, always, always being available, and making myself, I would say, just available. Really, and being responsive.
6	I think that also builds trust, that they know they can reach out and, and then if I tell them that I'm going to get back to you, I'll make it a point to get back to you, even if it's just to tell them I need more time to get back to you, right.
8	I think you do have to work harder to be available. And that's at every means possible. They need to be able to get you on the phone, they need to be able to get you by email, they need to be able to get you by Slack or Teams or IM'ing you on your phone, whatever it is they have to be able to reach you. Of course, we want that to happen the other way as well. But really, it's that availability, I think, that turns the corner to make these teams stick together and work together.

	I'm available, anybody can throw a meeting on my calendar if they need a one-on-one, or they're hearing something.
18	So, specifically, I will use IM, like Teams IM, or Teams chat, to reach out to people, pretty regularly, and make it, what I'm doing there, at least what I'm trying to do, is make it a norm, that I'm accessible like this, you don't have to set up a meeting with me, you don't have to, you know, you can't come stop by my office. So, I'm very accessible via chat. That means I can work whenever I want to. And, so, I'm pretty explicit that, that doesn't work for me. And I expect you to be accessible during normal business hours. I expect prompt response, and, in turn, I am always available during normal business hours, unless my calendar says otherwise. Which I keep very up to date. So that was a long answer to your question, but yes. Yes, I do expect availability. Let people know what you can and cannot do, keep that calendar up to date, be really, you know, forthcoming with availability. And, you know, just don't disappear. To me that's that, that's the kiss of death in these virtual times.
19	I make myself available. I do make myself available.

Theme 3: The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams. The researcher did not specifically ask the participants about the impact of technology on their virtual project teams during the semi-structured interviews for this research. However, 15 of the 17 participants mentioned the substantive impact of technology on the functioning of virtual teams. The researcher identified five lower-level codes for technology (busy calendar, challenges/bandwidth, image on video, new technologies, and whiteboard-mural). Figure 10 exhibits a bar chart representing the number of participants offering support during their interviews for each lower-level code.

Figure 9

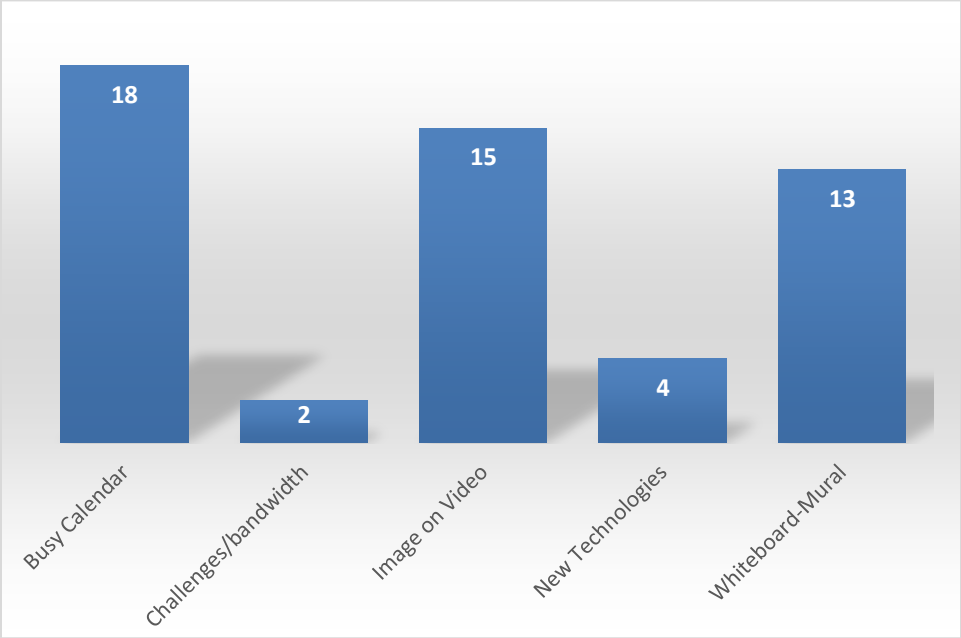
Number of Participants Supporting Lower-Level Technology Codes



Nine participants referenced having a busy calendar in the virtual environment, while only one participant spoke to new technologies. Figure 11 identifies the total number of references made by the participants to each lower-level technology code. Again, the participants made the most references to their busy calendars, 18, while only providing two references to technology challenges such as bandwidth.

Figure 10

Number of References to Lower-Level Technology Codes



The participants largely praised MITRE for their effective technology support of virtual project teams, including Participant 15. “MITRE did a fabulous job rolling out technology, you know, putting teams in place rapidly and running a series of educational opportunities for us to get up to speed on.” Participant 2 also applauded the effective implementation of technology at MITRE, “Technology was a home run, we got all of that done well.” The experiences of the research participants lead to the identification of Theme 3, the effective implementation of technology is foundational to the success of virtual project teams.

Several research participants acknowledged initial challenges associated with the technology supporting their virtual project teams, but generally reported they largely overcame these during their projects. Participant 1 noted that the widespread implementation of virtual workers in the United States during the COVID-19 pandemic positively influenced MITRE’s ability to effectively support its virtual project teams.

> At first, it was the tools. Because Teams, Zoom, the online editing, the tools weren't there. But they were improved rapidly because everybody in the world went virtual. So, a lot of money went into our infrastructure to make the tools work fast and work better. And Microsoft and all the other guys who make the software stepped up and fixed lots of things that were apparent when a high load was put on him.

Additionally, participants noted the importance of sufficient office equipment to support technology. Participant 3 explained, "When we start to think about the tools people need, we need to equip people for this. Not just Teams, Zoom, Google hangouts, no, there's hardware you need as well." One lingering technological concern centers on internet access. Much of the current technology required to successfully lead a virtual project team depends on each team member's ability to access high-speed internet from their remote office. Participant 14 indicated a few project team members still lack this necessary access. "Bandwidth. There've been a couple of people who live, I don't know where, and just constantly have Internet issues. I think it's a major issue … and that's a problem." Fortunately, this is not a widespread issue within MITRE project teams, but an issue virtual project managers need to keep in mind.

MITRE had fully integrated Microsoft Teams into their IT suite before sending most of their employees to work at home for quarantine during the COVID-19 pandemic. Thus, all virtual project teams at MITRE employed Microsoft Teams for the vast majority of their communication needs. While teams provided necessary functionality to virtual project teams, it also provided distinctly different challenges than those faced by collocated teams. Managing the online project meeting created a specific challenge that participants mentioned as impacting their effective use of teams. Project managers had to learn to monitor participant chats while leading a meeting. Participant 9 offered a specific lesson learned:

> Chatting, there's a lot of that. That was a thing for me, that was just like multitasking, just this chat box going on in a meeting while you're talking, and I'm very often, you know, listening and presenting. And then there's just this stuff so, you know, I always made sure that there was somebody on my team paying attention to that. So, they could intervene and say, 'we have a couple of questions here,' and do it, not in a disruptive way, but in a way that made sense.

Table 11 contains additional comments on technology, lessons learned, and praises for MITRE's effective support.

Table 11

Technology Provided a Foundation for Virtual Project Team Success

Participant	Quote
1	We can see each other. We can share our files. We can actually edit files in real-time amongst the entire team through a one-drive application we use. With this, everybody can be in the same document at once. We're editing and it keeps track of who's doing what. If somebody is editing the same paragraph, sentence, word, that you are, you notice you have to wait, so it's pretty efficient. Once people got their home offices set up, we operated very efficiently. Initially, some people complained about, 'I don't have the same big monitors or same high-power laptop or desktop, don't have a comfortable chair,' all that. So, we worked through those issues
3	I almost go back to the tools that you have to have, right. So, like I'm sitting here right now I have essentially three screens. I've got my laptop right here, with the camera on me. But then, here and here I have two big monitors. And having that much virtual real estate, screen real estate is really important because I have you over here, I've got, on Teams I have the picture of you here, I have my regular calendar over here, got my email over here on this side, and I have my OneNote open here for notes. But these screens are big enough that I can have other things in them as well. And so, by doing that, like if I'm in a regular meeting where I'm taking notes as well, I can have a document up that I'm working on here, taking notes here, I have two documents, slides over here, and that, that's really important if we're going to continue to do this, is having the right tools. I'm using, I'm using *inaudible* so I don't feel like I have to scream, I don't have to have a

headset on. Because the mike in my laptop just doesn't work that well, it sounds really awful when I talk on it.

Oh, amazing! I've been super happy. So early in the pandemic, an email came out and said, you can get a headset or you can order one of these, click a button. And, boom, it showed up like 5 days later. And they told everybody who were going home and not going to work in the office, take your monitors home, you don't even have to go through a process, just log in, and do it in the inventory system, you don't have to worry about security, you don't have to go out a certain door, just take it out to your car, and report that you have it at home. That was huge. Again, having the right tools.

Also, the tools have become more efficient. I mean even if you look at how Zoom evolved over the course of the pandemic. And so yeah, I think we still run into those issues on some days. Somebody's network is having a problem, but they'll announce that. They'll say, hey for bandwidth, I keep dropping off Teams, so I'm going to go screen off, and everybody accepts that. Everyone has experienced that.

4 I think, you know, the challenge was, from a corporate standpoint, our company had the right infrastructure in place. I remember there was a directors meeting where they had all of the folks at my level and the officer core together, and our CEO made a joke like don't everyone use your video because they didn't have enough of a pipeline. So, I think that there were infrastructure challenges, you know depending on your role. I didn't see that. I think for me it was maybe the tools, iPad, laptop, getting used to working, and then train myself to just be pure cloud based.

5 We have someone, who said I'll manage the chat for you. That's one of those great lessons learned that might help somebody, you know. And I don't even think about it, yes, because it's a lot. Especially if you're presenting the slides, you can't see the chat unless you have a second screen.

6 Things like that also work, and I think the tools exist to manage the challenges of working remotely, we just have to get better at using them.

As we start to use tools more effectively, I think that will only get better.

9 Teams was a pretty new application that we were introduced to at MITRE. But we weren't really using it with our customer. But I, I support [sponsor name], and they were just adopting Teams. So, we learned it together, and the functionality. And, and we're, we gave each other latitude, you know, it's connectivity issues or, you know, finding toggling over here, and this little feature, and, and, and we shared things. And so, you know, that kind of built trust with them, and, and, and a bond that hey, we're both learning this, and let's get it right because there's the way we're going to live for a while.

When someone is sharing something on the screen and hasn't shared a briefing, you can just kind of take a quick snapshot of it, and then you have it there to follow up with, you can follow up and ask for a briefing. But you have it, you know, right there as a primer. So, there are lots of advantages to working virtually.

10 I think having just one form of media going at one time is enough. Having like a distracting… the chat to me can be very distracting when someone is talking, and a lot of people are dropping in ideas. That normally wouldn't happen in a, in a meeting, a live meeting. You would take your turn to say what you need to say. It's just more information to have to process, and that can be overwhelming.

11 I've got three screens, two computers, a stand-up desk, a fancy chair that was the first purchase. So, we did go out and spend on office furniture. It's a layout for a nice home office and that's important.

I mean we have the tools to do it. If you've got the people who are willing to work with it, I think you're good to go.

12 So that's the other difference, I think, is that I'm not sure we leveraged our materials as well before, when we were in person, around a conversation, as we do today. Like now, you sit in a conference room, and you look at the big screen, and you look at the material, it's fine, but it's a long way away, you gotta read it, it's harder to share the information. But when you're actually sitting right in front of the computer, and it's zoomed in, it's right in front of everybody in the meeting, you can actually really leverage your materials to have a more efficient and effective meeting than if you were in person, I would argue.

15 The technology is key, right. You could lose a lot of ground just trying to get everyone being able to talk, or you've got mikes that fade in and out or you've got, and I do it too, you know, the people that are talking on mute and have to repeat themselves. So, it, it takes kind of a different set of skills I think to work virtually.

And again, it's that Microsoft Suite, right? You know it allows you to have your SharePoint it allows you to go back and see all the chat history from a meeting. It just provides a lot of functionality. Kind of stitched together. So, you've got kind of a consistent experience and you're not having to launch multiple products. So, I think Teams has done what it was designed to do, which is kind of enable the work and the exchange of information.

You've got the opportunity to instantly record a session. You've got the history of a chat stream when you're in a meeting, you've got the ability to

upload artifacts, you can go back to that meeting and kind of look back and pick up the artifacts and quickly move them over into a repository. So, I think you've got a lot of efficiency gains there because people may have missed the meeting. Well now they're truly able to go back and kind of resurrect the information that was shared, and even watch the recording, should they want.

16 I was used to having a keyboard, mouse, and two monitors and everything, and so I didn't really take the time to stop and think like, 'what should my work environment be like at home?'

How can I replicate my home my work environment, or I had that set up at home? And so, I was kind of zoomed-in doing just everything on the laptop and I wasn't used to that. And so that was, that was maybe a little bit different. And then my wife got me thinking, hey we've, you know, sitting at my desk here at home where we have our home computer and it has a monitor, you know. Is there a way that you can connect your monitor at home to your laptop? And I thought you know what, I probably could, so I just did a little shopping on Amazon and got a little adapter and then bought an external keyboard and mouse. And so now I have essentially that the same setup that I had at work at home, and it's great! So maybe something like that, where, you know, if people have, you know, similar equipment, you know, at home that they do in the office, or if they don't, even if there's a possibility where they could have a similar setup by connecting, like I did, their home equipment to their work equipment, in a secure way, which it is. Then teaching people how to do that, things that they may not know.

18 And then we would project in the room … if you have a clearance to see the data, and you're allowed to be in the room, we project with someone's [sponsor name] laptop and then screen share that way. That's been complicated, virtually, because you can't do that. Like right, we're on these two separate systems, that use systems that don't talk to each other easily for the purposes of screen sharing, for things like looking at each other's code. Stuff like that, you know, the analytics code for running our models. More recently, a way that we've gotten around that, but we do it inconsistently, is using zoom.gov, which became available on our laptops, I wanna say maybe 7-ish months ago, don't quote mean on that timeline, that's not exact. But you know, sometime during the pandemic it became available. And then we were able to screen share from our [sponsor name] laptops to our MITRE laptops.

What I don't like about Teams is it's too much of a one-stop-shop. Which can be unwieldy as hell when you're trying to navigate between a bunch of different things. You know, your files are there, your calls are there, your chats are there, it's all in one window. And that, to me, can be really difficult to manage. Especially if, like we're doing right now, you're virtual. So, I'm

	chatting with people, and on a meeting, and trying to find files, all in the same place. That can just, it feels, the experience of it is just like you're glued to this one application. You know, my whole life is in this one application. I almost want it to be more dispersed.
19	People in our organization, just speaking purely from an IT perspective, could do most of their work anywhere.

Participants identified a new challenge associated with virtual, video technology during their interviews. Seven participants mentioned the difficulty they faced managing their physical presence on videoconferencing software. Awareness, and understanding the image presented on screen is a paramount concern for participants and a potential area for training and improvement. Participant 7 explained these concerns.

> If it's visual, a whole bunch of criteria comes into play. How do you present yourself? I guess TV anchors and other TV guests are given that training, in terms of what people can see, and how best to use that real estate. Where we look, so on and so forth. And also, the background. How do you project the right image? And that's not easy by the way. You show a bookcase, are you trying to show that you're erudite? Are you showing a surface, is there a cat in the background? So, all these things matter, and some guidance along those lines would be good.

Table 12 contains additional comments and concerns from the participants on their online image, eye contact, and backgrounds.

Table 12

Video Image

Participant	Quote
4	It's also with the folks who didn't get to know me that well, you know, sometimes they're like you have like massive bitching resting face. Because when I'm actually focusing and typing on my notes, I'm looking in there, and some people were just like, he looks like he's really angry today. And it's like wait, no, that's not it, that's just me focusing on something because without my glasses everything's this big on the screen. So, I think, you know, sometimes certain things could be misread, so I thought that that was a challenge.
5	But I do say, if I'm on the call with the sponsor, and I'm taking notes, I'm like, hold on, you know, just so you know, I'm not looking away, but I'm taking notes.
7	With the video, the challenges are the screen space is shared with what you are projecting and the people's picture and also the positioning of the camera and the screen are not synchronized so you're looking in a general direction and you have to make an effort to look at the camera and then you lose the focus on the person and the image. With video, there are other factors. Such as, what's in your background, in the picture, making sure you project the right image, that you're dressed even though you're at home, and do I wear a tie? I always like to wear a tie because it's a mark of respect to the person you're visiting outside of work, but it feels silly to wear a tie at home.
10	One thing I did learn very quickly, was just to be camera-ready. After a while, I was like, it's just easier to get up and treat it like a normal workday. Get ready, sit down at the same time, and then just be prepared for the day. But in a virtual environment, using the computer, you can do that, and you can see these different things that are happening. And I have had a couple of people tell me that I looked very stern, or that I was frowning, or there's like, my face changed. And it was because something else was happening in the peripheral that took my attention away, for even 30 seconds. But it was a, it was noticeable to people I was on a meeting with. And luckily these were internal MITRE meetings with, you know, my team, but it made me more cognizant of, kind of my expressions, and trying to have a bit more of a poker face.
12	In general, our teams have been pretty good about using the 'hand up' approach on the Teams site. So, if somebody wants to speak, they'll go ahead

	and put their hand up, so that there is that rotational element You still have those team members who like toggle their mike, as you do in person, but the nice thing with the with the 'hands up,' it does provide that ability for the facilitator of the meeting to pause and say, hold one second, so and so has their hand up, and kind of force that protocol a little bit. So, when we conduct interviews, as a standard thing, I'll have the whole panel blur their backgrounds because some are at home, some are in the office. So, when you're in the office, in general, what's behind you is not such an issue, although, I don't know what's on the whiteboard, and do I really want people to see what's on the whiteboard, and do I really want to worry about it, right. We've got some folks fresh out of college who are dialing in from their bedrooms and there's dirty laundry behind them. I don't want them in this situation where they're going to be mortified when they suddenly realize that the sponsor's looking at their dirty clothes on their bed, right. Whereas, if you have a blurred background it takes all that away, and it gives people a little bit of grace to not worry about it and focus on the individual. The other thing is, when you talk to somebody, you know, you don't want them sort of looking around the room and getting distracted, right. It's like, that's not what we're there for.
15	Like you could put the backdrops and all that kind of thing yeah, but here's my office. Sometimes you don't always think to set a certain backdrop and so you're seeing inside someone's home and you're seeing what's going on around them and that type of thing. For example, I'm looking you in the eye on my camera, but it probably doesn't look like it.
16	I've heard some people say they've heard they look bored, so yeah. We, you know, things, more things to be aware of, right? I know, so for example, I look at my phone less during a meeting on video than I think I probably did in person, you know. When I could sort of, in a room full of 10 people, kind of hide over there and every once in a while, sort of take, take a peek at the phone and check email and stuff. Now, you know, it's a little bit more difficult to do that.

Nine participants recounted an essential learning curve to working with virtual project team supporting technologies. Specifically, many participants, including Participant 14, felt

overwhelmed by the number of meetings scheduled through the Microsoft Teams platform, “All day long. Back-to-back-to-back.” Participant 15 described a similar experience:

> I do remember early on, you know, where we just went back-to-back to back-to-back to back-to-back. I mean one meeting shut down and a new meeting came up, that meeting shut down and a new meeting came up. I mean it was exhausting.

Participant 2 also lamented about the ever-increasing number of emails received since moving to the virtual environment, “I have 4,034 unread emails.” Fortunately, over time, most of the participants reported improving the stressful number of meetings and emails related to working on virtual project teams. According to Participant 10, “Now we've gotten really better about pulling that back, so the team members don't feel quite so overwhelmed or exhausted.” Table 13 provides additional participant support to the virtual technology challenges.

Table 13

Virtual Technology Challenges

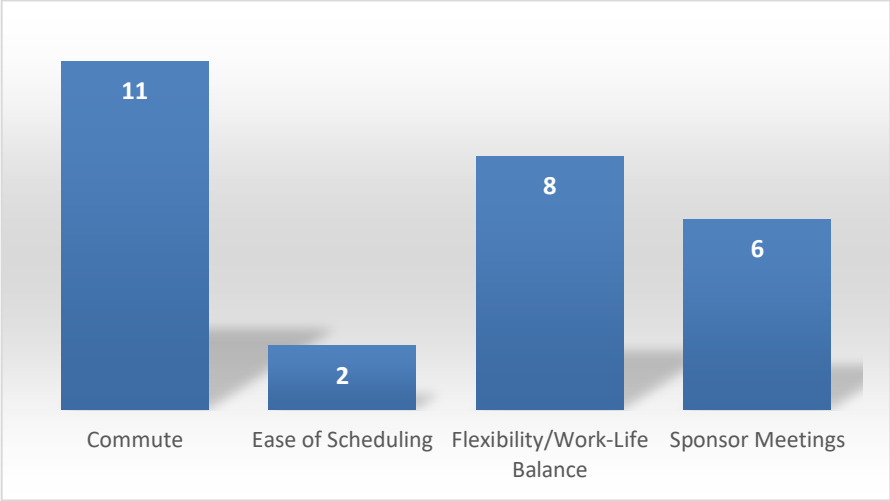
Participant	Quote
5	Like with the volume of email, you can miss something. You know, I send out administrative emails to my team leads saying I need you to do X, Y, and Z, and I try to highlight the important parts. But if there are five things in there, people are only going to do like three or four, you know, because just, oh well, I didn't read it that far. And so, you have to follow up and say, OK, just as a reminder I'm getting this.
6	It's also been a struggle to make sure that they read the right emails and all that. I think email is a productivity killer in that sense. There are two problems with email, I feel. That is that people send emails a lot, second thing is that some people treat emails like tag you’re it.
8	Teams takes over a good chunk of your day, no question.
9	Another thing, a practice that we've been conscious of, in our team, and in scheduling meetings, is we try to schedule for 50 minutes, you know, 45 minutes or 50 minutes, so not that full hour. To, you know, even signal to

	people, hey we're not going to, we want to give you time to, you know, you know, take a break between meetings. Because people are in back-to-back meetings. Like I say, you leave space for because there are back-to-back meetings if you work virtually.
10	I think the thing that happens with managing teams virtually is people get burned out, from the sheer amount of meetings that you have to have. It's a lot more meetings that you have to dial into via Teams or phone, than you if you had one long meeting per week in the office. Now you have to have more touchpoints, and people get, we hear, we've heard a lot of complaints at MITRE, specifically, about kind of the back-to-back meetings that people were in when COVID initially started. The downside of that too is seeing that your calendar fills up very quickly, right. That's, I think, that's a stressful element for some people. When they're looking at their calendar and saying, oh my gosh, I'm blocked for two days straight in 30 minutes increments.
12	One thing I think, with COVID, is that everyone's got meetings now, they're never available, like ever, and so, at least according to their calendars. But, in fact, if you IM them, you can generally connect with him and figure out a time. So, often, if I need to talk with someone that day, there's never calendar time available, so I'll IM them and say, hey by any chance do you have 5 minutes, when would be a good time, and then we can just connect.

Theme 4: Virtual Project Teams Create Advantages. Unquestionably, working on a virtual project team creates advantages for employees. Specific lower-level codes for these advantages included: commute, ease of scheduling, flexibility, sponsor meetings, and work-life balance. Figure 12 provides a bar chart representing the number of participants offering support during their interviews for each of these lower-level codes.

Figure 11

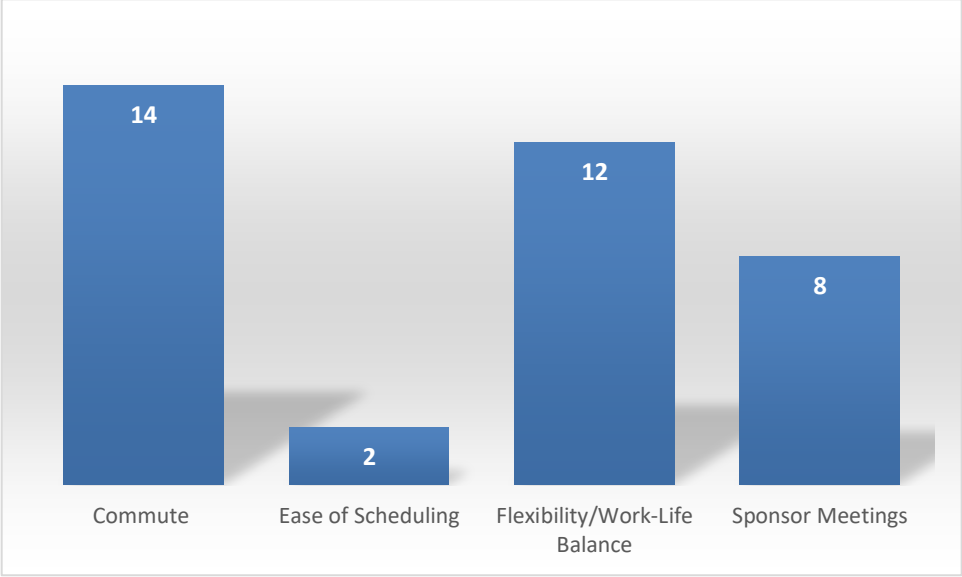
Number of Participants Supporting Lower-Level Advantage Codes



Commute was mentioned as an advantage of virtual project teams by 11 of the 17 research participants. Figure 13 highlights the total number of references the participants made to each lower-level technology code. Again, Commute received the most references, 14, among the lower-level advantage codes.

Figure 12

Number of References to Lower-Level Advantage Codes



Several participants mentioned the ability to acquire the best talent for a project team without geographic restrictions. This advantage is championed by Participant 7.

> Are there advantages to being geographically diverse? The answer is clearly yes! So, you need the skills. And the skills, why would we want to put an artificial barrier around where, geographically, the skills may be? I have made presentations from abroad to government sponsors, and so if I can work from anywhere that's a convenience, and that broadens the pool of resources. Someone at a different MITRE location, hey, we can still work as a team. Finding the right talent and, you know, all the trouble of travel.

Participant 14 provided additional support, "I could have people on my team who are experts in their domain, regardless of where they live."

Another advantage of virtual project teams, mentioned by eight of the research participants, is personal flexibility and work-life balance. Participant 1 provided their opinion on the greatest advantage of working in a virtual environment, "Flexibility. Flexibility is the thing I've heard from almost everybody." Table 14 lists additional participant impressions on work-life balance and flexibility on virtual project teams.

Table 14

Flexibility and Work-life Balance

Participant	Quote
1	I don't have to get up and get dressed, take my kids to daycare or school, go to the office and worry about getting home in time to pick the kids up. So, flexibility in terms of work-life balance especially with working moms or when both parents work and they've got school-age kids that was the biggest thing. Huge thing.
2	Flexibility is really important, and you earn flexibility by being dependable.
6	When we were coming to work, we all had a certain work schedule. There are core hours, and yes, folks like me come in sooner but leave sooner, others come in later but leave later, but there was at least overlap, let's call it 9 to 4, right. Now I feel, there is more flexibility in when people work.
9	Now I like the flexibility, you know, that that we have with, you know, being virtual.
10	I do think some people really like working from home and have enjoyed the flexibility of being able to work remotely.
14	I think I am able to be much more flexible with people's schedules. Um, I'm an empty nester, but I have a dog, and he's my only distraction. My husband works from home now, adult kids came home, now they're working from their rooms too. So, it was nice, nice to be able to see family in the middle of the … you know, trying to grab lunch kind of thing, right. I can exercise more, get to the gym. So, for me personally, it's a lot more relaxed day, ok.
16	We have more flexibility in how we're working. I also like being able to work from home on or Friday, or today I'm working from home because we have a thing, situation going on with the family, so it's just, it's just nice to be able to, to have that variety, and know that I can still stay connected and productive with, with everyone at work.
19	I realize that people need to get out and take their dogs for a walk or whatever, like put their feet, put their toes in the grass, which is totally cool, I encourage you to do that.

Participants recognized traffic as an especially onerous obstacle to working in the Washington DC metropolitan area. Eleven of the research participants identified the absence of the work commute while working in the virtual environment as a particularly pleasant advantage. Participant 11 complained, the commute in this area, “It sucks the life right out of you.” Table 15 presents additional participant comments. Interestingly, while participants cited the elimination of commute as an advantage, many reported they added this saved time directly to their workday. Thus, this advantage aggravates the challenge of additional time spent at work, discussed in the next theme, and is another paradox found working in a virtual environment.

Table 15

Commute

Participant	Quote
1	Not only the time savings but also the positive mental impact on me by not having to endure the stress of a long commute.
2	I try to avoid the mania that is the commute here, it really is miserable. One of the few nice things about COVID has been the more work from home.
3	I mean the ability to remove the commute on both ends of the day, created a lot of time.
6	Earlier I had a one-hour commute, each way, and that used to be a barrier, right.
8	Well, I don’t have to sit in traffic. It’s awful. No traffic, from here to McLean is 18 minutes, no problem. Coming home at night can take me an hour and a half.
10	Definitely, the lack of commute times.
11	Some people commute an hour in each direction if they go around the Beltway.
12	There is something about being able to roll out of bed, and a half-hour later … and I don’t have to commute in traffic, I think everyone appreciates that.
15	Traffic!

16	So, driving in on, like 66, you know, the drive could be anywhere from, during regular commuting hours, like an hour to an hour and a half, depending on the day, each way. So, let's just call it two to three hours.
18	Every minute of my day is booked, so adding a commute is really hard.

Similar to commuting, participants described the ease of meeting with external sponsors, and internal project team members as another important benefit. Each participant in this research supported a project team with a government sponsor. These government agencies transitioned to a virtual work environment as a result of the COVID-19 pandemic. Participant 1 explained,

> It's interesting about how well it's gone has been the fact that both we and our customers went virtual at the same time. If we had done it ourselves and our customers had not, then I doubt it would have gone as well.

During the COVID-19 pandemic, when both MITRE and sponsors adjusted to working virtually, videoconferences replaced face-to-face meetings. These video meetings created many advantages. Participant 1 continued:

> The biggest benefit has been the ease with which we can schedule meetings with them, right? Because we're not collocated with most of our customers, so going to see them involves travel, whether it's local or regional or further. And you know, getting into a government facility is a big deal. Security and scheduling the rooms and all of that. Where now we can meet with three or four different customers in an afternoon just by a click of the mouse.

Changing these meetings to videoconferences created many advantages and efficiencies as noted in Table 16. However, an additional virtual project team paradox is that this ease of meetings created an additional challenge due to the lack of spontaneous, face-to-face interaction with the sponsor.

Table 16

Video Meeting Advantages

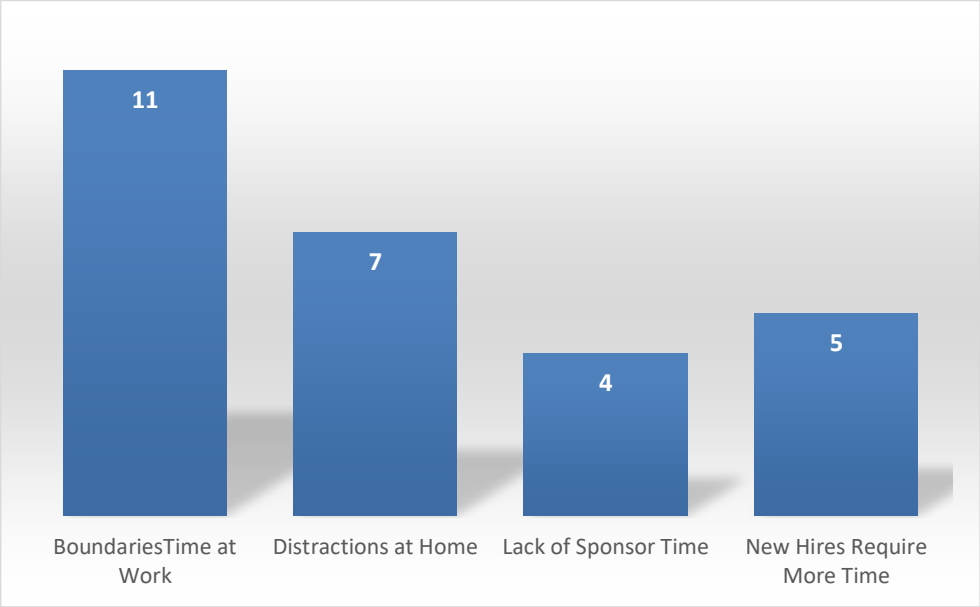
Participant	Quote
1	Just ease of scheduling. Ease of getting people together. Teams tend to be spread around the country, so it's hard to get people together in one spot.
4	You're doing less of the going from meeting to meeting and run around the buildings. For me, personally, when I'm in our McLean campus, where my office is versus say where my boss's office is, that's an 8-minute time to get from point A to point B. So, if I go down there for one meeting with her, well then that's 8 minutes on each end, and then there's usually a coffee run in the middle of it, so you can start to see the logistics of this deterministic operations research problem. You start to lose that opportunity space.
10	You can lose so much time driving to a sponsor site, an hour there, and an hour back. There's advantages to that. I know that some of my team members prefer that, the ability to have the remote calls, to dial in to the sponsor.
16	In a virtual environment, where people are spread around many different locations, in different states even, we've been able to get together, where maybe again we wouldn't have been able to before, and see people, and talk, and do things.
18	A major advantage was being able to switch our weekly in-person sponsor meeting to virtual. Because it required a group of us, every single Tuesday morning, to haul our butts downtown to [sponsor's name] building. Those meetings were a burden, honestly. They were a burden. And we did it as part of serving our sponsor. Because he wanted them, and he wanted them in person. So, people hated them. And so, it was like this, this shared burden, where you know, we take turns going. I always had to go, but I would take turns assigning it out. And I honestly think it drove some people away from the project because that got really old. So, that was actually a huge advantage and I do dread having to go back to that.

Theme 5: Virtual Project Teams Present Challenges. Research participants related overwhelmingly positive experiences working on project teams in the virtual environment. However, participants also identified potential challenges. These challenges correspond to four

lower-level challenge codes: boundaries/time at work, distractions at home, lack of sponsor face-time, and new hires require more time. Figure 14 represents the number of participants supporting each of these lower-level challenge codes.

Figure 13

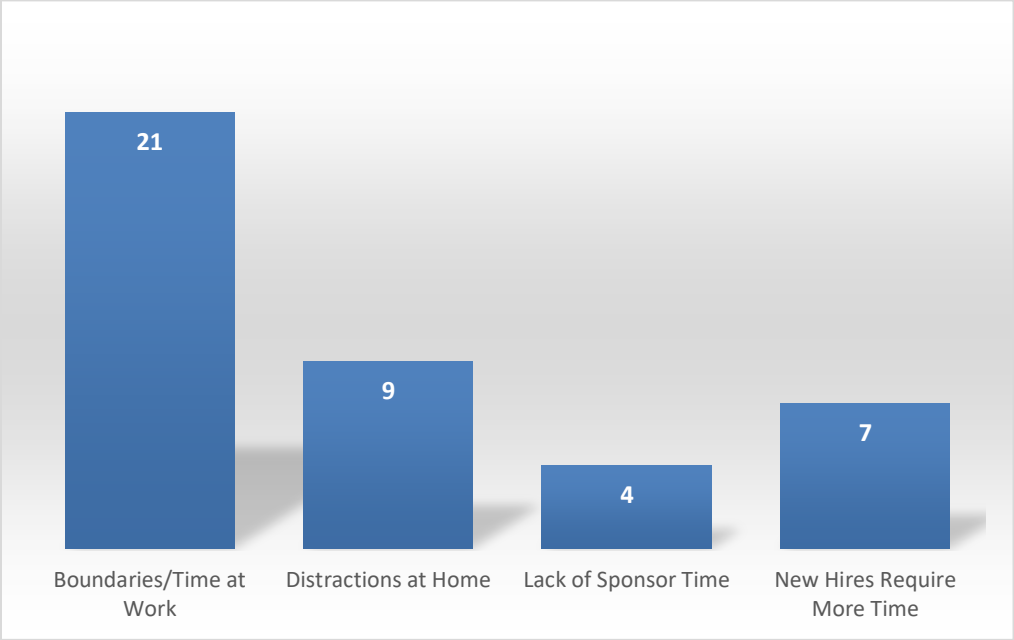
Number of Participants Supporting Lower-Level Challenge Codes



More research participants, 11, expressed the greatest challenge of virtual project teams was setting boundaries. Similarly, Figure 15 represents the number of references that the research participants made to each virtual project team challenge code. Again, the participants made the most references, 21, to the obstacle of setting boundaries around the time they spent at work.

Figure 14

Number of References to Lower-Level Challenge Codes



Seven participants noted the challenge of the apparent and unavoidable distractions in the virtual office space. However, Participant 4 pointed out that some of the situations that initially proved distracting became more acceptable over time. “Now people don't mind living rooms and backgrounds and seeing kids and animals running around, where I think, you know, that has now been adopted as the norm.” Ironically, these distractions positively influenced the intimacy created through the use of video as described in Theme 2. Table 17 displays participant observations on these distractions.

Table 17

Distractions

Participant	Quote
1	Then the distractions for people who have small children at home, right? Because suddenly everybody is at home. People have school-age children, got to deal with that, right?
6	They're cooking, or they're taking care of something else, or helping their kids get on the school computer, or you know, whatever the crisis of the moment, right. It's more difficult to disconnect all those pieces, as distinct.
8	Sometimes I think there's a, maybe, a focus issue. Because the child comes in, and the dog walks in, and the cat walks across the screen. I don't think it hamstrings you very much though. People seem to be able to get right back on it though, but it is a distraction, there is no lie there. Sometimes it is a distraction.
10	You can be a little bit more easily distracted online too than you would be able to in a meeting, and that's part of a challenge because you can zone out a bit more in a virtual meeting and not really listen, active listening 100% and that's problematic.
11	And the single folk. Those people really felt, well single folks, and the kids, the people with small kids. If you're single it's like solitary confinement, that's awful!
14	I had a teammate who had a puppy. That required way too much time and attention, and they kept providing it, to the point of like throwing the ball across the room over and over and over so the dog would have, you know, something to do. That was like, you're not, you're not even engaged here.

Another challenge repeated by eleven of the research participants, and accounting for the vast majority of the challenge references, involved establishing boundaries around work times, and spending extra time on work activities. As noted in Theme 4, the majority of participants cited a significant reduction or elimination of commute time as a major advantage of working in the virtual environment. However, several participants reported this time simply absorbed into their workday, increasing their work time. Thus, another paradox identified by the research participants is that the work-life balance gained in the virtual environment can lead to the

challenge of spending too much time at work, and the need to create boundaries. Participant 9, among others, discussed the lack of separation between work and home life, “The home life and the work-life tend to blur.” Participant 10 explained, “You never really get to plug away from the technology.” According to Participant 6, when working in the office, “There was a differentiation, a time differentiation. But that kind of went away while working completely virtually from home.” Participant 3 worried that allowing project team members to increase their workday could have negative consequences, “You really gotta be careful though because that burnout piece, and often force people to step back and get away.” To counteract this challenge, project managers need to encourage virtual team members to create structured bookends to their day. Participant 15 found a rhythm to maintain work-life balance:

> I mean it was exhausting, and I learned to truly bookend my day. Otherwise, we just never shut down. I would bookend my day. In the morning I would get up and I would go to the gym and then in the afternoon after work I would you know just turn everything off and that's when I would go run or go bike or do something. I mean I had my points where I turned my day on, and I turned my day off.

Some virtual project team members have greater difficulty finding this balance. Participant 10 found the balance too difficult, and returned to the office as soon as possible, “More for work-life balance. I like the separation. I prefer work at work, and home at home.” Table 18 exhibits additional comments concerning this challenge.

Table 18

Work-life Balance Challenges

Participant	Quote
3	Well, I mean the productivity was really high. I mean the ability to remove the commute on both ends of the day, created a lot of time. But it also has that downside of burnout. So, you really have to start to be disciplined about cut-off times.
4	What's the average commute time in the DMV area? An hour a day? For quick math, that's an extra, almost 10 hours of time. I know for me, spending an extra hour or two is not uncommon. Whereas, before there was maybe a little bit more of a separation of the day, generally speaking.
6	One thing that has happened during COVID, is that I think we all are working longer hours. I don't know if it's more productivity or not, but it's longer hours. And there are no barriers between work-life that way, right, less barriers. At least go for walk at about 6:00 or something, just a 10-minute walk, and that could become your mental barrier to say I'm switching off from work, I'm in the home mode. In the morning, similarly, maybe 8:00 or 7:00, whenever you start, go have a walk, and say that's your virtual commute, ok, I'm back in office mode.
8	Now my day is from 6:30 to 6:30 because people have figured out, I'm not in a commuting car and I can do more things for them. So, my days are significantly longer.
9	There's a lot of time, a lot more time is spent at work, and you don't even know it. And you gotta guard against that.
10	I actually think people probably work harder and work more virtually than they did when they actually worked in the office.
11	I mean, it's harder for people to turn off. I mean if the computer is just right down here in the basement that was probably putting in more hours and I was definitely putting in more hours.
12	Just no boundaries, right. People are working much, much longer hours. And meetings are starting early and ending late, right. It's just, so it interferes with my home time, my family time, my time. And that's something for everybody, there's, there's fewer and fewer boundaries.

	And now we're interfering with people's downtime, and so people are getting tired, and stress levels are higher. And, I think, that's on top of the world being a stressful place right now. So that's not productive because people are getting tired and more need a break.
15	I just realized for my own sanity I kind of needed to put some bookends on.
16	So, I saved that, but so and advantage is that I saved that. An advantage to MITRE is that I probably turned most of that into work time. I did take some time to figure out like where the boundaries are, especially at the end of the day.
18	I've heard people talk about wanting to go back to the office as a better place to focus, because they don't have dedicated space in their apartment, or something, to really, you know, be like this is my workspace and that's my home space.

Another challenge expressed by four research participants concerned the lack of sponsor face-time, and the opportunity for spontaneous, informal interaction. While the participants counted the ease of video sponsor meetings as an advantage, this also reduced the amount and quality of access to their sponsors. Specifically, Participant 9 lamented losing the face-to-face interactions with sponsors which often lead to essential, informal performance feedback, "Virtually, when you're done, you're done." Unfortunately, scheduling additional, or longer meetings with sponsors to recreate these crucial interactions is often not an option. According to Participant 12, "When we work with people at a very senior level, it's really hard sometimes to schedule a meeting with them." Participant 6 worries about the long-term effects of the lack of face-to-face meetings with government sponsors, fearing, "out of sight, out of mind."

Table 19

Virtual Sponsor Meeting Challenges

Participant	Quote
6	If you're not meeting with them, they're not going to actually gravitate towards you. They'll have you in the back of mind, they're just fighting the daily fires. If we were in the office space we would just walk by or drive by and say hello, and you know, chit-chat. Replicating that virtually, has been a challenge. You have to really get on their calendars, we have to dedicate some time, which is more difficult in that sense.
9	Again, it's the, you know, the informal connections that you have…We tried to do that face-to-face, but invariably dealing with senior sponsors, there were informal conversations afterwards, or there was something to follow up to just get additional guidance afterwards. Virtually, when you're done, you're done, you know when you turn off that camera. So that's one big thing. And, you know, there's the aspect of being able to float around, you know, bump into people, like other directors, and say hi and, and, you know, you get a sense of, you know, how we're moving a task and supporting them. Operating virtually, you don't get that informal feedback.
12	Yes, honestly, so the downside is that we don't get to walk the corridors and say hello to them. And getting on their calendar is a bear. When we just happened to be downtown, and we happened to walk past their office, and they just happen to be at their desk, it's awfully convenient, right. So, we miss it, it's frustrating because there's a lot of things, we would like to discuss with them, but we just can't get in the door, and they're all three times as busy right now, because everyone is dealing with COVID. So, that is a definite disadvantage.
15	I do still prefer being on-site with the customer because I think that's how you get more immersion and embedded to really understand the world within which they're operating. And if you're trying to help them with strategic change, you get more of the pulse of the environment and the culture and that kind of thing.

Relationship of the Findings

The themes identified above represent the findings of this flexible, qualitative case study research. According to Creswell (2016), the findings of case study research contain evidence for the central phenomenon of the case. Thus, the findings of this research study directly relate to the

research questions, the conceptual framework, the anticipated themes, the literature, and the problem identified and described in Section 1: Foundation of the Study.

The Research Questions. Identifying research questions is perhaps the most critical step in preparing to perform case study research (Yin, 2018) and is the key to successfully executing research (Robson & McCartan, 2016). The research questions that guided this study include:

RQ1. What are the causes for the lack of skills among project managers to lead teams in a virtual environment?

RQ2. What project management skills support the leading of collocated teams?

RQ2a. What project management skills support the leading of virtual teams?

RQ3. What specific leadership skills do project managers need to uniquely contribute to virtual team success?

RQ3a. What project management skills encourage trust in a virtual project team?

RQ3b. What project management skills encourage open communication in a virtual project team?

RQ3c. How does the application of these skills influence the ultimate success of a virtual project team?

The Interview Guide/Protocol (located in Appendix A) guided the data collection process and captured participant experiences to address these research questions. Each interview question related to at least one of the Research Questions guiding this study. Table 20 presents these correlations. Interview Questions 1, 2, and 10, an ice breaker question, a background question, and a wrap-up/closing question represented non-research related questions.

Table 20

Correlation Between Interview Questions and Research Questions

Interview Question	Research Questions
3 Did you feel a sense of trust on your virtual team?	RQ3, RQ3a, RQ2, and RQ2a
4 How effective was the communication on your virtual team?	RQ3, RQ3b, RQ2, and RQ2a
5 Did you have face-to-face interactions with your team?	RQ3, RQ3a, and RQ3b
6 Do you consider this project a success?	RQ3c
7 What were the greatest challenges you faced on the virtual project team?	RQ3
8 What were the greatest advantages to working on a virtual project team?	RQ3
9 How did you prepare to lead in the virtual environment?	RQ1 and RQ2

Interview Question 9 addressed Research Question 1. The vast majority of participants received no training before being assigned to lead projects in the virtual environment. 12 participants acknowledged they received no formal training. Including Participant 8, who recalled attending specialized project leadership training, but "they don't talk about virtual teams in there." When asked about engaging in formal, virtual project leadership training, Participant 18 bluntly remarked, "Oh, God, no. I mean was I trained to do anything, ever?" Three research participants received informal training or training on the virtual tools supporting virtual project management. According to Participant 10, "It was all, um, no formalized training. More or less, you know trial by fire. In some instances. I did have training on using technology in secure

environments." Participant 14 added, "Um, I wouldn't say training. There was someone, maybe [CEO] brought in an expert on building trust in a virtual environment." Participant 6 recalled attending training, "And I think there are some teams training that MITRE has. About how to run team, how to manage teams, and that does have a subchapter on virtual teams." Only one participant, Participant 19, reported receiving formal training, "Last year I got certified in leading, I think it was called leading virtual teams." However, while research participants received little to no formal training to lead virtual project teams, their sponsors recognized them for performing the task well. Participant 9 indicated that one of MITRE's sponsors asked them to bring some of their successful virtual project managers to their organization as experts to speak to them about their successful transition to virtual work.

Responses from Interview Questions 3, 4, and 9 addressed Research Question 2 and Research Question 2a. Participant's responses to these questions supported the development of all five identified themes. Theme 1: Importance of Communication to the Success of Virtual Project Teams, Theme 2: Importance of Trust on the Performance of Virtual Project Teams, Theme 3: The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams, Theme 4: Virtual Project Teams Create Advantages, and Theme 5: Virtual Project Teams Present Challenges. This research question highlighted the differences in skill sets needed for successful project management in virtual and collocated environments.

Participant responses to Interview Questions 3 – 8 addressed Research Question 3, and these participant experiences formed the foundation for each of the five themes. Research Question 3a focused on the skills that encouraged trust on a virtual project team and participant responses from interview questions 3 and 5, and encapsulated in Theme 2: Importance of Trust on the Performance of Virtual Project Teams, and its three sub-themes: a video presence

enhances trust on virtual project teams, trust on virtual project teams develops through performance over time, and availability and responsiveness improve trust on virtual project teams. Participant 7 emphasized the importance of trust in all environments, “I think trust development is a must regardless of the method, whether it’s virtual or not.” Overall, the research participants felt MITRE successfully managed their project teams in the virtual environment. According to Participant 11, “I don't think the virtual nature of it degraded the trust.”

Research Question 3b focused on the specific skills that encouraged open communication on a virtual project team and participant responses from interview questions 4 and 5 formed Theme 1: Importance of Communication to the Success of Virtual Project Teams, and its three sub-themes: virtual project teams benefit from reliable and frequent communications, successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical to virtual project teams. A common sentiment among research participants concerned the main skill necessary for successful project management. In the words of Participant 18, “My strategy was always just communicate, communicate, communicate.”

Research participant’s responses to Interview Question 6 addressed Research Question 3c, the influence of project management skills on the ultimate success of their virtual project teams. Speaking directly to the influence of project manager’s skills on their project’s success, Participant 2 remarked, “The questions about could we do it, have been uniformly removed. We know we can do this; we know we can do this well and be high performing.” Participant 15 believes the transition from a collocated to a virtual environment positively affected project

success, “I think we all did a great job and are continuing to do a good job of delivering value while having to work in a completely different way.” Participant 10 agrees,

> I actually think that the project success rate may be higher. I think everything is amped up. Maybe the pressure is amped up. But the delivery is amped up. Yeah, I don't think, at all, that the production has waned from the virtual environment.

Participant 18 and Participant 19 reported experiencing an increase in the productivity and quality of the work on their projects as a result of the move to a completely virtual project environment.

The Conceptual Framework. The conceptual framework explains the key factors of the research and the presumed relationships between them (Robson & McCartan, 2016). Section 1 of this study presented both a narrative description and a graphical representation of the conceptual framework (Figure 1). The framework is comprised of two leadership theories (path-goal theory and transformational leadership), and two well-established concepts from the current body of literature (the challenges of virtual project teams, and guiding project management concepts). Each of these elements relates to the findings of this research.

Challenges of Virtual Project Teams. Two main challenges of virtual project teams as identified in the literature include: facilitating trust in virtual project teams positively influences project success; and establishing open communication on virtual project teams is essential for project success. These challenges affect how a project manager leads their virtual project team and impacts virtual project success. The findings from this study directly support this concept.

According to the current body of knowledge, the first challenge, facilitating trust, is essential for effective collaboration of teams, especially virtual teams, and impacts the ultimate success of virtual projects (Cascio & Shurygailo, 2008; Dixon, 2017; Ford et al., 2017; Mehta &

Shah, 2019). The research questions guided discussion of this concept, and the findings of this study offer support for this concept as identified in Theme 2: Importance of Trust on the Performance of Virtual Project Teams. Each participant dedicated a large portion of their interview on their experiences developing trust in their virtual project teams. Through their experiences, three sub-themes emerged: a video presence enhances trust on virtual project teams, trust on virtual project teams develops through performance over time, and availability and responsiveness improve trust on virtual project teams.

The second challenge identified in the conceptual framework is establishing open communications. According to the literature, open communications positively influences virtual team performance, but the lack of in-person communications creates additional challenges (Chang et al., 2013; Fan et al., 2013; Hunt & Weintraub, 2017). In addition, Pullan and Prokopi (2016) suggested the use of video technologies is the most promising form of communication, as it most closely simulates the richness of communication found in face-to-face interactions. This concept is also supported in the findings of this research as identified in Theme 1: Importance of Communication to the Success of Virtual Project Teams. The research participants responded that they spent a great deal of their time focusing on project team communications. These experiences consolidated into three sub-themes: virtual project teams benefit from reliable and frequent communications, successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical to virtual project teams. The challenge of virtual communications also touched on Theme 3: The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams. Specifically, participants recounted challenges in projecting an appropriate, professional image on video screens. Participants explained that communicating

virtually over video technologies requires special attention to image, including a focus on eye contact, facial expressions, backgrounds, and distractions.

Project Management Concepts. Two project management concepts from the current scholarly literature influence this research: skills and experience influence project success, and the triple constraints, or the Iron Triangle, indicate project success. These concepts affect the project manager's ability to successfully lead project teams. The first project management concept asserts virtual project leadership differs from collocated leadership, and successful skills are not equally effective in both environments (Purvanova, 2014; Schmidt, 2014). Lee (2021) argued that project management expertise is the most vital element in predicting project success, yet virtual project management remains largely unsupported. Many participants referred to the positive impact of experience on project success in the findings, however, it is not directly reflected in the formalized themes. The research participants, as identified in Table 1, had an average of 10 years of experience working on project teams at MITRE. Thus, their skills and expertise influenced their ability to contribute to all five of the study's findings.

The second project management concept defines project success through the use of the triple constraints of time, cost, and scope (Pollack et al., 2018), with many practitioners adding quality, among others, as a fourth constraint (Cullen & Parker, 2015). Theme 1, Theme 2, and Theme 3 from the findings address factors that contribute to the overall success of a virtual project. Participant 1 directly commented on the importance of understanding and sharing the triple constraints with project team members, "I try to make sure everybody understands what the cost is, what the schedule is, and what the scope of the work is, and just try to take care to touch base with everybody."

Path-goal Theory. The leadership project managers' offer to their team directly impacts project team success (Drouin et al., 2018). The path-goal theory is a situational leadership theory, developed by House (1996) that describes how leaders can positively encourage their team members to achieve specific goals.

> The ability to adapt leadership style to the situation, team member, project, and ever-changing global environment of virtual project management can be essential to the success of the virtual project. (Lee, 2021, p. 22)

The findings of the study reflect the ability of the project managers to change their style to adapt to the virtual project environment. The lessons learned reflect the research participant's ability to adapt their leadership to support their virtual team members in reaching their project.

Transformational Leadership. The transformational leadership theory developed by Bass (1985) described four components of leadership that improve team performance: charisma or influence, inspirational motivation, intellectual stimulation, and individualized consideration. Lee (2021) described transformational leaders as those who, "motivate and inspire followers to work" (p. 20). According to the literature, the transformational leadership style is a key determinant of the effective performance and success of virtual project teams (Hoyt & Blascovich, 2016; Mysirlaki & Paraskeva, 2020). Many of the participants of the study utilized this leadership style, but in particular, many referred to the individualized consideration component. Leaders exhibiting individualized consideration act as mentors to their team members and focus on their personal development (Bass, 1985; Bass & Riggio, 2006). Participant 12, when describing the need for more purposefully scheduled one-on-one virtual interactions with her team members (as part of Theme 1) outlined the individualized consideration behavior:

> So, for me, it is very important to have one-on-one time with individuals at the beginning. To get to know them personally. Just connect with them, hear their ideas, listen to them. Just make sure that I understand what drives them, what their long-term goals are. So, that as I'm creating a project team, and putting those sets of responsibilities together, it not only leverages their skills but also aligns with where they want to go career-wise. Because I always find that, from a project perspective, it's always beneficial for the project as a whole to do that. But also from an individual standpoint, when you listen to individuals, in terms of what they're looking for, and when you can align somewhat to that, they feel far much more heard. And more of a, you know, a member of the combined team. I'm very much about, you know, individuals bring their own strengths, and that is for the greater good of the whole team, and each team member brings their own value.

Table 21 highlights other research participant's descriptions of the difficulties, and extra time needed to mentor new team members in the virtual environment.

Table 21

Individualized Consideration: Mentoring New Team Members

Participant	Quote
1	As a new person, it would be almost impossible to form any kind of connection, because you never really met anybody. You know it's part of getting to know someone who's again that in-person vibe you get off somebody that you can't get over a computer screen or a phone.
2	I hired new people into MITRE, who joined MITRE during COVID. Some had been working for two weeks when they were told to go home. And so, the acculturalization process has been a challenge, as they learn what it means to operate effectively within MITRE, that's been very hard. Even for those, not for the ones who were virtual before, but the ones who didn't know MITRE, and then had to be virtual.

	A younger person who isn't used to a normal work tempo doesn't have experience to fall back on, and so they're just requiring a little extra mentoring and messaging. For all my employees now, I have check-ins. So, we would have those anyway, but now they're a bit longer to work through this especially for the new people. So, I said five new MITRE employees over the last eight months, and we started out with twice a week for an hour. Which is a significant time investment, when we have 5, so that's 10 hours out of my 40 already. And then, as I can judge their comfort level, or their own needs, back off to once a week, and then less than an hour once a week. So that's how we've been doing it - a crescendo of activity and then as they're able to de-crescendo.
9	You bring a new person on this team, you build them up, but yeah, it's yeah, you have to think about how, you know, help this person, buddying up with somebody, or I think it's, I think it's, it's, it's just that much more important to look out for those new people because there isn't that person in the next office.
12	I like to check in with my new hires for the first month, and then back off a little bit from there, depending on their level, and how much they need, how well-positioned they are on their project. That sort of stuff I like to do with regular check-ins.
16	She's never met, she's never met people in person and worked with them, actually done work in person with people. And so, you know, I think maybe just thinking about people like that, and again pairing them up, showing, you know, how do you connect with people in a virtual environment, but also finding opportunities to bring them in and get them connected with people in real life, would really help.
18	There's another theme, onboarding new team members. We've had several new team members, obviously during the pandemic, since it's been a year and a half, of course, you're gonna have new team members. And we are trying to describe to them what we were seeing in the data and, you know, trying to use a virtual whiteboard to sketch it out. That takes a really long time, it's really inefficient, so um, those are some of our struggles.

Anticipated Themes. Section 1 of this research identified three anticipated themes. First, facilitating trust in virtual teams positively influences project success. The data expressly confirmed this anticipated theme, and Theme 2, and its three sub-themes, capture it in the Presentation of the Findings. Second, establishing open communication on virtual teams is

essential for project success. Again, the research findings, specifically Theme 1, and its three sub-themes directly support this theme. Third, including opportunities for face-to-face interactions positively improves virtual project team performance. Several research participants discussed this anticipated theme, but not a majority. Thus, this anticipated theme is not included in the five main emergent themes of the findings. This omission does not exclude this as a factor affecting virtual project teams, rather, its importance impacted a minority of participants. One proponent of the necessity of face-to-face meetings, Participant 16 said, "I really do think that having face-to-face interactions with people, at times, in a way that works for everybody, is really important." Participant 11 believes the MITRE should invest the money it saves on facilities by having its employees working from home, in bringing people together face-to-face, "I think that would be a nice little investment to build that nugget that you can build a long-term relationship over." Participant 14 added that face-to-face meetings become especially important for complicated collaborations that, "would not have happened virtually with the same outcome." Participant 3 also agrees that when the entire project team physically gets together in one place, "those are big gains." Participant 6 also agrees, "There's value in having a cup of coffee or lunch with your project mates because that builds relationships."

One unanticipated theme arose from the data, Theme 3: The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams. While Section 1 acknowledged the importance of technology to support virtual project teams, it underappreciated the effects. Thus, Theme 3 emerged as a major theme from the data. However, while the participant's positive experiences with technology provided a foundation for the success of virtual project teams, technology did not adequately satisfy participants' needs in one area. Specifically, seven participants brought up the importance of whiteboarding at MITRE. Six of

these participants lamented over the inability of existing technology to replicate the experience of physically working together as a project team around a whiteboard. The outlier, Participant 12 found the existing technology solution, Mural, adequate for collaboration.

> There's a couple of tools that MITRE has that I really like. One is called Mural, and it's a really great collaborative tool. It's a big whiteboard with post-its, and, you know, you share your different ideas … I find it a really nice method of collaboration and communication and making sure everyone has an opportunity to put up their ideas and brainstorm.

Participant 3 captured the essence of the other participants' opinions of whiteboarding, and the feeling it evokes among team members.

> It's when you're brainstorming, and we've got someone at the whiteboard, and they're drawing out their concept and another person comes up, and they've got their marker and erases a little bit, and now they're building off of this, and the energy in the room starts to feed it. And getting that energy, that feed of energy is hard, it is a challenge in the virtual environment.

Participant 15 summarized, "I don't think any of us have found Mural to be like a whiteboard." However, the participants remain hopeful a future technology solution is possible, including Participant 15 who added, "Mural will get better and better." Table 22 contains additional participant reflections on the whiteboard.

Table 22

Whiteboard

Participant	Quote
3	The ability to hover around a whiteboard. To get in a room and work through something. I've used Mural, I've used all these other virtual whiteboard-type things and you know, you just don't get the same experience. I wish we could, I wish we could get to that point, I think it'll be more through a VR solution at some point in the future. I know there are some things out there, but they're a little more expensive. We recently held an in-person working session for another one of my projects, and because of that, because we just needed to get everybody in a room around a whiteboard. And we're gonna be doing another one of those in mid-September for the same reason. It's just that's the part that we haven't, that's the nut that we haven't cracked yet. The ability to get to stand next to someone face-to-face and draw something out on the whiteboard, it's huge. Yes, and that's why I think a virtual reality solution in the future could work for that. To where you could be in that virtual environment and be writing on the same board. That's great. That might get you somewhat there, but, um, that's a hard one to replace.
6	And then, of course, the whole virtual, I think we all are still learning, I cannot say that we have mastered it. It does present maybe, maybe the older we are the more difficult we find it, I don't know. Because we all grew up with whiteboards and whiteboarding stuff, and suddenly that was taken away from us, right. We could not whiteboard and while MITRE provided a lot of support, a lot of tools, it does take extra effort to learn the tools, and get familiar with it, and have that mastery that you need.
11	I think a whiteboard would be the thing that I missed the most. I would love to be able to draw pictures across the screen and see that happen.
14	So, when we have to be very critical about prioritization, and ways to work in parallel, or ways that we can, um, modify complicated dependencies to more efficient or effective. I find that it is easier to do with walls of whiteboard. Yeah, and even some of the tools that MITRE has to do it, or at least the one that seems to float around most these days, it's too constraining. It's just not worked, computer screens are too small, you know when you think about the physiological effects of lifting one's head up and taking in information that requires, um, peripheral vision. The monitor just holds us in. It doesn't matter whether you got four or five monitors set up in front of you. It's still this structured hardware.

But the interaction of being able to put thoughts on paper, on a monitor, through a tool, when you could just pick up a marker, and then erase it, and say, no it's this way. You know, we just don't have the pictures is worth a thousand words ability, I mean, I can't tell you how many times somebody scribbled something on their book and they're like, "see"!

15 And to me, there's nothing like that team environment and the open space with whiteboards and seeing functionality and being able to have a developer that's just looked through something and say come over and see.

We do miss the whiteboard, those of us that are, you know, kind of visually oriented, miss the picking up and collaborating with someone in real-time.

When you get everyone, in my prior role, I did a lot of design thinking, and then there was nothing better than getting your customer to take, you know, the marker and get up and kind of draw what they're looking for, as far as an experience, and so there is a lot of power in a whiteboard.

Interesting that Teams doesn't have anything that becomes a whiteboard. You could just, there will be something someday that's integrated, right. Within the virtual meeting where you can truly mimic a whiteboard that's intuitive as some other drawing tools that I've used, right. Well and also, I've seen some things about us creating our own little avatars, so we're kind of in the space you know more of a virtual reality which would be kind of fun right. So, you actually create your little avatar in here all sitting around a conference table and yes you can you know draw things interactively save that image bring up a new one just like you would be you know paper on an easel or a whiteboard, and how fun would that be? I mean part of it is you need to make meetings fun, right? And the whole little avatar thing could be a lot of fun!

18 We, I think, something that we've really struggled with is we used to do a lot of whiteboarding. The projects that I'm thinking of in particular, was or is, a data analytics project, where a lot of our conversations are around, 'OK well here's the distribution, let me draw the x and y-axis, here's the distribution of your data, or, let me write out your equation' etc. And, so, we've struggled without having that ability.

The Literature. The review of the professional and academic literature in Section 1 included business practices, the problem, concepts, theories, related studies, and anticipated and discovered themes. The relationship of the findings section covers each of these topics, except for business practices. Thus, the literature section focuses on business practices.

The literature review provided ample support for the exponential growth of virtual workers across the globe. Some authors predict virtual teams will eventually completely replace collocated teams (Mehta & Shah, 2019). In addition, the COVID-19 pandemic hastened the transition to virtual work (Brynjolfsson et al., 2020). The experience at MITRE supports this, as almost all of their employees moved to a virtual work environment during the pandemic of 2020-2021.

MITRE incorporated virtual project team members into their projects before the COVID-19 pandemic. However, research participants reflected they had not been treated as equal members. Participant 15 explained the difficulties:

> We had a couple folks that were teleworkers. And so, by design we always had to conference them in. But, I think, in talking to them they felt it was better when everyone went virtual. Because there were the impromptu conversations that would be had with the folks that were in McLean or when we were on site and then you're dialing these others in and sometimes the technology didn't work, or sometimes you know you had just an informal meeting outside of a conference room and he didn't think, “Oh well let's call this person, let's call that person” right, so they kind of missed out because the rest of us were there. But then when everyone was virtual, I think if you talked to some folks that were in a teleworking position, they would feel like they were much more connected because everyone thought to invite them to the teams meeting.

Participant 4 explains that not only is the capability for supporting virtual workers in place at MITRE, but their acceptance has improved, “I think perceptions changed … The tools were there, I just think there may have perceptions there, and then people's comfort levels changed.” Participant 9 now also believes virtual team members are fully accepted, “virtual, you know,

operating remotely was kind of frowned on. It was kinda unstated, but now it's widely accepted." Participant 3 believes the lessons project team members learned while working in the virtual environment will have a lasting impact on virtual project team members in the future. "They're equal now. Because we're all having to work this way. So, by accepting that, people are understanding the value that you can bring from a virtual vantage point." Participant 6 intends to apply the lessons learned during the pandemic, when teams operated completely remotely, in the future, "Let's continue those good practices so that we maintain their level playing field, because those members of remote are just as equal members of team as anybody else."

The review of the literature also focused on the benefits and challenges of the growth of virtual employees. The benefits sub-divided into those affecting employers, employees, and the environment. The findings of this study did not fully address the benefits to employers or the environment, but mainly focused on the advantages for employees, as captured in Theme 4: Virtual Project Teams Create Advantages. However, several employer advantages tangentially appeared in the findings. For example, Participant 7 and Participant 14 mentioned the ability to hire the most talented employees without geographical restrictions. This finding supports the review of the literature (Liao, 2017; Pullan & Prokopi, 2016). Another benefit for employers identified in the literature lied in the improvement in performance and productivity (Dulebohn & Hoch, 2017; Gajendran et al., 2015; Purvanova, 2014; Zuofa & Ochieng, 2017). The findings of this research support this. Participant 3 remarked, "I mean the productivity was really high." Participants 17 and 18 echoed this sentiment.

The review of the professional and academic literature identified work-life balance as one of the main benefits for employees (Bae et al., 2019; Mello, 2019; Omar & Asif, 2016). The literature also identified that 80% of employees cited the elimination of commuting as the main

advantage to virtual work (Global Workplace Analytics, 2020). Similarly, the findings of this study confirmed these two advantages. Specifically, the data heavily supported the flexibility and work-life balance (Table 14) and reduction in commute (Table 15). Theme 4 of the findings also included ease of video meetings (Table 16) as a third advantage to employees. The review of the literature did not identify this advantage.

The review of the literature also focused on specific challenges associated with the growth of virtual employees, sub-dividing challenges into generational differences, cultural differences, employer challenges, and employee challenges. Again, the main focus of this research regarded employee challenges. However, one participant touched on the subject of generational differences. According to the literature, younger employees, identified as 'digital natives' feel more comfortable with virtual communications, while the older generations prefer face-to-face communications (Beattie et al., 2014; Schmidt, 2014). None of the participants in this study seemed to struggle with technologies, however, Participant 18 noted that the younger generation prefers to keep their video off, while the older generations prefer it on:

> I would say that my teams that are more technical folks, and younger technical folks … But those people do not, we don't do video. I kind of, it's almost I think, transgressive in some ways to turn on your video, because then other people feel pressure to turn on their video…Whereas on meetings with my boss, who you know, is a career government executive before coming to MITRE, he always has his video on. And, so, I always turn my video on with him. And when we have group meetings that he is leading with the other department managers, and our chief engineers, everyone's camera is on.

None of the participants mentioned cultural differences, as they all worked with government officials, and mainly with employees on the east coast of the United States. Theme 5: Virtual

Project Teams Present Challenges, from the findings of this research, identified three main challenges: distractions (Table 17), setting boundaries (Table 18), and lack of face-to-face interaction with sponsors (Table 19). The literature provided support for setting boundaries, and the inclination of employees to spend more hours at work, but concluded, the benefits outweigh the risks (Messenger, 2019).

The Problem. The specific problem addressed in this research is the lack of leadership skills of some project managers in the government contracting industry to lead teams in the virtual environment, resulting in reduced project efficiency, productivity, and overall success. The literature identified the problem having a dual focus that project managers' lack the communications skills required, and the ability to build trust in the virtual environment (Liao, 2017; Olaisen & Revang, 2017; Purvanova & Kenda, 2018; Zuofa & Ochieng, 2017). This is supported by the participant experiences and the development of lessons learned in Theme 1 and Theme 2 in the presentation of findings in this research. In addition, the problem focused on previous studies that showed that the skills project managers successfully implemented in the collocated environment did not simply transfer to the virtual environment (Ford et al., 2017; Lee, 2021). According to Lee (2021), the success of firms in the future, "depends greatly upon an understanding of how traditional leadership models and theories differ from virtual leadership and how communications differ from co-located to virtual."

The findings of this research supported the problem. The lessons learned by participants in the differences between working in a face-to-face and virtual environment provided support for each of the five themes discussed in the findings. The difference is succinctly summed up by Participant 7, "I think it takes more patience. It takes more work, more planning, more energy to be successful in a virtual environment. The reward is worth it though."

Summary of the Findings

The purpose of this flexible, qualitative case study research seeks to understand the project management skills necessary to build the trust and communications on virtual project teams that lead to successful project outcomes. The research also sought to fill a gap in the current literature concerning the best practices of virtual project managers in the real world. Specifically, the researcher interviewed 17 project managers and project team members from MITRE to understand the most effective project management skills employed in the virtual environment in the government contracting industry. The researcher addressed the research questions and implemented the Interview Guide/Protocol (Appendix A) to guide the semi-structured interviews.

Following the interviews, the researcher coded and analyzed the transcriptions. Five themes emerged. Theme 1, Importance of Communication to the Success of Virtual Project Teams, further divided into three sub-themes: virtual project teams benefit from reliable and frequent communications; successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical to virtual project teams. Theme 2, Importance of Trust on the Performance of Virtual Project Teams, also further divided into three sub-themes: a video presence enhances trust on virtual project teams, trust on virtual project teams develops through performance over time, and availability and responsiveness improve trust on virtual project teams. Theme 3, The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams, focused on the impact of technology on virtual project teams, with a particular focus on video technologies. Theme 4, Virtual Project Teams Create Advantages, and Theme 5, Virtual Project Teams Present Challenges, highlight the benefits and challenges in the

experiences of research participants in the virtual project environment. These themes form the findings of this research and relate to the research problem, the purpose of the study, the research questions, the conceptual framework, anticipated themes, and the literature review from Section 1: Foundation of the Study. The presentation of the findings also included an explicit discussion on the relationships between the findings of the research and the research questions, the conceptual framework, anticipated themes, the literature, and the problem. The research findings supported these foundational elements.

The findings identified four paradoxes. The first, being physically separated from project team members created a greater sense of intimacy within the team. Theme 2 identified and described this paradox. Although project team members no longer collocated geographically, the video technologies, and the distractions of home life, surprisingly created a more personal connection than that which occurred in the office. The second paradox, the decrease in commute time generated an increase in work time, arose from the data as a benefit in Theme 4 and a challenge in Theme 5. The fact that the time they gained by eliminating their personal commute absorbed into their workday, surprised many participants. Similarly, the third paradox, the flexibility gained from an improved work-life balance caused the need for establishing boundaries between work and home also surfaced from a benefit in Theme 4 and a corresponding challenge in Theme 5. The participants reported that the lines between work and home blurred unless proactively managed. The final paradox also appeared as a benefit in Theme 4 and a challenge in Theme 5. The ease of meeting with sponsors virtually created a more formal relationship. While project team members and sponsors could meet quickly, and with less stress, the informal relationship building and performance feedback that occurred after a meeting, no

longer happened, and scheduling this informal time with the sponsors posed too difficult a challenge.

Overwhelmingly, research participants commented on the success of MITRE's transition to all virtual project teams. Improvements and lessons learned occurred with newly-virtual project team leaders and project team members and veterans alike. According to Participant 2, "I think even those teams that are long-standing have learned new lessons and new performance standards based on the last 16 months." That itself is a lesson learned.

Application to Professional Practice

This qualitative case study research sought to understand the problem that some project managers in the government contracting industry lack the skills to lead teams in the virtual environment. The findings of the research presented five themes developed through the careful analysis of the research data. This section extends these general themes into practical lessons learned that can improve general business practices and provide potential application strategies for organizations embracing virtual project teams. The application of the findings of this research to professional practice highlights the significance of this study.

Improving General Business Practice

The results of this study have a direct application to the improvement of general business practices. Specifically, the research findings can influence the successful implementation of virtual project teams. While virtual teams are not new, they have gained prominence over the last 30 years. According to Gilson et al. (2021), "The term virtual teams was first used in 1992 and, as recently as 2016, working virtually was still being referred to as a 'new paradigm shift'" (para. 5). However, the COVID-19 pandemic of 2020-2021 exaggerated the shift of acceptance and implementation to the virtual environment. Kozlowski et al. (2021) referred to the almost

immediate shift from predominantly face-to-face teamwork to virtual collaboration during the pandemic as a “metamorphic shift” (p. 1). Academicians and professionals consider the greater prominence of virtual project teams in the aftermath of the pandemic as the new normal (Gibson & Grushina, 2021).

Many project managers are unprepared to transition from leading collocated teams to leading project teams in the virtual environment. During the COVID-19 pandemic, “Individuals with little or no background or training in e-leadership, virtual project management or virtual team management suddenly found themselves in the environment of virtual work” (Lee, 2021, p. xiii). Research by Kozlowski et al. (2021) reported that 58% of virtual project team members believed their leaders, “are not appropriately prepared or trained to lead virtually” (p. 1). This case study research supported this general lack of preparation and training. Only one of the 17 research participants acknowledged receiving any formal training that explicitly addressed project management in the virtual environment.

The data gathered in this case study reflected the virtual project management lessons learned at MITRE during the COVID-19 pandemic. The findings uncovered five main themes from the research, highlighting the nuances of leading projects in the virtual environment (see Table 2). Adoption and application of the practical lessons learned, as described in the next section and highlighted in Table 23, can improve the implementation of virtual project teams in the current business environment. Newman and Ford (2021) agreed that to increase the likelihood of success, leaders must first understand the differences between traditional and virtual team leadership and then take proactive action to learn and adapt lessons learned from existing virtual project teams.

The continued increase in virtual working arrangements and the ubiquity of virtual project teams have placed a burden on businesses around the world to improve their virtual leadership. Their ability to train and employ highly qualified project managers may impact their overall competitiveness and capacity to execute corporate strategy. Dinh et al. (2021) stressed that engaging leaders who understand the unique functioning of virtual project teams, including the importance of building trust and communication, enhance the "group's ability to perform tasks effectively" (p. 1). Fortunately, the lessons learned from the results of this study, in conjunction with the current body of knowledge, can improve a corporation's ability to develop better virtual leaders. This leadership is essential because, quite simply, "Without good leadership, virtual teams are very likely to fail" (Kozlowski et al., 2021, p. 1).

Potential Application Strategies

The findings of this research study describe several lessons learned from virtual project teams at MITRE. These lessons have potential applications in many organizations within and without the government contracting industry. Existing virtual project managers can leverage these lessons to improve their virtual leadership skills, and traditional project managers can use them to prepare to lead in the virtual environment. These lessons may also contribute to the development of project management training programs as they expand to include virtual project leadership elements. The main lessons represent the practical application of the themes of this study. These nine lessons and the supporting themes from the findings are shown in Table 23 and described below.

Table 23

Lessons Learned

Number	Lesson Learned	Supporting Theme (Theme Number from Table 2)
1	Set a cadence for your team with predictable, regularly scheduled communications.	Virtual Project Teams Benefit from Reliable and Frequent Communications (1a)
2	Schedule one-on-one time with team members to discuss personal matters in addition to work-related issues.	Successful Project Managers Intentionally and Purposefully Schedule Time for Personal Interactions in a Virtual Environment (1b)
3	Celebrate your team through innovative meetings.	Successful Project Managers Intentionally and Purposefully Schedule Time for Personal Interactions in a Virtual Environment (1b)
4	Establish and communicate clear roles and responsibilities to reduce uncertainty.	Defining Clear Roles and Responsibilities is Critical to Virtual Project Teams (1c)
5	Turn your camera on!	A Video Presence Enhances Trust on Virtual Project Teams (2a)
6	Focus on results.	Trust on Virtual Project Teams Develops Through Performance Over Time (2b)
7	Technology is Essential!	The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams (3)
8	Be mindful of the image you project on camera.	The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams (3)
9	Place bookends on your day to create healthy boundaries and improve work-life balance.	Virtual Project Teams Create Advantages (4), and Virtual Project Teams Present Challenges (5)

The first four lessons learned from this case study research problem support Theme 1: Importance of Communication to the Success of Virtual Project Teams. The first lesson, 'Set a cadence for your team with predictable, regularly scheduled communications,' specifically supports Theme 1a: Virtual Project Teams Benefit from Reliable and Frequent Communications. The participants in this study stressed the need for frequent and reliable meetings to provide a drumbeat for the team, keeping them in sync and supporting team cohesion. Participants also stressed this rhythm was more important in the virtual environment when, in the words of Participant 7, "you're missing the in-person element."

The second lesson learned, 'Schedule one-on-one time with team members to discuss personal matters in addition to work-related issues,' and lesson 3, 'Celebrate your team through innovative meetings,' support Theme 1b: Successful Project Managers Intentionally and Purposefully Schedule Time for Personal Interactions in a Virtual Environment. Both of these lessons are supported in recent literature. Reyes et al. (2021) identified the tendency for some employees to feel disconnected from their team and their organization when working in a virtual environment as a major challenge. To combat this sense of isolation the authors suggest managers, "Continue to have one-on-one calls that are not just related to tasks," and "Create, engage, and encourage fun, non-work related virtual events (e.g., virtual happy hour) to uplift those who are feeling isolated" (Reyes et al., 2021, p. 2). Research by Gibson and Grushina (2021) also suggested maintaining and celebrating personal relationships among virtual project team members to maintain vitality within the team and can, "keep members motivated to support team goals through regular engaged participation" (p. 11). Maynard and Gilson (2021) studied 400 individuals across 68 global virtual project teams and add support to the importance of personal connections within a virtual project team.

> Our research finds that relationships also play a very important business role – they help teams be more successful and remain more likely to want to work together in the future. In order to be successful, virtual team members need to freely share, exchange and integrate information. This sharing and integrating is inherently a social phenomenon that is enhanced when team members have a stronger relationship with one another built upon familiarity. (p. 5)

While the authors stress the current body of knowledge may not support this building personal relationship building among all types of teams, their study, and the findings of this research, indicate the value of creating personal familiarity in virtual project teams.

The fourth lesson learned, 'Establish and communicate clear roles and responsibilities to reduce uncertainty,' gained support from Theme 1c: Defining Clear Roles and Responsibilities is Critical to Virtual Project Teams. While project managers historically focus on clarity around roles and responsibilities, according to Participant 9 in the virtual environment, "it takes on even more importance." Gibson and Grushina (2021) agreed that virtual team leaders need to communicate a clear, formalized structure to reduce ambiguity and maximize team effectiveness.

The fifth lesson learned, 'Turn your camera on!' found support from the findings leading to the development of Theme 2a: A Video Presence Enhances Trust on Virtual Project Teams. Overwhelmingly, the research participants supported the importance of keeping a visual connection with team members to build trust. According to Participant 15, "Turning on your camera builds trust. Because it's in many ways letting someone inside your personal space." This idea is supported by recent literature. Grözinger et al. (2020) found real-time video mitigated many of the challenges of virtual project teams. In addition, the findings included a paradox that the physical distance between virtual project team members created a greater sense of intimacy.

Maynard and Gilson (2021) also supported this surprising result, “This idea that working virtually is allowing us to become more familiar with our teammates runs counter to what much of the early virtual teams' research suggested” (para. 3).

The sixth lesson learned, ‘Focus on results,’ found support in Theme 2b: Trust on Virtual Project Teams Develops Through Performance Over Time. In the absence of daily face-to-face interactions with team members, virtual project managers rely on performance to establish trust. According to Dinh et al. (2021), “Trust typically develops over time, through repeated positive interactions. Minor interactions, facilitated by physical proximity, can often accelerate this process” (p. 2). This perspective aligns with the study participants. Participant 16 offered that in the virtual environment, “we’re meeting milestones like we’re supposed to, and we’re kind of moving along together, that to me helps to feel like I can trust other people very well.” Feitosa and Salas (2021) found that in the virtual environment, managers focused on results rather than other considerations, such as hours worked. This was especially true during the COVID-19 pandemic when project leaders focused on remaining flexible and compassionate while supporting team members.

The seventh lesson learned, ‘Technology is Essential!’ and the eighth lesson, ‘Be mindful of the image you project on camera,’ were supported by Theme 3: The Effective Implementation of Technology is Foundational to the Success of Virtual Project Teams. Almost every participant addressed the importance of technology for the success of virtual project teams. Participant 15 very succinctly stated, “The technology is key.” Newman and Ford (2021) affirmed the importance of technology, “Technology hardware, software, applications, and tech support need to work properly if the organization expects employees to be efficient and effective” (p. 4). According to Maynard and Gilson (2021):

> With improvements in technology, the physical face-to-face meeting has become less important. Technology now allows team members to feel like they are in a face-to-face meeting and … become really connected. In fact, technology often goes a step deeper in allowing team members to get a closer look into each other's lives, work habits, and areas of expertise. (para. 4)

The improvements in video technology also bring challenges. Participant 7 noted, "With video, there are other factors. Such as, what's in your background, in the picture, making sure you project the right image, that you're dressed even though you're at home, and do I wear a tie?" Javidan and Zaheer (2021) also supported the universal importance of a professional first impression on building trust. Thus, virtual project managers and project team members must learn to project a professional and personable image. Participant 10 offered, "One thing I did learn very quickly, was just to be camera-ready." Participant 12 learned to suggest her project team members incorporate blurred backgrounds during video meetings with sponsors to eliminate the possibility that the sponsor is, "looking at their dirty clothes on their bed." In another learning experience, Participant 4 discovered project teams members believed he projected an angry face when focusing on the camera.

The ninth lesson learned, 'Place bookends on your day to create healthy boundaries and improve work-life balance' found support in Theme 4: Virtual Project Teams Create Advantages, and Theme 5: Virtual Project Teams Present Challenges. As identified in the findings, employees enjoy many advantages working in the virtual environment, including the elimination of commute, work flexibility, and improvements in work-life balance. However, project team members must create boundaries between their work life and their home life to reduce the temptation to overwork and potential burnout. According to Participant 3, "the ability

to remove the commute on both ends of the day created a lot of time. But it also has that downside of burnout. So, you really have to be disciplined about cut-off times." Research by Golden (2021) supported this finding that without proper boundaries, virtual workers face additional work-family conflict:

> With work-related materials within easy reach and sight, employees are likely to be easily reminded of their work responsibilities and feel pulled to carry out these activities rather than pursuing personal or family needs and desires. At the same time, employees are also likely to be reminded of home activities and responsibilities when they are working within the home… With the traditional geographic separation between work and home absent, and no commute to or from the office, traditional mental boundaries become blurred and less distinct. (p. 2)

Many participants offered examples of methods to reduce this conflict. Participant 15 created bookends around their day by going to the gym, going for a run, or taking a bike ride, "I had my points where I turned my day on, and I turned my day off." Participant 6 replaced commute time with a 10-minute walk at the beginning and end of the workday. Thus, creating boundaries, or bookends, around the workday allows virtual project team members to enjoy the advantages of working in the virtual environment and mitigating the challenges.

Summary of Application to Professional Practice

This section outlined the significance of this qualitative case study research by examining its application to improve general business practices and providing potential application strategies. The findings of this research described five main themes that arose from interviews with virtual project managers and project team members at MITRE. These themes have the potential to influence businesses across the globe as they continue to shift towards virtual project

teams. Thus, to improve the effectiveness and success of virtual project teams, the findings of this research contributed to nine practical application strategies that corporations may adopt to improve their virtual project management capabilities.

Recommendations for Further Study

The researcher conducted this qualitative case study research between August 10, 2021, and September 13, 2021, during the global COVID-19 pandemic. On a positive note, the pandemic expanded the opportunities to study employees who experienced working in the virtual environment and participated in virtual project teams. While this created an ideal circumstance to capture the experiences of project team managers and project team members as they transitioned from traditional to virtual environments, it also created a unique circumstance. For example, almost all MITRE employees worked from home during the COVID-19 pandemic. This artificially created project teams that operated completely in the virtual environment. Many experts believe a hybrid project team, where some employees work in the traditional office space and others work in a virtual office space, may become more prominent in the post-COVID climate. Thus, conducting this project in a post-COVID environment, with a hybrid project team model, might provide new insights. Similarly, the research participants at MITRE all worked with sponsors who also transitioned to the virtual environment during the COVID-19 pandemic. According to research participants, the sponsors exhibited extreme empathy as they learned and adopted new technologies and established new work routines alongside MITRE employees. Repeating this study a few years post-pandemic might capture new challenges identified when working with corporate sponsors who may or may not return to the traditional work environment.

The researcher's interview with Participant 18 identified another opportunity for additional study. The research participant spoke to the potential generational differences surrounding the incorporation of video technology for project team meetings and other interpersonal communications. Concerning the younger generation, Participant 18 emphasized, "those people do not, we don't do video." However, Participant 18 acknowledged the importance of using the video component of communication with older generations. "I always turn my video on with [my boss]. And when we have group meetings that [my boss] is leading with the other department managers, and our chief engineers, everyone's camera is on." Thus, repeating this study with the modification of comparing the responses of participants by generation might yield lessons that could enhance virtual project manager training.

Finally, this research might benefit from a quantitative follow-up study. Sending a survey addressing the identified themes to a large representative sample of project managers in the government contracting industry through industry associations could provide valuable insight. A survey could directly identify the project management skills that most greatly influence the success of virtual projects. A quantitative study could establish causation between project management skills and project success and create a greater opportunity to generalize the findings to the larger population (House, 2018). In addition, a well-designed study could aid researchers in replicating the study as they explore industries outside of government contracting.

Reflections

Conducting this research project provided the researcher with many opportunities for personal, professional, and spiritual growth. Personally, the researcher practiced perseverance and demonstrated resiliency. Professionally, the researcher learned to use new software products including Microsoft Teams, Outlook, and NVivo and practiced the art of interviewing

participants. Spiritually, working through the dissertation process at Liberty University allowed the researcher to grow in faith, placing trust in God's plan and accepting grace from professors and family in the face of hardships. Upon reflection of the entire doctoral process, the researcher has shown tremendous growth, personally, professionally, and perhaps most importantly, spiritually.

Personal and Professional Growth

The researcher experienced personal growth while conducting the research process. The research process is daunting, but the researcher learned to focus on one step at a time to avoid feeling overwhelmed. Identifying research participants, emailing potential subjects for interest, sending follow-up emails to ascertain commitment, scheduling interviews, and obtaining consent required diligence, persistence, and patience. The researcher initially hoped to identify subjects, and schedule and perform interviews within two weeks, but quickly learned the schedule of the research participants took precedence. Each participant graciously offered their time and shared their experiences, and the researcher appreciated each minute and every story. The researcher also learned that completing each element of the dissertation quickly was not the ultimate goal, but listening to advisors, and incorporating their feedback created a clearer, more complete product. The researcher also learned to ask for help. Frustrations quickly turned to moments of clarity when advisors offered their input and sparked intellectual curiosity. In addition, through this iterative process, the researcher's writing ability and analytical thinking capability drastically improved. The researcher could not have completed the research project alone.

The researcher gained new insights and updated and expanded existing professional competencies. The researcher completed a Master's in Business Administration (MBA) and completed the Project Management Professional (PMP) certification in 1992. The researcher also

worked as a practicing project manager for ten years. However, the researcher had not worked professionally in the business community for approximately 20 years. Although familiar with Microsoft products, the researcher had to refresh previous skills and learn the nuances of newer versions of Microsoft Word, Excel, and PowerPoint. In addition, the researcher had to gain proficiency in new software such as Microsoft Teams and Outlook to schedule and perform participant interviews, and NVivo to aid in data analysis. Also, the researcher viewed the current climate of project management from the vantage point of the research participants and learned to view the field as an academician, rather than a practitioner. Finally, the researcher had limited experience conducting interviews. However, the researcher reviewed writings from experts in the field and improved with each interview, learning to feel more comfortable in the academician role. The researcher learned the flexibility to adapt to each participant's perspective, focused on listening more than speaking, and allowed the subject to pause in silence and reflect. These skills may help the researcher in future endeavors.

Biblical Perspective

Improving virtual project management skills provides the opportunity for project managers to better serve their companies and the team members they support. The culmination of this research project resulted in five main themes. Each of these themes relates to and supports a biblical worldview.

The first identified theme is the 'importance of communication to the success of virtual project teams.' God's word contains many instructions for effective communication. In the Old Testament, we are instructed, "The hearts of the wise make their mouths prudent, and their lips promote instruction" (New International Version, 2011, Proverbs 16:23). In the New Testament, James reminds us, "My dear brothers and sisters, take note of this: Everyone should be quick to

listen, slow to speak and slow to become angry" (New International Version, 2011, James 1:19). Paul offers similar advice, "Be wise in the way you act toward outsiders; make the most of every opportunity. Let your conversation be always full of grace, seasoned with salt, so that you may know how to answer everyone" (New International Version, 2011, Colossians 4:5-6). What we say and how we say it affects our relationships. Communication also affects our ability to work as a team. In the Old Testament, when God confused the communication between those building the tower of Babel, "they stopped building the city" (New International Version, 2011, Genesis 11:8). Poor communication stifles productivity, likewise, good communication fosters successful teamwork. However, communication faces additional challenges and requires greater emphasis in the virtual environment.

The second theme that emerged from this research is the 'importance of trust on the performance of virtual project teams.' One of the lessons the Bible teaches us is to place our complete trust in God. Proverbs 3:5-6 (King James Bible, 1769/2017) says, "Trust in the Lord with all thine heart and lean not unto thine own understanding. In all thy ways acknowledge him, and he shall direct thy paths." However, the Bible also warns us to temper our trust among men. Jesus warned his disciples, "I am sending you out like sheep among wolves. Therefore, be as shrewd as snakes and as innocent as doves" (New International Version, 2011, Matthew 10:16). Thus, we must exhibit discernment while we work to earn trust and extend trust to our colleagues. However, this trust builds strong teams and is biblically supported. In Romans 12:4-5, Paul encourages Christians to work together to serve God. "For just as each of us has one body with many members, and these members do not all have the same function, so in Christ, we, though many, form one body, and each member belongs to all the others" (New International Version, 2011). When Christians bring their God-given talents together, they can accomplish

more than they could alone. “As iron sharpens iron, so one person sharpens another” (New International Version, 2011, Proverbs 27:17). The importance of trust in teams is critical, including virtual project teams.

The third theme that arose from this study was ‘the effective implementation of technology is foundational to the success of virtual project teams.’ While technology constantly changes, implementing the creations of the image-bearers of God is supported by a biblical worldview. In the Old Testament, God bestowed upon the Israelites the talents to create and use technology for His purposes. For example, in Exodus 31:1-5 (New International Version, 2011) when providing instructions to Moses for building the tent of meeting and the ark of the covenant, God describes how he prepared the workers for the task.

> The Lord said to Moses, ‘See, I have chosen Bezalel the son of Uri, son of Hur, of the tribe of Judah, and I have filled him with the Spirit of God, with wisdom, with understanding, with knowledge and all kinds of skills -- to make artistic designs for work in gold, silver, and bronze, to cut and set stones for setting, to work in wood, and to engage in all kinds of crafts.’

When building the tabernacle, God also encouraged the Israelites to use their intelligence, knowledge, and craftsmanship. In another example, when Uzziah reigned in Judah, God gave him strength, ordaining his use of technology.

> And he made in Jerusalem engines, invented by cunning men, to be on the towers and upon the bulwarks, to shoot arrows and great stones withal. And his name spread far abroad, for he was marvelously helped, till he was strong. (King James Bible, 1769/20172, Chronicles 26:15)

Other instances of the use of technology to build God's kingdom include King Solomon building the temple and Noah building the ark. Jesus himself was a carpenter before entering into his ministry on earth. However, technology can support sin against God. One example includes the Israelites building the golden calf while waiting for Moses to return from Mount Sinai, as described in Exodus 32. Another example is the building of the tower of Babel. "Come, let us build ourselves a city, with a tower that reaches to the heavens, so that we may make a name for ourselves" (New International Version, 2011, Genesis 11:4). These examples highlight the importance of using our talents and new technologies for the glorification of God and the benefit of his creation. In this study, for example, participants emphasized the use of video technology. This technology increased the intimacy and the trust experienced among project team members. Technology is not inherently good or evil, but we must ensure we use it to improve God's kingdom. We must recall Paul's admonition in 1 Corinthians 10:31 (New International Version, 2011), "So, whether you eat or drink, or whatever you do, do all to the glory of God."

The fourth theme acknowledged "virtual project teams create advantages.' Especially important for employees was the improvement of their work-life balance. God intended for us to work. The first verse in the Bible, Genesis 1:1, shows God at work, "In the beginning, God created the heavens and the earth" (New International Version, 2011). Then, in Genesis 2:15 God placed Adam in the garden to work, "The Lord God took the man and put him in the Garden of Eden to work it and take care of it" (New International Version, 2011). While emphasizing the importance of work, God also stressed the importance of rest.

> By the seventh day God had finished the work he had been doing; so, on the seventh day, he rested from all his work. Then God blessed the seventh day and made it holy because

> on it he rested from all the work of creating that he had done. (New International Version, 2011, Genesis 2:2-3)

From these examples, we can see God designed us for both work and rest. In this research, participants explained how working in the virtual environment improved their ability to balance their home and their work responsibilities, which is supported by a Christian worldview.

The final theme that emerged from this research was 'virtual project team's present challenges.' Perhaps one of the most significant challenges identified in the research involved the need for employees to set boundaries. When participants re-located their offices to their homes, they struggled against the temptation to overwork. From a biblical perspective, we must remain wary not to let anything in our lives become an idol. An idol is anything, even good things like work that we elevate over the centrality of God in our lives (Keller & Alsdorf, 2012). Thus, while work provides purpose and direction in our lives, we must ensure God remains our foundation.

The researcher's greatest hope is that this research study further enables project managers to better serve God through loving and supporting their team members as they navigate the transition to virtual project teams. The themes that emerged from interviews with research participants are supported biblically and resonate with a Christian worldview. Thus, while improving project team outcomes improves the success of organizations holding a secular viewpoint, it also enhances the lives of God's children on earth.

Summary of Reflections

Ultimately, conducting this qualitative case study research was extremely rewarding. Completing a terminal degree was a lifelong goal for this researcher. However, the road to meet that objective gave the researcher more opportunities for personal, professional, and spiritual

growth than anticipated. Personally, the researcher learned to focus on one step of the process at a time, practice patience, and learn to rely on others. Professionally, the researcher learned new skills, such as interviewing, worked with new technologies, including videoconferencing, and improved writing and software skills. The researcher's biblical worldview supported each of the five main themes developed in this research. Communication, trust, the implementation of new technology, the need for work-life balance, and not making work an idol are supported through this research and are sound biblical philosophies. Most importantly, the research process, and the support of Liberty University, allowed the researcher to follow God's plan, grow in faith, and accept the love and grace of Jesus Christ.

Summary of Section 3

Section 3: Application to Professional Practice concludes this qualitative case study research. Supported by the foundation outlined in Section 1, and the methodology presented in Section 2, Section 3 described the case study research conducted, its findings, and its application to professional practice. The 17 participants of this research described their experiences leading virtual project teams at the MITRE Corporation through semi-structured interviews. These interviews focused on the project management skills the participants found necessary to build the trust and communication necessary to lead successful project teams. After careful data collection, coding, and analysis, five major themes (and six sub-themes) emerged: the importance of communication to the success of virtual project teams (sub-themes: virtual project teams benefit from reliable and frequent communications, successful project managers intentionally and purposefully schedule time for personal interactions in a virtual environment, and defining clear roles and responsibilities is critical to virtual project teams), the importance of trust on the performance of virtual project teams (sub-themes: a video presence enhances trust on virtual

project teams, trust on virtual project teams develops through performance over time, and availability and responsiveness improves trust on virtual project teams), the effective implementation of technology is foundational to the success of virtual project teams, virtual project teams create advantages, and virtual project teams present challenges. These themes directly relate to the foundational elements of this study, including the research questions, the conceptual framework, the anticipated themes, the literature, and the problem statement.

Section 3 also included a discussion on the application of the study's themes to professional practice. The researcher highlighted nine lessons learned through analysis of the themes, illustrating the study's practical application to professional practice. These lessons include: set a cadence for your team with predictable, regularly scheduled communications; schedule one-on-one time with team members to discuss personal matters in addition to work-related issues; celebrate your team through innovative meetings; establish and communicate clear roles and responsibilities to reduce uncertainty; turn your camera on; focus on results; technology is essential; be mindful of the image you project on camera; and place bookends on your day to create healthy boundaries and improve work-life balance. In addition, Section 3 outlined recommendations for further study, provided reflections of the researcher concerning both personal and professional growth, and a discussion integrating the biblical worldview of the researcher to the study results. Each theme gained support from a Christian worldview and biblical examples. The researcher hopes that the conclusions of this qualitative case study research improve the lives of project managers and benefit businesses as they face the challenges associated with the transition to virtual teamwork, especially the hastened transition following the COVID-19 global pandemic.

Summary and Study Conclusions

Section 1, Foundation of the Study, identified the problem for this research study. Specifically, project managers in the government contracting industry often lack the skills required to successfully lead virtual project teams. The purpose of this research was to both discover the skills that uniquely qualify project managers to successfully transition to the virtual environment and fill a gap in the current literature through a real-life case study. A conceptual framework for this research project presented two leadership theories (path-goal and transformational leadership) and guiding project management concepts (skills and expertise, and definition of project success) that influence a virtual project manager. In addition, how a project manager addresses the virtual team challenges identified in the current body of knowledge (developing trust and open communications) impacts project team members and ultimate project success. Finally, a thorough review of the existing literature completed the foundation for this research.

Section 2, The Project, specifically delineated the manner in which the researcher conducted this research study. Specifically, the researcher conducted a flexible, case study analysis of virtual project teams at The MITRE Corporation. An interview guide provided the protocol for semi-structured, individual interviews. The researcher began scheduling interviews with research participants following approval of the research proposal by the School of Business and the IRB. The researcher conducted 17 interviews and confirmed data saturation. The NVivo software both supported data analysis and assisted the researcher in identifying common themes from the interview transcripts. The researcher upheld the Christian values of Liberty University in all interactions with employees at The MITRE Corporation.

Section 3, Application to Professional Practice, outlined the research findings and their implication to business and the field of project management. The findings of this research examined the defined problem statement, addressed the research questions, and fulfilled the purpose as set out in Section 1. The researcher interviewed 17 participants from the MITRE Corporation to represent the government contracting industry. The nine practical lessons learned, adapted from the five identified themes represented in the findings, can impact future project managers as they learn to successfully transition to the virtual environment. This transition is prevalent in the current business environment and was hastened during the COVID-19 pandemic. The conclusions presented in this qualitative case study research fill a gap in the current body of knowledge and may improve the practice of virtual project management and the likelihood of virtual project team success in the government contracting industry and beyond.

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Appendix A: Interview Guide/Protocol

Project Management Skills for Highly Successful Virtual Project Teams

Section 1:

Date:

Location and mode of Interview: (in-person, videoconference, or telephone)

Name: (Name used for follow-up opportunities only, and omitted from write-ups)

Participant #: (used for reference in narrative descriptions and quotes)

Team position: (project manager or project team member)

Consent form signed: y/n

Introduction:

Thank you so much for speaking with me today. As a reminder, my name is Andrea Hogge, and I am pursuing a doctoral degree in Business Administration with a concentration in Project Management at Liberty University. This research project seeks to understand the project management skills that are effectively employed on virtual project teams in the government contracting industry.

You were selected to participate in this study because you are either a project manager or a project team member on a successful virtual project team. Your participation is completely voluntary, and you may choose not to respond to any question that makes you uncomfortable or end this interview at any time. I am recording this interview to ensure I capture your responses accurately and completely. I will keep the audio files and transcribed interview on a password protected computer to ensure your confidentiality and destroy all files three years from the completion of this dissertation. In the future, I will refer to this interview with your participant number, not your name.

I both appreciate and respect your time and will keep this interview to 30 minutes.

Section 2:

Questions:

1. How long have you worked at MITRE? **[ice breaker]**

a. In what capacities?

2. Have you worked on both traditional, face-to-face project teams in addition to virtual project teams? **[background]**

a. Which did you prefer?

b. Why?

3. Did you feel a sense of trust on your virtual team? **[RQ3, RQ3a, RQ2, RQ2a]**

a. What positively influenced your ability to trust your project manager? Your team members?

b. What negatively influenced your ability to trust your project manager? Your team members?

c. How could your project manager improve trust on this virtual team?

d. How is this different than your experience on collocated teams?

4. How effective was the communication on your virtual team? **[RQ3, RQ3b, RQ2, RQ2a]**

a. What positively influenced communication?

b. What negatively influenced communication?

c. How could your project manager improve communication on this team?

d. How is this different than your experience on collocated teams?

5. Did you have any face-to-face interactions with your team? **[RQ3, RQ3a, RQ3b]**

a. How did this affect your relationships?

b. How did this affect your ability to work together?

c. Do you think more face-to-face interaction would affect trust and communication?

d. If you had a previous face-to-face relationship with some team members, did this affect your virtual team experience?

6. Do you consider this project a success? **[RQ3c]**

a. Did the virtual nature of the project team influence the success?

7. What were the greatest challenges you faced on the virtual project team? **[RQ3]**

a. How did your project manager address these?

8. What were the greatest advantages to working on a virtual project team? **[RQ3]**

a. How did your project manager support these?

9. If you were the project manager, how did you prepare to lead in the virtual environment? **[RQ1, RQ2]**

a. Did you receive any special training?

b. Would you like additional training?

c. What are your strengths leading collocated project teams? Weaknesses?

d. What areas do you think challenge you the most in leading collocated project teams? Virtual teams?

10. Is there anything else you would like to add about successful project management in the virtual environment? **[wrap-up/closing question]**

Section 3:

Closing:

Again, thank you for participating in this interview and sharing your invaluable insights. Your responses will remain confidential and will allow me to better understand the project management skills that are successful in leading project teams in the virtual environment. If you

have any questions about this project, or if you would like to provide additional information, please feel free to reach out to me. Also, would you be available for follow-up questions? Would you be interested in viewing my analysis before I submit my findings?

Appendix B: Participant Consent Form

Consent

Title of the Project: Project Management Skills for Highly Successful Virtual Project Teams
Principal Investigator: Andrea Hogge, graduate student, Liberty University School of Business

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be a project manager or a project team member of a virtual project team at the MITRE Corporation. Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of the study is to understand the project management skills that are successful in leading project teams in the virtual environment. This study will add to the current body of knowledge and provide lessons learned that can help project managers of virtual project teams.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. Participate in a 30-minute semi-structured interview concerning your experience as a project manager or a project team member on a virtual project team at the MITRE Corporation. The researcher, Andrea Hogge, will make an audio recording of this interview to create a written transcript for data analysis. The researcher will send you an invitation to the interview, and schedule an in-person, video, or telephone call at your discretion and convenience. The researcher has received both of her COVID-19 vaccines.
2. Review the research results and provide feedback to the researcher (optional).

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include adding to the current body of knowledge concerning the project management skills that are effective in the virtual team environment. Information gathered from this research may lead to improved training, skill development, and recruitment for project managers leading virtual project teams.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Published reports will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only

the researcher will have access to the records. Data collected from you may be shared for use in future research studies or with other researchers. If data collected from you is shared, any information that could identify you, if applicable, will be removed before the data are shared.

- Participant responses will be kept confidential through the use of pseudonyms. Interviews will be conducted in a location where others will not easily overhear the conversation.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.
- Interviews will be recorded and transcribed. Recordings will be stored on a password locked computer for three years and then erased. Only the researcher will have access to these recordings.

How will you be compensated for being part of the study?

Participants will not be compensated for participating in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University or the MITRE Corporation. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Andrea Hogge. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at XXX-XXX-XXXX or XXXXXX@liberty.edu. You may also contact the researcher's faculty sponsor, Dr. Mathis at XXXXXX@liberty.edu.

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

Before agreeing to be part of the research, please be sure that you understand what the study is about. You can print a copy of the document for your records. If you have any questions about the study later, you can contact the researcher using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

☐ The researcher has my permission to audio-record me as part of my participation in this study.

_____

Printed Subject Name

_____

Signature & Date