DISSERTATION

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN PROJECT MANAGERS' AMBIGUITY TOLERANCE AND PREFERRED PROJECT DIMENSIONS IN HEALTHCARE: A QUANTITATIVE EXPLORATORY STUDY

Submitted by

Joanne Michelle Sullivan

School of Education

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Doctoral Committee:

Advisor: James E. Folkestad

Gene W. Gloeckner
William M. Timpson
Scott A. Glick

ABSTRACT

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN PROJECT MANAGERS' AMBIGUITY TOLERANCE AND PREFERRED PROJECT DIMENSIONS IN HEALTHCARE: A QUANTITATIVE EXPLORATORY STUDY

With the advent of healthcare legislation beginning in 1996, information technology projects associated with the implementation of these regulatory projects were found to have ambiguous requirements, novel organizational relationships, and complex technology, requiring completion within stringent deadlines. Ambiguity tolerance is an emotional and perceptual personality variable (Frenkel-Brunswik, 1948) that reacts differently based on the situation including novel, complex, insoluble stimuli (Budner, 1962) and individuals may be attracted to or have an aversion of these stimuli (McLain, 1993). Healthcare project manager personality characteristics can be a critical success factor in the implementation of information technology projects. Performance resulting from ambiguity tolerance levels and preferred project dimensions, could contribute to the success or non-success of a project.

Based on project manager to project (PM-P) fit theory (Malach-Pins et al., 2009), the purpose of this investigation was to test for a relationship between healthcare project managers' ambiguity tolerance (AT) levels and preferred project dimensions based on novelty, technology, and complexity (NTC). It was hypothesized that high AT would correlate to high levels of preferred project dimensions (NTC) and low AT would correlate to low levels of preferred project dimensions (NTC) and the results supported this hypothesis. Other variables tested, (such as years of experience and education level) along with others were not found to be predictor or moderator variables for AT or NTC.

A quantitative, self-report measure was created using several demographic questions, McLain's (2009) MSTAT-II ambiguity tolerance measure, and Shenhar and Dvir's (2007) NTCP diamond framework model for preferred project dimensions. This study further extends project manager to project (PM-P) fit theory when a strong positive correlation was found, and possibly for the first time uses Shenhar and Dvir's (2007) NTCP (novelty, technology, complexity, and pace) diamond framework model as a quantitative measure. To increase the reliability coefficient for this measure to .78, the dimension of "pace" was withdrawn. A strong positive correlation with a large effect size (Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C., 2007, p. 94), was found for AT and NTC, r (22) = .49; p = .02 when p was found to be less than .05.

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DEDICATION

I dedicate this work to my family and friends whose encouragement was constant throughout my journey. First and foremost is my husband Jim who never let me give up on my dream to complete this advanced degree. Jim's kind words of encouragement occurred almost on a daily, weekly, and monthly schedule – exactly what I needed to hear when I needed to hear them. Thank you sweetie, without your continued support, I could not have finished.

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CHAPTER ONE: INTRODUCTION

In 2009, the federal government signed into law legislation requiring healthcare organizations share electronic patient information in an attempt to enhance patient outcomes and change Medicare (federal) and Medicaid (state) reimbursement strategies (Escobedo, Kirtane, & Berman, 2012; Glaser, 2010; Jones, 2013). The healthcare legislation required innovative technology, complex functionality, and novel organizational relationships between both public and private healthcare corporations with deadlines for implementation (Gold & McLaughlin, 2016, p. 655).

Healthcare organizations employed project managers and used project management methodologies to implement this legislation (Abdelhak, Grostick, & Hanken, 2014; Duus, 2016). Abdelhak et al., (2014) stated in their book that the project manager is the most important element of project management. Abdelhak et al., found that selecting the most qualified project manager can be the key to the project's success or failure because the project manager is accountable for the project and dedicated to achieving its goals (p. 690).

Chapter one examines what the research problem is, the questions this research attempted to answer, and the significance of the study. Also included in this chapter are definitions of terms, assumptions, limitations, and delimitations. Additionally, the researcher's perspective is included to provide additional context for the study.

Background

Beginning in 1996, the Health Insurance Portability Privacy Act (HIPAA) providing for the security of patient records was signed into law (Health Insurance Portability and Accountability Act of 1996, 1996) and commenced the overhaul of healthcare information technology (IT) as we know it today. Then in 2009, the Healthcare Information Technology for

Economic and Clinical Health Act (HITECH) was signed into law as part of the American Recovery and Reinvestment Act (ARRA). The HITECH portion of the ARRA law provided more than 27 billion dollars in reimbursement for the early implementation and adoption of electronic health records (EHR) by healthcare organizations and providers (American Recovery and Reinvestment Act of 2009, 2009; Health Insurance Portability and Accountability Act of 1996, 1996).

A year later, the Patient Protection and Affordable Care Act (PPACA) legislation mandated the certification and meaningful use of EHRs (Blumenthal, 2009) as well as other new EHR functionality (Patient Protection and Affordable Care Act of 2010, 2010). Furthermore, this legislation contained financial penalties, such as reductions in reimbursement from Medicare and Medicaid, until EHR certifications and additional EHR functionality was implemented (Glaser, 2010, p.19; Patient Protection and Affordable Care Act of 2010, 2010).

Both HITECH and PPACA functionality presented many organizational and technical challenges. In addition to the implementation and certification of EHRs, electronic prescribing (e-prescribing) between medical providers and commercial pharmacies was also required. In a report to congressional committees, Kohn (2013) recommended that the Centers for Medicare and Medicaid Services (CMS) take a look at contradictions between e-prescribing and EHR programs and the use of technology to implement these functions as required by the PPACA legislation.

PPACA also required several other technical features such as telehealth for the exchange of medical information via the telephone for remote locations. Portal applications were needed for patients and providers to access medical information via the Internet. Furthermore, physician quality reporting initiative (PQRI) included regular reporting on patient outcomes to the federal

government via electronic transmission (Patient Protection and Affordable Care Act of 2010, 2010).

As part of the legislation, novel business relationships were introduced and healthcare providers were encouraged to create accountable care organizations (ACOs) and clinically integrated networks (CINs) through contracts to support specific populations (Glaser, 2010). Affected organizations included group practices, networks of individual physician practices, partnerships, joint ventures, and hospitals participating as ACOs and CINs (Patient Protection and Affordable Care Act of 2010, 2010). Organizational changes to meet this legislation resulted in mergers, acquisitions, and affiliations (Halamka, 2013) which paralleled the technical features implementation resulting in increased project complexity.

The PPACA legislation assumed that public and private computer systems could be effortlessly integrated. This legislation required extensive connectivity and data harmony information technology (IT) projects necessitating highly skilled project managers to lead project implementation efforts. However, standards for interoperability and connectivity between IT systems were not provided in the legislation, and thus, are still an on-going challenge between various healthcare providers and medical vendors (Bordenick, Okubo, Kontur, & Siddiqui, 2015; Detmer, 2010; Gold & McLaughlin, 2016; Thorpe, Gray, & Cartwright-Smith, 2016).

The success of these projects has been imperative for the survival of healthcare organizations that have relied heavily on Medicare and Medicaid reimbursement, which was reduced if the legislation was not implemented by specified deadlines (Kohn, 2013). Most healthcare organizations count on Medicare and Medicaid reimbursement payments totaling more than 50% of their overall compensation (Glaser, 2010). With the adoption and meaningful use of EHRs and EHR certification, e-prescribing, telehealth, patient and provider portals, and

physician quality reporting initiatives (PQRI), healthcare organizations were pressured to complete highly complex and novel projects within tight timelines to meet HITECH and PPACA legislation or risk the loss of significant revenue (Gold & McLaughlin, 2016).

Projects are temporary organizations brought together to deliver unique products, services, or results (PMI®, 2013), and project managers are accountable for the successful delivery of the project objectives (Abdelhak et al., 2014). Although project management is relatively new to healthcare (Aubry, Richer, Lavoie-Tremblay, & Cyr, 2011), these organizations have used project management methodology and project managers to lead IT projects to implement software and hardware needed to comply with the new healthcare legislation (Abdelhak et al., 2014).

Project managers are situated between operational workers who perform project tasks and leadership who are responsible for the overall delivery of projects (Kerzner, 2009), and although healthcare workers are knowledgeable regarding patient care, they can lack the experience and skills necessary to implement projects associated with new and innovative technology (Chiocchio et al., 2012). Project managers are the stabilizing force for the duration of the project. An experienced project manager can be a valuable resource as organizations commence implementation of complex technologies (Abdelhak et al., 2014, p. 394).

Many studies have evaluated the relationship between project manager personality characteristics, the characteristics of their projects, and project success (Creasy & Anantamula, 2013; Dvir, Sadeh, & Malach-Pines, 2006; Malach-Pines, Dvir, & Sadeh, 2009). Malach-Pines et al., (2009) looked at several project managers' personality traits and project characteristics to see if correlations existed between them and successful project outcomes. The study results lend

tentative support to their hypotheses (p. 46). On the other hand, Malach-Pines et al. concluded the following from their study:

> In summary, the hypothesis that projects managed by project managers whose personality matched their projects' type will be more successful than projects managed by project managers whose personality didn't match their projects especially with regard to impact on the customers and benefit to the organization was fully supported. The data also indicate that project managers tend to prefer to manage projects that fit their personality. (p. 282)

Malach-Pines et al.'s, research supported both of their hypotheses, and they recommended that additional personality measures be examined (p. 283).

Statement of the Problem

The problem this researcher has identified is the healthcare federal legislation was replete with ambiguous project requisites (Bordenick et al., 2015; Detmer, 2010; Gold & McLaughlin, 2016; Thorpe et al., 2016), and as a result, healthcare project managers may need special skills for handling novel situations and vague project requirements. Though various researchers have investigated numerous project manager personality characteristics and skills associated with delivering successful projects (Creasy & Anantamula, 2013; Dvir et al., 2006; Malach-Pines et al., 2009; Smith, 2001), few if any studies were found to have examined ambiguity tolerance as a personality characteristic in the domain of healthcare project management.

Project manager personality characteristics are recognized as critical success factors in the successful delivery of projects (Creasy & Anantamula, 2013; Hartman & Ashrafi, 2002; Pinto & Slevin, 1988, 1999; Thite, 2000). Previous research studies indicated that project managers who prefer and whose personalities' are compatible with their projects' characteristics were more successful at delivering projects (Malach-Pines et al., 2009). This research investigated whether or not project managers' ambiguity tolerance levels and preferred project dimensions were related based on novelty, technology, complexity, and pace. Additional

variables were evaluated against the primary variables (ambiguity tolerance and preferred project dimensions) to determine if any were predictor variables and could confirm or confound the correlational results.

Research Questions

Malach-Pines et al. (2009) concluded that project managers whose personality matched the NTCP diamond framework project dimensions were more successful than those whose personality did not match these project dimensions, providing support for their theory of project manager–project (PM-P) fit. Ambiguity tolerance can be measured for attraction (high) and aversion (low) based on five areas: ambiguity, complex stimuli, uncertain stimuli, insoluble, and new situations (McLain, 1993, 2009). Preferred project characteristics can be measured with the NTCP diamond framework model based on the following dimensions: novelty, complexity, technology, and pace (Shenhar et al., 2005, p. 9).

The following questions guided this inquiry:

- Primary research question: Do healthcare project managers' ambiguity tolerance levels correlate to their preferred project dimensions based on novelty, technology, complexity, and pace?
- Secondary research question: Are there other predictor variables such as years of experience or education level that may influence healthcare project managers' ambiguity tolerance level?
- Tertiary research question: Are there other predictor variables such as years of experience or education level that may influence healthcare project managers' preferred project dimensions including novelty, technology, complexity, and pace?

Hypotheses

- $H1_a$: There is a positive correlation between project managers' ambiguity tolerance levels and their preferred project dimension levels based on novelty, technology, complexity, and pace.
- $H1_0$: There is not a positive correlation between project managers' ambiguity tolerance levels and their preferred project dimension levels based on novelty, technology, complexity, and pace.
- $H2_a$: There is a positive correlation between modifier variables such as years of experience and education level that may influence healthcare project managers' ambiguity tolerance levels.
- $H2_0$: There is not a positive correlation between modifier variables such as years of experience and education level that may influence healthcare project managers' ambiguity tolerance levels.
- $H3_a$: There is a positive correlation between modifier variables such as years of experience and education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, complexity, and pace.
- $H3_0$: There is not a positive correlation between modifier variables such as years of experience and education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, complexity, and pace.

Definition of Terms

For the purpose of this study, the following definitions were used:

- *Ambiguity tolerance* (AT): An emotional and perceptual personality variable that reacts differently based on the situation (novel, complex, insoluble), and individuals may be attracted to or have an aversion of these stimuli (McLain, 2009, p. 975).
- *NTCP diamond framework*: The scale includes project dimensions of novelty (never been done), complexity (system of systems), technology (all new technology), pace (crisis/blitz; Shenhar & Dvir, 2007b, p. 46).
- *Electronic health record* (EHR): EHRs defined by the industry as digital records of patient health information from a variety of sources that have been "certified" by a governing regulatory body (Abdelhak et al., 2014, p. 209).
- *Project success*: Projects that are completed within the constraints of scope, time, cost, quality, resources, and risk as approved between the project managers and senior management (PMI®, 2013, p. 35).
- *Telehealth*: The delivery of healthcare services and information using telecommunications technology (Abdelhak et al., 2014, p. 343).
- *Patient portals*: A secure web-based system that provides patients convenient 24-hour access to personal health information from any device with an Internet connection (Abdelhak et al., 2014, p. 173).
- *Physician portals:* A secure web-based system that provides providers convenient 24-hour access to patient health information from any device with an Internet connection (Abdelhak et al., 2014, p. 173).

- *Physician quality reporting initiative* (PQRI): These are patient quality measures that must be electronically reported by healthcare providers to the federal government (Abdelhak et al., 2014, p. 805).
- *Patient Protection and Affordable Care Act* (PPACA): Part of the new healthcare reform act passed by congress in 2010. Also known as the Affordable Care Act or ACA (Abdelhak et al., 2014, p. 36).
- *American Recovery and Reinvestment Act* (ARRA): Federal legislation signed into law in 2009 intended to provide a stimulus to the U.S. economy in the wake of the 2008 recession (Abdelhak et al., 2014, p. 71).
- *Health Information Technology for Economic and Clinical Health* (HITECH): The portion of the ARRA law that provided more than 27 billion dollars in reimbursement for the implementation, adoption and meaningful use of certified electronic health records by healthcare providers (Abdelhak et al., 2014, p. 71).
- *Meaningful use*: Refers to the phased approach and meaning full use of the electronic health record (Abdelhak et al., 2014, p. 92).
- *Electronic prescribing*: Refers to the electronic fulfillment of prescriptions between public and private healthcare organizations (Abdelhak et al., 2014, p. 106).
- *Accountable care* organization (ACO): An ACO is created by hospitals and physician groups entering into contractual agreements to provide healthcare to specified populations (Abdelhak et al., 2014, p. 712).

Significance of the Study

Healthcare has invested millions of dollars in projects to implement the HITECH and PPACA legislation, and this investment may be reimbursed by the federal government if

completed within the legislated timeframes (Glaser, 2010, p. 19). Penalties for non-compliance of the legislation are severe and misrepresentation or inaccurate reporting may result in loss and/or reduction of Medicare and Medicaid claims reimbursement (Jones, 2013, p.42). Project managers are being used to lead these efforts to a successful conclusion and project manager personality characteristics may be a critical success factor in the implementation of projects (Pinto & Slevin, 1988, 1999; Thite, 2000).

The assignment of the right project manager to the right project is a key success factor for the implementation of projects (Crawford, Hobbs, & Turner, 2005; Milosevic & Patanakul, 2004; Turner & Müller, 2008). More specifically, Turner & Müller (2008) looked at project managers' competency including leadership style and project success, and both hypotheses were supported in their mixed methods (quantitative and qualitative) study:

1. The project manager's competency, which includes his or her leadership style, is positively correlated to project success.
2. Different combinations of project management competency are correlated with success on different types of projects. (p. 75)

Turner et al., (2008) defined competence as "knowledge, skills, and personal characteristics in achieving performance in a job as defined by appropriate standards" (p. 75). Others have also stated that project manager personality characteristics can be a critical success factors in the delivery of projects (Creasy & Anantamula, 2013, p. 38). From their quantitative research results, Hagen et al., (2003) found that a project manager's ability to work within ambiguous situations was critical in guiding a complex project through completion with good results (p. 63) which supports research on the topic of leadership and ambiguity tolerance (Fullan, 2001, p. 20).

There have been many studies looking at project manager personality characteristics and how these characteristics correlate to project success (Dvir et al., 2006; Malach-Pines et al.,

2009; Smith, 2001). However, a review of the literature did not reveal research on healthcare project managers' ambiguity tolerance levels as a personality characteristic with regard to their preferred project dimensions in the healthcare domain. Exploring the relationship between ambiguity tolerance levels and preferred project dimensions may add to the project management body of knowledge related to project manager assignments and inform both organizational leaders and project managers alike. Project managers may not initially understand the assigned project. It may take several weeks or even months before the ambiguity of the project begins to affect the project manager and his or her intolerance to that ambiguity begins to affect their emotional state (phenomenological) and subsequent (operative) behavior (Budner, 1962, p. 30).

Researcher's Perspective

This researcher has over 25 years of experience in IT project management in healthcare, emergency 911, and telecommunications and has held roles as project manager, program manager, and director of project and program management in these industries. This researcher holds a Project Management Professional (PMP®) certification since 2007 and a certification in project and program management from the University of Denver since 2000.

The largest project this researcher participated in was performed from 2006 through 2011, and included the deployment of a new electronic health record (EHR) for a three hospital system and over 300 physicians and their offices with a $70 million dollar budget. This project scope included the implementation of 12 applications and took 4.5 years utilizing over 150 resources. More than 90 customized workflows were built along with 70+ interfaces for connectivity to various down-stream third party systems. Actual project costs were $65 million and in 2012 the healthcare system received $60 million in reimbursement from the federal government as part of the HITECH legislation. This reimbursement resulted in a grand total

investment of $5 million dollars for the entire EHR implementation. Subsequently, the healthcare system acquired eight additional hospitals for a total of 11 hospitals and very few project managers left the organization during this project.

The latest project this researcher participated in was performed from 2015 through 2016, and was the adaption of an existing EHR into two large hospitals, seven smaller critical access hospitals (CAH), and more than 450 physicians and their offices with an approximately 40 million dollar budget. This deployment included 21 applications and was nine months in duration. More than 250 resources were involved to build over 100 semi-customized workflows and 100+ interfaces to downstream third party systems. Actual project costs were approximately $55 million and no federal reimbursement was received. Due to the late start of the project and subsequently missing the legislative deadline, financial penalties reduced Medicare and Medicaid reimbursement that led to severe financial constraint for the healthcare system.

Later in 2016, this healthcare system announced a merger with another healthcare system. Many project managers left the project prior to completion. Some project managers left for other healthcare project manager positions in other healthcare institutions, some left healthcare for other industries, some left project management entirely, some were hospitalized for various medical conditions, and some project managers retired. These personnel departures left the remaining project management team responsible and accountable for the incomplete projects and associated tasks which contributed to overages in the project budget.

CHAPTER TWO: LITERATURE REVIEW

The following literature review provides a broad review of the theoretical framework and empirical research associated with the project management discipline and ambiguity tolerance concepts, definitions, and scales. Where possible, the overlap of these ideas are reviewed and analyzed. Beginning with ambiguity tolerance, the history of ambiguity tolerance, associated definitions, and a myriad of studies and scales are considered. Within the field of project management and through the filter of project manager selection and assignment, a review of project dimensions, project success, and associated topics are discussed. The relationships and overlap between ambiguity tolerance and project dimensions are highlighted throughout the literature review discussion.

Ambiguity Tolerance

The concept of ambiguity tolerance has been researched for more than 70 years. Over that period of time, the original concept, intolerance of ambiguity (Block & Block, 1951; Bochner, 1965; Budner, 1962; Frenkel-Brunswik, 1948), has changed and evolved to include tolerance of ambiguity (Durrheim & Foster, 1997; Friedland, Keinan, & Tytiun, 1999; Furnham & Ribchester, 1995; Merrotsy, 2013; Teoh & Foo, 1997), and more recently, ambiguity tolerance (Mac Donald, 1970; McLain, 1993; Norton, 1975). The most modern concept reflects the range of intolerance to tolerance of ambiguity as well as attraction and aversion of the phenomenon.

Ambiguity tolerance concept, definition, and maturation are attributed to a myriad of studies and continues to be studied as a relevant variable today (Brun, 2015; Hagen & Park, 2013; Tong et al., 2015; Van Hiel, Onraet, Crowson, & Roets, 2016; Weissenstein, Ligges, Brouwer, Marschall, & Friederichs, 2014; Xu & Tracey, 2014; Zhihui, Hui, Jiali, & Ruiming, 2015). Ambiguity tolerance is an emotional and perceptual personality characteristic that reacts

differently based on the situation (Budner, 1962; Frenkel-Brunswik, 1948; Furnham, 1994; McLain, 2009; Norton, 1975). Studies of this concept have occurred in the following disciplines: medicine, psychology, education, finance, and organizational behavior to name just a few. However, few if any studies were discovered on the relationship between preferred project dimensions and ambiguity tolerance levels of project managers in the domain of healthcare.

History and Definition

Frenkel-Brunswik is credited with originating the concept of intolerance of ambiguity and identifying this trait as an emotional and perceptual personality variable. In a qualitative study, Frenkel-Brunswik (1948, 1950) attempted to confirm intolerance of ambiguity as a reason for prejudice in children and adults. Further studies showed intolerance of ambiguity as a powerful predictive variable for behavior in a variety of settings (Frenkel-Brunswik, 1951). In various branches of psychology, Frenkel-Brunswik's seminal work is the basis of many scales and studies (Furnham, 1994). More recently, ambiguity tolerance and its synonyms have been studied in the field of project management as a critical success factor for delivering complex projects (Hagen & Park, 2013).

Budner (1962) furthered the definition of intolerance of ambiguity as "the tendency to perceive (i.e., interpret) ambiguous situations as a source of threat" (p. 29) and tolerance of ambiguity as "the tendency to perceive ambiguous situations as desirable" (p. 29). Budner stated the following about ambiguous situations:

> An ambiguous situation may be defined as one which cannot be adequately structured or categorized by the individual because of the lack of sufficient cues. It is possible to identify three such situations: a completely new situation, in which there are no familiar cues, a complex situation in which there are a great number of cues to be taken into account and a contradictory situation in which different elements or cues suggest different structure—in short, situations characterized by novelty, complexity or insolubility. (p. 30)

When individuals are confronted with unfamiliar, complex, and incongruent signs, these stimuli trigger effects on two levels: phenomenological, how an individual perceives, evaluates, and feels and operative, how an individual behaves or acts in some manner with reference to the external environment (Budner, 1962, p. 30). Budner also stated that the individuals' behavior does not occur until they are confronted with the ambiguous situation.

Budner's results closely relate to recent studies on emotional intelligence and the behavior of project managers as transformational leaders when confronted with highly ambiguous projects (Clarke & Howell, 2010; Goleman, 2003). When faced with complexity, ambiguity, and change, project managers' ability to handle these situations is evidence of their overall emotional intelligence (Clarke, 2010, p. 17). Clarke's (2010) conclusion supports Budner's effects of ambiguity, including an individual's emotional (phenomenological) changes as well as subsequent behavioral (operative) changes (Budner, 1962).

Bochner (1965) extracted and organized a comprehensive list of primary and secondary characteristics from Frenkel-Brunswik's (1948, 1949, 1951) qualitative research on intolerance of ambiguity. The primary characteristics included (a) rigid dichotomizing into fixed categories "need for categorization"; (b) seeking for certainty and avoiding ambiguity "need for certainty"; (c) inability to allow for the co-existence of positive and negative features in the same object: e.g., good and bad traits in the same person; (d) acceptance of attitude statements representing a rigid white-black view of life; (e) a preference for the familiar over the unfamiliar; (f) a positive rejecting of the different or unusual; (g) resistance to reversal of apparent fluctuating stimuli; (h) the early selection and maintenance of one solution in a perceptually ambiguous situation; and (i) premature closure (Bochner, 1965, p. 394).

Secondary characteristics of persons who are intolerant of ambiguity included: (a) authoritarian, (b) dogmatic, (c) rigid, (d) closed minded, (e) ethnically prejudiced, (f) uncreative, (g) anxious, (h) extra-punitive, (i) aggressive (Bochner, 1965, p. 394). Bochner's (1965) own study confirmed that the two dimensions positively correlated were "the need for categorization" and "the need for certainty" (p. 398). Bochner's analysis of Frenkel-Brunswik's (1948, 1949, and 1951), written observations contributed too many later studies and scale development using these primary and secondary characteristics.

Furnham's (1994) definition expanded on Budner's (1965) and changed Frenkel-Brunswik's (1948, 1949, 1951) description from intolerance of ambiguity to ambiguity tolerance. Furnham defined ambiguity tolerance as a way an individual (or group) perceives and processes information about ambiguous situations (p. 179) when confronted by an array of unfamiliar, complex, or incongruent cues (Budner, 1962, p. 30). The concept's name change is noteworthy because tolerance of ambiguity signifies a positive relationship with ambiguity and intolerance of ambiguity signifies a negative relationship; whereas, ambiguity tolerance is inclusive to both sides of the spectrum (Furnham & Ribchester, 1995, p. 178). Furnham furthers explained that there are two sides to the unidimensional single score scale: individuals who score low-ambiguity tolerance experience stress, react prematurely, and avoid ambiguous stimuli; whereas, those who score high-ambiguity tolerance are attracted to and even thrive in ambiguous situations and stimuli (Furnham & Ribchester, 1995, p. 179).

McLain's (1993) definition of ambiguity tolerance built on Budner's (1962) and Furnham's (1994) definitions by encompassing and acknowledging the range between aversion and attraction to ambiguous stimuli. McLain (1993) used this definition to build the multiple stimulus types ambiguity tolerance-I (MSTAT-I) scale which was revised in 2009 to the current

version, MSTAT-II. McLain's (1993) contemporary ambiguity tolerance definition was built on the premise that some individuals are attracted to ambiguous situations; whereas, others have an aversion to ambiguous situations. This definition would support project manager-project (PM-P) fit theory and explain why some project managers are attracted to highly novel, complex, technical, and fast-paced projects and others are content with simple repeatable type projects (Dvir et al., 2006; Malach-Pines et al., 2009). Some research has referred to these phenomena as hard and soft projects. Hard projects are those that have clearly defined criteria, goals, scope, and requirements; whereas, soft projects are those where the project requirements are yet to be defined and developed, resulting in high ambiguity and uncertainty (Atkinson, Crawford, & Ward, 2006, p. 688).

Scales and Reliability

Budner (1962, p. 34) created one of the first self-report scales to measure tolerance of ambiguity in a variety of students. The 16-item scale was designed to identify one of four types of threats (phenomenological denial, phenomenological submission, operative denial, and operative submission) and one of three types of situations (novelty, complexity, and insolubility). Budner reported alpha reliabilities from .39 to .62 after testing the scale on 17 different samples with a coefficient alpha of .49. Later, the scale was used with medical students where Budner hypothesized that ambiguity tolerance levels would be relevant to their medical specialty preferences. Budner predicted that those with high tolerance to ambiguity would gravitate toward unstructured specialties as compared to those with low tolerance to ambiguity. The results of the study supported Budner's hypothesis (p. 44).

Other self-report ambiguity tolerance scales have been created and tested over the last 60-plus years (Block & Block, 1951; Foxman, 1976; Herman, Stevens, Bird, Mendenhall, & Oddou,

2010; McLain, 1993, 2009; Norton, 1975) with varying degrees of reliability and validity (Furnham, 1994; Kirton, 1981; Norton, 1975). McLain (2009) and others (Furnham, 1994; Furnham & Marks, 2013; Furnham & Ribchester, 1995; McLain, 1993) criticized early ambiguity tolerance scales as lacking psychometric quality, thus, contributing to reliability and validity issues. Table 2.1 lists the widely used ambiguity tolerance scales from Furnham and Marks recent literature review (2013, p. 723). The table has been adapted to include reliability data from the original journal articles:

Table 2.1

Ambiguity Tolerance Scales

TA/AT Scales Author/Year	Name of Scale	N	Number of Items	Reliability Coefficient Alpha/Retest (if available)	Dimensions
(Herman et al., 2010)	The tolerance of ambiguity scale	2351	12	.73	(1) 4
(McLain, 2009)	Multiple stimulus types ambiguity tolerance scale-II (MSTAT-II)	870	13	.82/.42	(1) 3
(Buhr & Dugas, 2002)	Intolerance of ambiguity scale	276	27	.94	4
(Lange & Houran, 1999)	Rasch model AT-20	110	18	.93	1
(Durrheim & Foster, 1997)	Attitudinal ambiguity tolerance scale	421	20*	.81/.66	4
(McLain, 1993)	Multiple stimulus types ambiguity tolerance scale-I (MSTAT-I)	148	22	.86	1
(Norton, 1975)	MAT 50	1496	61	.89	8
(Mac Donald, 1970)	AT-20	789	20	.86/.63	1

(Budner, 1962)	16 item scale	947	16	.59	1
(O'Connor, Becker, & Fewster, 2018)	Walk's A scale	Not published	8	.58	1

Note. The asterisk (*) represents a correction in the number of items in the Furnham and Marks literature review (2013, p. 723). The correct number of items is 20, found in the original literature (Durrheim & Foster, 1997, p. 744).

McLain's multiple stimulus types ambiguity tolerance scale-II (MSTAT-II) scale was chosen for this research study due to its consistently strong reliability and internal validity (.82/.42) as compared with other ambiguity tolerance scales (McLain, 2009, p. 984). As Table 2.2 denotes, the MSTAT-II scale has only 13 questions that addresses possible cognitive fatigue and more importantly, McLain's (1993) definition of ambiguity tolerance is closely aligned with Shenhar and Dvir's (2007b) NTCP (novelty, technology, complexity, pace) diamond framework model that was also used in this research. McLain (2009) states, ambiguity tolerance is an emotional and perceptual personality variable that reacts differently based on the situation (novel, complex, insoluble) and individuals may be attracted to or have an aversion of these stimuli (p. 977). McLain (2009) further suggest that the MSTAT-II may be appropriate for use with other scales related to complexity and novelty (p.986). The MSTAT-II survey questions are found in Table 2.2:

Table 2.2

MSTAT-II Scale

1. I don't tolerate ambiguous situations well (G1).[c]
2. I would rather avoid solving a problem that must be viewed from several different perspectives (I1).[c]
3. I try to avoid situations that are ambiguous (G2).[c]
4. I prefer familiar situations to new ones (N1).[c]
5. Problems that cannot be considered from just one point of view are a little threatening (I2).[c]
6. I avoid situations that are too complicated for me to easily understand (C1).[c]
7. I am tolerant of ambiguous situations (G3).

8. I enjoy tackling problems that re complex enough to be ambiguous (C2).
9. I try to avoid problems that don't seem to have only one "best" solution (I3).[c]
10. I generally prefer novelty over familiarity (N2).
11. I dislike ambiguous situations (G4).[c]
12. I find it hard to make a choice when the outcome is uncertain (U1).[c]
13. I prefer a situation in which there is some ambiguity (G5).

Note. The small ([c]) represents reverse-scored items. The scale includes three items considered insoluble, illogical, irreducible, and internally inconsistent stimuli (I), two items address unfamiliar, new and novel stimuli (U), two items address complex stimuli (C), one item refers to uncertain stimuli (U), and five items correspond to ambiguous stimuli in general (G). The measure uses five Likert-type responses that range from 1 – strongly disagree to 5 – strongly agree and has nine items that are reverse-scored ([c]) because the questions are negatively stated (McLain, 2009, p. 978).

Closely Related Concepts

Several concepts and studies are closely related to ambiguity tolerance, but none is more populous and closely aligned than uncertainty tolerance. Ambiguity tolerance is described as a present state and uncertainty tolerance is defined as a future state (Iannello, Mottini, Tirelli, Riva, & Antonietti, 2017). Some researchers tied uncertainty tolerance to ambiguity tolerance by saying that probability, ambiguity, and complexity are sources of uncertainty (Hillen, Gutheil, Strout, Smets, & Han, 2017).

Neuroticism and intolerance of uncertainty were positively correlated (Zhihui et al., 2015), and in a variety of cultures, uncertainty avoidance was researched (Hofstede & Hofstede, 2005; Peterson et al., 1995). Researchers found a positive relationship between ambiguity tolerance and uncertainty tolerance in clinical practices and suggested that tools and strategies should be taught in medical schools to address deficiencies associated with the intolerance of these concepts (Iannello et al., 2017). High and low operational uncertainty was studied in relationship to empowerment and performance (Wall, Cordery, & Clegg, 2002). Hagen and Park's (2013) suggestion that ambiguity acceptance may be an uncommonly important characteristic of project team leaders (p. 63).

Project Management

Project management has been in existence for more than 2000 years beginning with the Egyptian pyramids but only accepted as a scientific methodology in the last 50 years with the advent of the Project Management Institute® (PMI®). Within the last 20 years, PMI® has greatly contributed to the operationalization of project management through education, research, and certifications of project managers around the world. Industries such as aerospace, engineering, construction, finance, telecommunications, and healthcare are using project management methodologies (Shenhar & Dvir, 2007b).

Organizational leadership has recognized that project managers assist projects with the delivery of corporate strategic objectives (Shenhar, 2004). Using a temporary organization and usually a pre-defined timeline and budget, project managers meet organizational objectives by bringing together project resources to complete project tasks to a successful conclusion (PMI®, 2013). Project manager personality characteristics are recognized as critical success factors in the successful delivery of projects (Creasy & Anantamula, 2013; Hartman & Ashrafi, 2002; Pinto & Slevin, 1988, 1999; Thite, 2000); therefore, assignment of a project manager to a project is a critical leadership decision (Adams, Barndt, & Martin, 1979; Shenhar, 2001b).

Of notable interest is a recent research study involving project managers' ambiguity acceptance, open communication, customer, and organizational outcomes (Hagen & Park, 2013). The results showed that the greater the ambiguity acceptance and open communication by the project manager, the more likelihood of positive results as related to customer and organizational outcomes (Hagen & Park, 2013). Hagen & Park (2013) also recommended that project managers be assessed for their tolerance of ambiguity and propensity for open communication (p. 62).

Project Dimensions

Project management literature has recently noted the need to classify and categorize projects. Comparing and contrasting projects on a detail level helps evaluate costs against return on investment benefits in addition to understanding organizational capability and capacity for successful project implementation (Crawford et al., 2005). Literature on project classification and categorization is limited and fragmented, specifically literature addressing individual environments without recommendations for standardization across multiple projects or industries (Crawford et al., 2005).

Early on, Blake (1978) suggested the delineation of minor versus major changes in projects, with minor changes called alpha projects and major changes called beta projects. Wheelwright and Clark (1992) classified projects based on the degree of product change, including derivative, platform, and breakthrough, based on research and development projects. Some researchers articulated radical changes versus incremental changes to classify projects (Eisenhardt & Tabrizi, 1995).

Few researchers used the concept of project classification and associated dimensions to assist in the selection and assignment of project managers. In researching NASA on the subject, Shenhar et al. (2005) began development on the NTCP diamond framework model as a way to tailor a project management approach to project dimensions based on novelty, complexity, technology, and pace. Shenhar's extensive research in this area postulated that different categories of projects needed different project management styles to complete projects successfully (Shenhar, 1998, 2001b, 2004, 2015).

In their book *Project Categorization Systems*, Crawford et al. (2005) focused on how organizations can develop and use project categorization for a variety of purposes, one of which

was project manager selection (p. 85). They recommended that project manager assignment to a project be associated with project experience and/or relationship to the customer or industry (p. 121). This is contrasted by Shenhar (1998) whose research indicated projects should be assigned based on the evaluation of project dimensions and utilizing the appropriate project management leadership style (p. 45).

Others agree that consideration of project requirements (e.g., level of risk, project schedule, task/organizational complexity, technical novelty) and project manager competencies (e.g., administrative/process, business/strategic, technical, interpersonal, intrapersonal, multiple projects management) are strong criteria for project selection and project manager assignment (Adams et al., 1979; Hauschildt, Keim, & Medcof, 2000; Milosevic & Patanakul, 2004).

Milosevic and Patanakul (2004) further expanded the definition for project selection and project manager assignment. Their criteria included strategic elements of the project (e.g., increase profitability and/or revenue, improve customer satisfaction) and organizational limitations (e.g., project manager credibility, resource capacity, project team strength, interdependencies/interacts, availability of support resources) are especially needed in high velocity organizations (Milosevic & Patanakul, 2004, p. 10).

Still more researchers were interested in project manager personality traits, including emotional intelligence. In their book *Choosing Appropriate Project Managers*, Turner and Müller (2008) looked at two questions for their research (p. 2): (a) does the project manager's competence, including his or her leadership style, influence project success? (b) Are different competence profiles, including different leadership styles, appropriate for different types of projects? Through personal interviews and a web-based questionnaire, these researchers found

that both questions were supported, and more importantly, some of the theoretical implications included the following:

1. Emotional dimensions of leadership make the most significant contribution to project performance for all project types, especially complex projects. (Turner & Müller, 2008, p. 77)

2. There is an increasing need for emotional competencies. Simple projects require transactional leadership (concern for process) and medium to high-complex projects require transformational leadership (concern for people). (Turner & Müller, 2008, p. 77)

Project success might be in jeopardy if project managers do not adapt their leadership style to the project type (Turner & Müller, 2008, p. 78). Shenhar (2001b) supported this conclusion that not all projects should be managed in the same way. Shenhar has done a number of studies in project management styles based on project categorization (Shenhar, 1998, 2001a, 2001b, 2004, 2008) and with other colleagues (Shenhar & Dvir, 1996, 2007a, 2007b; Shenhar, Dvir, Levy, & Maltz, 2001; Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002). Shenhar (2001b) attempted to match project management styles to different types of projects by classifying and identifying different project dimensions. Utilizing the results of these research studies over time, Shenhar and Dvir (2007b) built and refined their NTCP diamond framework model.

Based on classical contingency theory, Shenhar's (2001b) research study results supported the concept that emerging project dimensions (uncertainty and complexity) called for an adaptive approach to project management; whereas, more traditional (structured) project management approach was well suited for predictable, stable, certain projects (p. 19). Additional traits that closely reflect ambiguity tolerance definitions were identified through Shenhar's research to include novelty (new) and pace (speed). Project managers were asked to evaluate engineering projects against the four dimensions (novelty, technology, complexity, and pace) to produce a diamond shaped topology based on the following definitions in Table 2.3 (Shenhar, 2001b):

Table 2.3

NTCP Diamond Framework Model

1. **Novelty:** The product newness to the market and the customers. It has an impact on product requirements definition and market related activities:
   a. *Derivative:* Improvement in an existing product (e.g., a new color option in a MP3 player; the addition of a search feature in a software program).
   b. *Platform:* A new generation on an existing product line (e.g., new automobile model; new commercial airplane).
   c. *New to Market:* Adopting an existing product to a different market (e.g., customer service call center).
   d. *New to the World:* Product never existed before (e.g., the first Post-it Note; the first microwave oven).

2. **Technology:** The extent of new technology used. It impacts product design, development, testing and technical skills needed:
   a. *Low-tech:* No new technology is used (e.g., house; city street).
   b. *Medium-tech:* Some new technology (e.g., automobile; appliances).
   c. *High-tech:* All or mostly new, but existing technologies (e.g., satellite; fighter jet).
   d. *Super high-tech:* Non-existent or never used technologies (e.g., space shuttle).

3. **Complexity:** The location of the product on a hierarchy of systems and subsystems. It impacts to coordination, organization and formality of project management:
   a. *Component/Material:* An element or material in a sub-system (e.g., hard drive).
   b. *Assembly:* Subsystem, performing a single function (e.g., CD player; cordless phone).
   c. *System:* Collection of subsystems, multiple functions (e.g., train; cars).
   d. *Array:* Widely dispersed collection of systems with a common mission (e.g., subway system; air traffic control system).

4. **Pace:** Project urgency and available timeframe. It impacts time management activities and team autonomy:
   a. *Regular:* Delays not critical (e.g., community center).
   b. *Fast-competitive:* Time to market is important for the business (e.g., satellite radio; plasma television).
   c. *Time-critical:* Completion time is crucial for success—window of opportunity (e.g., mission to Mars; Y2K).
   d. *Blitz:* Crisis project—immediate solution is necessary (e.g., Apollo 13; 9/11/2001).

Note. Adapted from "Why Projects Fail? How Contingency Theory can Provide New Insights – A Comparative Analysis of NASA's Mars Climate Orbiter Loss" by B. J. Sauser, R. R. Reilly, & Shenhar, *International Journal of Project Management, 27*(7), p. 670. Copyright (2009) by Elsevier B.V. The table was modified by Sauser et al. (2018) to show four project gradiations per dimension.

Shenhar and Dvir's (2007b) project management approach is adaptive depending on the extent of each project dimension (trait) being measured for novelty, technology, complexity, and pace (NTCP). Shenhar and Dvir's NTCP diamond framework scale (Figure 2.1) allows project managers to rate the magnitude of their projects based on four dimensions including novelty, complexity, technological uncertainty, and pace of their projects.

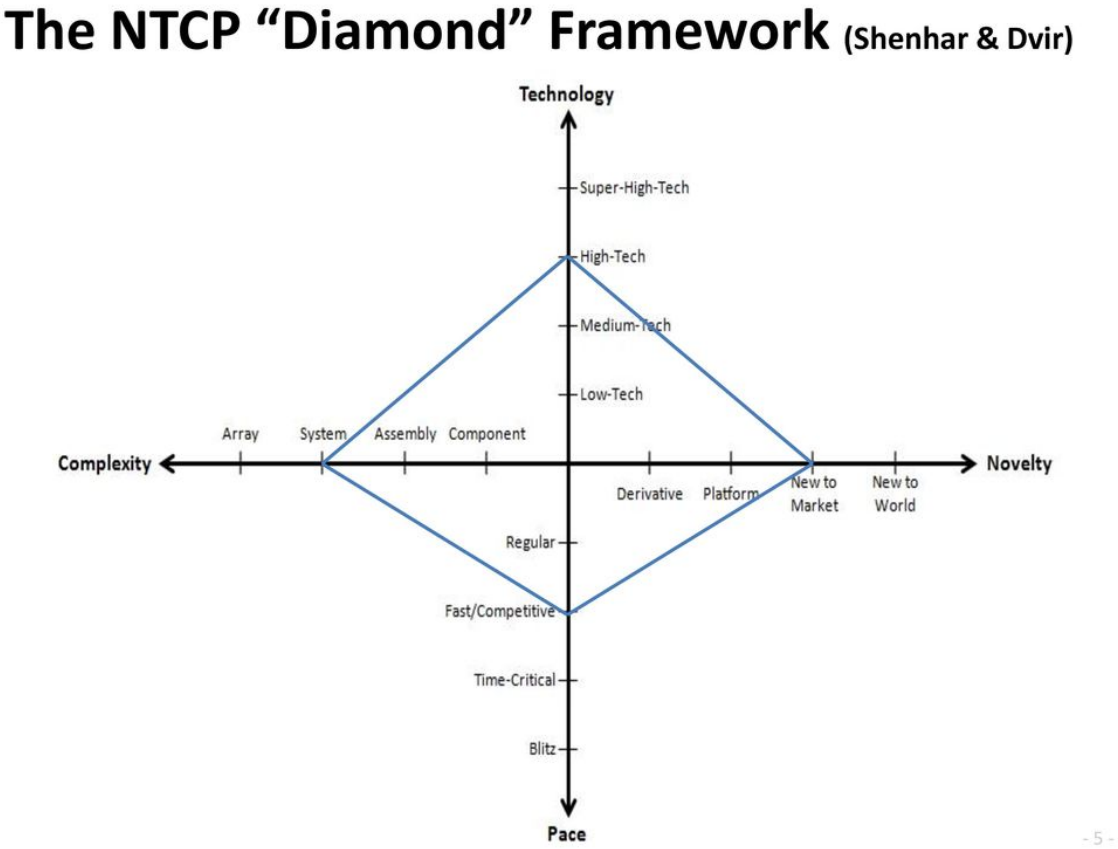

Figure 2.1. The NTCP diamond framework model rating. From "Projects and Project Managers: The Relationship between Project Managers' Personality, Project Types, and Project Success." D. Dvir, A. Sadeh, & A. Malach-Pines, 2006, Project Management Journal, 37(5), p. 36-48. Copyright 2006 by PMI®.

Shenhar and Dvir's (2007b) research inferred that projects with low NTCP scores should use a traditional project management approach, and projects with high NTCP scores should use an adaptive project management approach. From their book, *Reinventing Project Management*

(2007b), Shenhar and Dvir compared and contrasted traditional project management methodology versus adaptive project management methodology (p. 11) which can be seen in Table 2.4 below.

Table 2.4

Traditional Versus Adaptive Project Management Approaches

Approach	Traditional Project Management	Adaptive Project Management
Project Goal	Getting the job done on time, on budget, and within requirements (triple constraint)	Getting business results, meeting **multiple criteria**
Project Plan	A collection of activities that are executed as planned to meet the triple constraint	An organization and a process to achieve the expected goals and business results
Planning	Plan once at project initiation	Plan at outset and **re-plan when needed**
Managerial Approach	Rigid, focused on initial plan	**Flexible, changing, adaptive**
Project Work	Predictable, certain, linear, simple	**Unpredictable, uncertain, nonlinear, complex**
Environment Effect	Minimal, detached after the project is launched	Effects the project throughout its execution
Project Control	Identify deviations from the plan, and put things back on track	Identify changes in the environment, and **adjust plans** accordingly
Distinction	All projects are the same	Projects differ
Management Style	One size fits all	**Adaptive approach**; one size does not fit all

Note. **Bolded** words denote adjectives also found in definitions identifying individuals with high levels of ambiguity tolerance (Budner, 1962; Furnham, 1994; McLain, 1993, 2009). Adapted from Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation (p. 11), by Shenhar, & Dvir, 2007b, Boston, Massachusetts: Harvard Business Review Press. Copyright (2007) by Harvard Business Review Press.

Within the adaptive project management approach, some of these same words denote adjectives used in the ambiguity tolerance definitions (Budner, 1962; Furnham, 1994; McLain, 1993, 2009). When projects are very complex, there is a need for greater flexibility and changeable approach. (Atkinson et al., 2006; Floricel, Piperca, & Banik, 2012; Perminova, Gustafsson, & Wikström, 2008).

Hällgren and Maaninen-Olsson (2005) looked at deviations, ambiguity, and uncertainty in project management. They concluded that when dealing with project deviations and ambiguity, formal project management methodology may not be sensitive enough to identify nor flexible enough to control and resolve issues (p. 25). Ylinen and Gullkvist (2012) research was of interest as they identified individuals with lower tolerance of ambiguity favored stronger project controls and those with a higher tolerance preferred more open, informal, and flexible project controls. With the advent of more complex projects, researchers are finding that a flexible and adaptive approach to project leadership results in successful project delivery (Shenhar, 2015, p. 30).

Other studies have looked at project manager traits. In one study by (Starkweather & Stevenson, 2011), a survey of information technology (IT) executives rated the importance of 15 competencies for project managers using a Likert scale: 1=extremely unimportant to 7=extremely important (p. 36). The 15 competencies came from a previous study of IT recruiters to determine the most important competencies when hiring project managers. All 15 items showed strong reliability using Cronbach's alpha of .92.

Their study further ranked the 15 items and the top five extremely important and important percentages are listed in Table 2.5.

Table 2.5

Project Manager Core Competencies

Competency	"Important" and "Extremely Important" Percentages
Leadership	94.8
Ability to communicate at multiple levels	93.5
Verbal skills	87.2
Written skills	87.1
Attitude	85.3
Ability to deal with ambiguity and change	**82.9**

Note. **Bold italics** denotes the study results for ability to deal with ambiguity and change. From "PMP® Certification as a Core Competency: Necessary but not Sufficient," by J. A. Starkweather, & D. H. Stevenson, 2011. *Project Management Journal, 42*(1), p. 36. Copyright 2011 by PMI®.

The next competency on (Starkweather & Stevenson, 2011) list was work history with a 68.9 percentage, a full 14 percentage points below the fifth item on the list: "Ability to deal with ambiguity and change" (p. 36). Besides these findings, there were limited project management related studies and articles focused on project managers dealing with ambiguity, and no literature was found on project manager ambiguity tolerance levels and corresponding preferred project dimensions in healthcare.

In their book *Aspects of Complexity: Managing Projects in a Complex World,* (Cooke-Davies, Crawford, Patton, Stevens, & Williams, 2011) asked the question, "What causes complexity and why is it a problem" (p. 3)? They were referring to how organizations categorize their projects. They cited several attributes that contribute to complexity, including project scope, technical complexity, number of functions, skills involved, organizational involvement, level of ambiguity and uncertainty, number of sites, locations, or countries, whether a project has

ever been done before (novelty), speed of the project, and many more (Cooke-Davies et al., 2011).

Many other studies and books are available on the issue of project complexity (Floricel et al., 2012; Williams, Klakegg, Walker, Andersen, & Magnussen, 2012). In their book *Exploring the Complexity of Projects: Implications of Complexity Theory for Project Management,* (Cicmil, Cooke-Davies, Crawford, & Richardson, 2009) identified three pertinent concerns that illustrate project complexity: (a) persistent ambiguity and unclear project goals, contradictory and conflicting project success metrics; (b) inherent unpredictability of future events; and (c) complex multi-agency interfaces, social interactions, and process of relating among the project team members and stakeholders (p. 43). Shenhar's (2001) approach to complexity was more engineering related when he identified that complexity was based on the location of the product on a hierarchy of systems and subsystems resulting in the project's impact to coordination, organization and formality of project management (p. 399).

Project Success

There are copious research studies on what criteria best defines project success. Generally most researchers can agree on the following success criteria: the project is live and operational, delivered on time and on budget, and the project is delivered with features and functionality originally specified in the scope (Baccarini, 1999; Baker, Murphy, & Fisher, 2008; Creasy & Anantamula, 2013; Dvir et al., 2006; Gemeunden & Lechler, 1997; Rose, 2011; Shenhar & Dvir, 2007b; Williamson, 2012). Additionally, stakeholder perspectives concerning the success or non-success of a project are also being taken into consideration (Cavarec, 2012; de Wit, 1988; Lipovetsky, Tishler, Dvir, & Shenhar, 1997). Recent studies on project managers' personality characteristics can be a critical success factor in the implementation of projects

(Creasy & Anantamula, 2013; Hartman & Ashrafi, 2002; Pinto & Slevin, 1988, 1999; Thite, 2000). More recently, the importance of project manager to project fit lends supports to project success (Creasy & Anantamula, 2013; Dvir et al., 2006; Malach-Pines et al., 2009).

Theoretical Framework

Theory is important for research because it provides a framework for data analysis, a method for efficient field development, and a clear explanation for the pragmatic world (Wacker, 1998, p. 362). The theoretical framework for this research explicated the following areas of study: project management and personality psychology to better understand healthcare project managers' preferred project dimensions and ambiguity tolerance levels. Included in this review are general systems theory, theory of constraints, and fit theory. These theories were the underpinnings and structure for the variables examined in this study.

General Systems Theory

Project management is derived from general systems theory (Kerzner, 2009). Through observation, biologist Ludwig von Bertalanffy (1972) identified sub-systems within systems exchanging matter within the biological environment and referred to this process as an "open" system (von Bertalanffy, 1972). Von Bertalanffy furthered developed this theory into general systems theory by applying the theory across other fields such as chemistry, physiology, psychiatry, biophysics, economics, etc. In one example, von Bertalanffy used the human body as an example of subsystems within a total system. Kerzner (2009) applied general systems theory to project management and said,

> Von Bertalanffy identified how specialists in each subsystem could be integrated so as to get a better understanding of the interrelationships, thereby contributing to the overall knowledge of the operations of the system. Thus, the foundation was laid for the evolution and outgrowth of project management. (p. 58)

Project management is the art of planning, organizing, directing and controlling company resources for a temporary timeframe to meet specific objectives (Kerzner, 2009; PMI®, 2013). A project is a temporary endeavor with a definite beginning and end undertaken to create a unique product, service, or result (PMI®, 2013). Project managers lead projects and are responsible for coordinating and integrating activities and tasks between multiple functional units (Kerzner, 2009). Assignment of a competent project manager along with other factors may also play a part in the successful delivery of a project (Cartwright & Yinger, 2007), and assignment of the right project manager to the right project may lead to project success (Hauschildt et al., 2000).

Contingency Theory

Fiedler is generally credited with the development of contingency theory (Miner, 2005). Luthans (1973) stated that "the contingency approach to organizational design starts with the premise that there is no single design that is best for all situations" (Luthans, 1973, p.71). Fit theory which is based on contingency theory has been studied for over 100 years (Kristof-Brown, Zimmerman, & Johnson, 2005). "Goodness of fit" is emphasized between operational and environmental variables (Lawrence & Lorsch, 1967; Van de Ven & Drazin, 1985). Shenhar and Dvir extend contingency theory to project management with the claim that "one size does not fit all" regarding their research on project classification, gradation of project dimensions, and management style associated with projects (Shenhar, 2001b, 2004; Shenhar & Dvir, 2007b).

Fit Theories

There have been several positive correlations found in fit studies. Most notably is person-organization (PO) fit that speaks to job performance and job satisfaction as an explanation for success at work (Caldwell, 2011; Kristof-Brown et al., 2005; Kristof, 1996).

Other closely related fit theories include person-environment (PE) fit (individual to environment congruence), person-job (PJ) fit (matching individuals to positions), person-vocation (PV) fit (individual to career alignment), person-organization culture (PO-C) fit (individual harmony with organizational cultural), person-group (PG) fit (individual with group association) and (pairing individuals to supervisors) person-supervisor (PS) fit (Caplan, 1987; Carless, 2005; Chatman, 1989; De Goede, Van Vianen, & Klehe, 2013; O'Reilly, Chatman, & Caldwell, 1991).

Generally researchers agree that with good PO-fit (matching the right individual to the right organization) results in higher productivity along with better job satisfaction and less turnover (Carless, 2005). In their study, De Goede et al., (2013) expanded this definition to include individual attraction and aversion to organizations based on similar values. The notion of fit or congruence in many areas support the hypothesis for project manager to project fit (Dvir et al., 2006; Sadeh, Dvir, & Malach-Pines, 2007).

PM-P Fit

Based on PO-fit theory, project managers leading temporary organizations are attracted to and have better results when projects "fit" their personalities (Dvir et al., 2006). In their research, Malach-Pines et al. coined the expression project manager-project (PM-P) fit when they found significant positive correlations between project manager personality characteristics and project dimensions. Based on a review of the literature, Malach-Pines et al., (2009) gathered 14 personality traits to investigate including intuition, perceiving, extroversion, investigating, enterprising, secure, avoidant, anxious ambivalent, open to experiences, entrepreneurial risk, investment risk, managerial risk, entrepreneur, and manager (p. 277). Malach-Pines et al. compared these personality characteristics against Shenhar and Dvir's (2007b) NTCP diamond framework model (project dimensions) including novelty, technology, complexity, and pace.

Malach-Pines et al. results concluded that project managers whose personality matched these project dimensions were more successful than those whose personality did not match these project dimensions, providing support for their theory of project manager–project (PM-P) fit. Malach-Pines et al. also recommended more studies with additional personality variables be pursued.

Summary

In summary, ambiguity tolerance is measured by how individuals will respond and react to ambiguous stimuli (McLain, 2009). Individuals with lower tolerance of ambiguity favored stronger project controls and those with a higher tolerance preferred more open, informal, and flexible project controls (Ylinen & Gullkvist, 2012). With the advent of more complex projects, researchers are finding that a flexible and adaptive approach to project leadership results in successful project delivery (Crawford et al., 2005).

Malach-Pines et al. compared 14 personality characteristics against Shenhar and Dvir's NTCP diamond framework model/project dimensions including novelty, technology, complexity, and pace (Shenhar & Dvir, 2007b). Malach-Pines et al., (2009) results concluded that project managers whose personality matched these project dimensions were more successful than those whose personality did not match these project dimensions, providing support for their theory of project manager–project (PM-P) fit. Convergence of the two variables, preferred project dimensions including novelty, technology, complexity, and pace (NTCP) and ambiguity tolerance (AT) levels, can be synthesized from the literature; therefore, providing strong direction for this research study.

Ambiguity tolerance is an over-arching emotional and perceptual personality variable that can be applied to Shenhar and Dvir's (2007b) NTCP diamond framework model and related

project dimensions. Other researchers (Malach-Pines et al., 2009) disagree and think there is no single personality construct that would apply to all of these project dimensions (p.45). This study will bring the two primary variables together to discover if any relationship exists.

Title Searches and Journals

The following searches were conducted through the online Colorado State University library. The terms "ambiguity tolerance," "intolerance of ambiguity," and "tolerance of ambiguity" were used in a title search of *Business Source Complete* database resulting in 32 full text scholarly peer reviewed sources and *Business Source Premier* Database resulting in 32 full text scholarly peer reviewed sources, totaling 64 articles published from 1973 to 2017. These databases were chosen due to their relationship to business which is the environment for the current study. *Academic Search Premier* and all associated databases were selected for the same title searches, resulting in 53 articles published from 1973 to 2017. Much of the seminal research on ambiguity tolerance was performed prior to 1973, beginning in 1948. To supplement this literature review, additional resources were acquired from other sources such as the *Brighton Anythink Library* online database, *Project Management Institute* online database and *Google Scholar*.

Several journals published articles and studies on ambiguity tolerance, tolerance of ambiguity, and intolerance of ambiguity. The following list (although not conclusive) of peer reviewed journals provides an overview of the types of journals that included more than one article on the subject: *Journal of Personality, Journal of Personality Assessment, Personality and Individual Differences, Psychological Reports,* and *Social Behavior & Personality: An International Journal*. Ambiguity tolerance is an emotional and perceptual personality variable

(Frenkel-Brunswik, 1948) which is highlighted and reinforced by the number and type of personality journals interested in this research.

The majority of articles researched for project management included search terms such as "project dimensions," "project categorization," "project manager selection," "project manager characteristics," "project manager assignment," and "project success." Most of these articles were found in the Project Management Institute's online database from the *Project Management Journal.* Other articles were found in the *International Journal of Project Management* and a smaller percentage of articles came from the *Journal of Construction Engineering & Management, Journal of Management in Engineering and R&D Management*. Additional information came from single articles came from a multitude of other journals, primary sources such as books, and several from conference proceedings.

CHAPTER THREE: METHOD

This investigation used a post-positive quantitative approach and correlational design. A single self-report survey was used to investigate the strength of relationship between preferred project dimensions and ambiguity tolerance levels using associational inferential statistics. In an attempt to better understand these two variables, several types of testing were employed. The results of two scales (preferred project dimensions and ambiguity tolerance level) were analyzed using statistical testing to see if any correlations existed. In addition, other demographic information such as years of experience and education level was analyzed to determine if any were predictor variables. Additional variables were tested to determine if there were any other predictor variables or if the two sets of data were significantly different from each other based on grouping results.

Based on PO-fit theory, project managers leading temporary organizations to complete organizational objectives are attracted to and have better results when projects "fit" their personalities (Dvir et al., 2006). In their research, Malach-Pines et al. (2009) coined the expression project manager-project (PM-P) fit when they found significant positive correlations between project manager personality characteristics and Shenhar and Dvir's (2007) NTCP diamond framework model based on novelty, technology, complexity and pace dimensions. Although these researchers tested 14 different personality characteristics with NTC dimensions (pace was omitted), and ambiguity tolerance was not one of the personality characteristics tested.

This chapter provides specific details of what the research study was designed to determine and the procedure the researcher used to reject or fail to reject the null hypotheses. Included in this chapter are the research questions, hypotheses, research approach and rationale, population and sampling, measures, reliability and validity, data collection, and data analysis

used throughout the research process. Also included are the assumptions, limitations, and delimitations of the study as well as protection of human subjects.

Purpose of the Study

This study had the purpose of adding to the project management body of knowledge through increased understanding of ambiguity tolerance and preferred project dimensions in the healthcare domain. This understanding could enhance the goodness of fit between project managers and their projects (PM-P fit), resulting in improved project success (Malach-Pines et al., 2009). Project managers and organizational leaders alike may benefit from these results when assigning and selecting project managers for projects in healthcare.

Research Questions

Malach-Pines et al. (2009) concluded that project managers whose personality matched the NTC project dimensions were more successful than those whose personality did not match these project dimensions, providing support for their theory of project manager–project (PM-P) fit. Ambiguity tolerance levels were measured for attraction (high) and aversion (low) based on five areas: ambiguity, complex stimuli, uncertain stimuli, insoluble, and new situations (McLain, 1993, 2009). Preferred project characteristics were measured with the NTCP diamond framework model based on the following dimensions: novelty, technology, complexity and pace (Shenhar et al., 2005, p. 9). This research investigated whether or not project managers' ambiguity tolerance levels and preferred project dimensions based on novelty, technology, complexity, and pace were related. The following questions guided this inquiry:

- Primary research question: Do healthcare project managers' ambiguity tolerance levels correlate to their preferred project dimensions based on novelty, technology, complexity, and pace?

- Secondary research question: Are there other modifiers such as years of experience or education level that may influence healthcare project managers' ambiguity tolerance level?
- Tertiary research question: Are there other modifiers such as years of experience or education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, complexity, and pace?

Hypotheses

- $H1_a$: There is a positive correlation between project managers' ambiguity tolerance levels and their preferred project dimension levels based on novelty, technology, complexity, and pace.
- $H1_0$: There is not a positive correlation between project managers' ambiguity tolerance levels and their preferred project dimension levels based on novelty, technology, complexity, and pace.
- $H2_a$: There is a positive correlation between other modifier variables such as years of experience and education level that may influence healthcare project managers' ambiguity tolerance levels.
- $H2_0$: There is not a positive correlation between other modifier variables such as years of experience and education level that may influence healthcare project managers' ambiguity tolerance levels.
- $H3_a$: There is a positive correlation between other modifier variables such as years of experience and education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, complexity, and pace.

- $H3_0$: There is not a positive correlation between other modifier variables such as years of experience and education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, complexity, and pace.

Research Approach and Rationale

This investigation involved assessing the strength of the relationship between project managers' preferred project dimensions and project managers' ambiguity tolerance levels in healthcare. This exploratory study was an attempt to explore the relationship between these two variables; no treatments were offered, thus, supporting a non-experimental correlational design. Correlational research shows the strength of two or more variables but does not imply causality (Gliner, Morgan, & Leech, 2000, p. 351). Experimental research is needed to show causality and further the understanding of these two variables.

A self-report survey was a convenient way to obtain subject matter expert (SME) information from healthcare project managers in geographically separated locations. Also, both AT and preferred project dimensions (NTCP) were not readily observable by direct means which supported utilizing scales to collect this data (DeVellis, 2016, p .9). Additionally, the study evaluated possible predictor variables in the demographic information including years of experience and education level along with the two scales to determine if the primary variables being studied were influenced by these variables. A few additional questions were asked on the survey regarding project management certification and leaving a position prior to the project going live. Again, these variables were looked at to confirm or confound the primary variables.

Population and Sampling

The population was healthcare project managers and sample participants for this study were healthcare project managers employed by, associated with, or vendors of a large not-for-

profit healthcare system located in Denver, Colorado. The original data sample included 250 healthcare project manager email addresses. This number was reduced to 144 project managers when 106 email addresses sent on June 11, 2019 failed to be delivered due to no longer being valid. Snowball sampling from participant responses provided an additional 10 project manager email addresses that were used in the sample for a total of 154 active email address receiving the letter of consent and the Survey Monkey® hyperlink.

Return rates were low, so the survey was sent out eight times over a period of eight weeks concluding on August 9, 2019. A total of 25 participants started the survey process with 24 participants out of 154 (active email addresses) completing the assessment for a response rate of approximately 16% (.16). This response rate percentage was higher than the 13% expected for surveys delivered via email mode (Dillman, Smyth, & Christian, 2009, p. 414). The project managers were employees, contractors, and consultants located in geographically separated locations. The single survey design was a convenience sample, and snowball sampling was requested in the survey for respondents to recommend their colleagues for participation.

Measure

The survey was a single observation, 30-question self-report instrument that had three parts including eight demographic questions, McLain's (2009) multiple stimulus types ambiguity test II (MSTAT-II) survey with 13 questions, and Shenhar and Dvir's (2007b) NTCP diamond framework model used as a scale consisting of four questions about preferred project types based on four dimensions NTCP. Participants were also asked to recommend other healthcare project managers (snowball sampling) who might be interested in participating in this survey and participants provided email addresses of these individuals. Approval was obtained to use both

the NTCP diamond framework and MSTAT-II scales in this study. Please see Appendix D for MSTAT-II approval for use and Appendix E for NTCP approval for use.

The demographic section asked respondents a variety of questions including age, title, certification, years of experience, employment status, and education level. McLain's MSTAT-II survey (McLain, 2009) was used to identify project managers' ambiguity tolerance levels. These levels were measured with 13 questions based on five areas including ambiguous stimuli, complex stimuli, uncertain stimuli, insoluble stimuli, and new stimuli. The 13 questions were measured with a Likert-scale (Strongly Disagree – 1 to Strongly Agree – 5) with high scores indicating an attraction to ambiguity and low scores indicating an aversion to ambiguity. By using an associational design research methodology (Gliner et al., 2000), the results of the two scales were tested first for reliability and then for correlational strength and possible relationships between ambiguity tolerance levels and project dimension levels.

Shenhar and Dvir's (2007b) NTCP diamond framework model was used in the survey to ask healthcare project managers to identify one level of preferred projects based on novelty, technology, complexity, and pace. Each dimension listed four sets of projects that were rated based on a degree of difficulty gradient scale of 1 to 4 with 1 being low and 4 being high within each of the four dimensions. For example, under the technology dimension, a selection of low-tech meant no new technology was used and a selection of super high-tech meant non-existent or never used technologies at time of project initiation. High scores indicated a preference for high technology projects and low scores indicated a preference for low technology projects. See Appendix C for the full questionnaire.

Reliability and Validity

The MSTAT-I scale has been heavily tested with alpha reliability of (.86) with a factor analysis of 148 respondents supported a unidimensional model. The scale significantly correlated with other tolerance of ambiguity scales including Budner's (1962) 16-item scale (.60), Storey and Aldag's (1983) 8-item scale (.71), and MacDonald's (1970) 20-item scale (.58) reliability alpha in parenthesis (as cited in McLain, 1993, p. 5). The MSTAT-II was later modified to reduce the number of questions to 13 with internal consistency reliability of (.83) and significant correlation of (.57) with MacDonald's AT-20 scale (McLain, 2009, p. 982).

Shenhar and Dvir's (2007b) NTCP diamond framework model was derived from over 15 years of qualitative and quantitative studies in project classification and after having collected information from more than 600 projects in the United States and Israel (p. 214). The model has been used in numerous studies involving the identification of project characteristics and classification of project magnitude (Ehrman & Holzmann, 2012; Orhof, Shenhar, & Dori, 2013; Sauser et al., 2009; Shenhar & Dvir, 2007b; Shenhar, Holzmann, Melamed, & Zhao, 2016). Limited reliability scores could be found in the literature, and thus, this exploratory study may be the first to use this model as a scale for preferred project dimensions based on NTCP.

Both the NTCP diamond framework model scale and AT scale (MSTAT-II) were tested for internal consistency reliability using Cronbach's coefficient alpha. The MSTAT-II consisted of 13 items, the mean score was 36.71 (SD = 6.70) and the internal consistency reliability of the scale was (α = .90; n = 13) which was higher than the .80 suggested to be considered internally consistent (Gliner et al., 2000, p. 159).

The original NTCP diamond framework consisted of four items, the mean score was 10.38 (SD = 2.55) with the internal consistency reliability of the scale was (α = .64; n = 4);

however, a reliability coefficient of .80 or higher is needed to be considered internally consistent in some social science research (Gliner et al. 2009, p. 159). It was determined that the elimination of one item (pace) would increase the reliability coefficient ($\alpha = .78$; $n = 3$) which is lower than the suggested .80 but is high enough for these items to be considered internally consistent (Gliner et al., 2000, p. 159). See Table 3.1 for Cronbach's alpha for NTCP if the item of "pace" was deleted.

Table 3.1

Scale Means if Item Deleted, Scale Variance if Item Deleted, Corrected Item – Total Correlation, Correlation, and Cronbach's Alpha if Item Deleted

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item – Total Corr.	Squared Multiple Correlation	**Cronbach's alpha if Item Deleted**
Based on novelty, select one project type you would prefer to manage below.	7.88	2.46	.59	.61	.45
Based on technology, select one project type you would prefer to manage below.	7.71	4.22	.55	.45	.50
Based on complexity, select one project type you would prefer to manage below.	7.25	3.76	.68	.50	.41
Based on pace (speed of project), select one project type you would prefer to manage below.	8.29	5.96	.01	.20	**.78**

Note. **Bolded** words and value denotes Cronbach's alpha if item deleted.

The model was generated a second time without the pace dimension and resulted in a mean score of 8.29 ($SD = 2.44$), and internal consistency reliability of ($\alpha = .78$; $n = 3$) which is

considered internally consistent in some social science research. Therefore, only novelty, technology, and complexity (NTC) dimensions were used for internal consistency reliability and subsequent hypothesis testing and analysis.

In summary, reliability and validity of the NTCP diamond framework model was in question because this may be the first time the model was used as a scale. The results of the scale were tested using Cronbach's alpha and the dimension of pace removed to increase the internal reliability $\alpha = .78$. The researcher trusts the face validity of the model (now scale) for preferred project dimensions including novelty, technology, and complexity (NTC) for this research study.

Data Collection

Data collection consisted of a single observation, self-report instrument. Colorado State University (CSU) Institutional Review Board (IRB) approval was received prior to sending the research survey. See Appendix A for CSU IRB approval. The survey letter of consent was sent to 250 healthcare project manager email addresses. This number was reduced to 144 project managers when 106 email addresses failed to be delivered due to no longer being valid. Snowball sampling from participant responses provided an additional 10 project manager email addresses that were used in the sample for a total of 154 active email addresses receiving the letter of consent and the Survey Monkey® hyperlink.

The letter of consent consisted of the following components: communication about the study, permission to participate in the study with electronic signature, voluntary and confidential nature of the study, how to opt-out of the study, how the study would remain anonymous, how the data will only be shared in summarized format, how to participate using the hyperlink, primary investigators' contact information along with the institution review board (IRB) contact

information. Additionally, the researcher followed-up by sending the survey to anyone who was recommended during the snowball sampling. Please see Appendix B for a copy of the CSU IRB approved letter of consent.

Data Analysis

Data collected through the Survey Monkey® tool were imported into IBM® SPSS Statistics® (SPSS®) for data analysis. This analysis included both descriptive and inferential statistics. Data were reviewed and consistently coded in SPSS® to correctly reflect the type of data received based on ordinal, nominal, and scale measurement. Data were evaluated by means, standard deviations, histograms, scatter plots, and percentages to better understand the sample. Hypotheses testing included correlational, regression, and difference testing.

The MSTAT-II survey was used for evaluating healthcare project managers' AT. There were nine negatively stated questions that required reverse scoring (McLain, 2009, p. 979). Questions 13, 14, 15, 16, 17, 18, 21, 23, and 24 were reversed scored to strongly agree = 1, agree = 2, neither agree nor disagree = 3, disagree = 4, and strongly disagree = 5, in accordance with the author's instruction. All remaining questions (19, 20, 22, and 25) were scored strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly disagree = 1. The highest score that could be obtained was 65 and the lowest score obtained was 13.

The NTCP diamond framework model was used to elicit healthcare project managers' preferred project dimensions including novelty, technology, and complexity. The model provided a definition of each dimension and provided four corresponding sets of project examples. Each set of projects is a degree of magnitude and progression of difficulty within that dimension. Participants were asked to select their preferred projects (on a scale of 1 to 4) within each project dimension (NTC). Please see the section on reliability and validity for more

information regarding internal consistency reliability using Cronbach's coefficient alpha and related Table 3.1.

For each project dimension (novelty, technology, and complexity), four sets of projects were listed. The first set of projects represents the lowest level of difficulty and was given a value of 1, the second set of projects represents the next higher level of difficulty and given a value of 2, the third set of projects represents the next level of difficulty and given a value of 3, and the last set of projects represents the highest level of difficulty and given a value of 4. The highest score that could be attained was 16 and the lowest score was 4 and all of the projects listed were content-free and non-industry specific. See Appendix C for the full questionnaire.

The means were then calculated for both AT and NTC results. Histograms were generated to provide a visual depiction of the distribution of the two scales. In addition, to determine if the results were normally distributed, a scatter plot was evaluated and effect size (r^2) calculated. Then, internal consistency reliability between the two measures was evaluated using Cronbach's alpha. See the section on reliability and validity for more information on internal consistency reliability and Table 3.1.

Hypothesis testing occurred for the primary research question (do healthcare project managers' ambiguity tolerance levels correlate to their preferred project dimensions based on novelty, technology, and complexity?) using Pearson's product-moment correlation. Data were found to be parametric in nature (normally distributed) and none of the assumptions were markedly violated. A scatterplot was generated to confirm and better understand the R^2 value.

Hypotheses testing occurred for the secondary and tertiary research questions, (Are there other modifiers such as years of experience or education level that may influence healthcare project managers' ambiguity tolerance (AT) level and preferred project dimensions based on

novelty, technology, and complexity (NTC)? respectively. Multiple regression testing was used with years of experience and education level to determine if either of these were predictor variables for either of the primary variables (AT and NTC). Additional demographic data were examined using multiple regression testing to see if any additional relationships were found. Independent samples *t*-tests were used to see if there were any differences between the primary variables (AT and NTC) and when grouped by additional data collected.

In summary, this study's research method included a non-experimental, quantitative, correlational design and used a self-report, single observational survey. Data analysis included descriptive and inferential statistics to better understand the sample and to perform hypothesis testing. Data were tested using means, standard deviations, histograms, scatter plot, and frequencies. Hypothesis testing included correlational, multiple regression testing, as well as independent samples t-tests to compare groups.

Assumptions, Limitations, Delimitations

Below are the assumptions, limitations, and delimitations that informed this research and researcher. This information provides a context for understanding the results and addresses some questions the audience may have about the research. The researcher attempted to address each of these areas to reduce the impact and/or influence on the research study.

Assumptions

It was assumed that respondents answered the survey questions honestly and accurately. Precautions were taken to keep the participants' identification anonymous and that anonymity was conveyed to participants in all communications. This study assumed that participants had performed projects with their preferred project dimensions and could report that information accurately on the survey.

Limitations

Correlational research is limited to showing the strength of the relationship between variables but does not show causation which normally requires experimental research. Another limitation was using a self-report measure and the inherent challenges with this type of data collection method. Instructions and format of the questionnaire attempted to help respondents better understand the questions and properly use rating scales to reduce bias and mistakes when answering survey questions.

The email list of healthcare project managers being used in this study was associated with a large not-for-profit healthcare organization located in Denver, Colorado. Due to an impending merger, this organization experienced leadership changes, downsizing including multiple layoffs, and department reorganizations. The elimination of project manager positions resulted in email addresses no longer being valid and some project managers in the research organization may have known the researcher and were aware of the study, and may have some form of bias.

Delimitations

This research was delimited to project managers managing information technology (IT) projects in healthcare. These healthcare project managers had worked on IT projects associated with HIPAA, HITECH, and/or PPACA legislation as well as other IT related projects. Project managers were identified as employees, contractors, or consultants.

Protection of Human Rights

Approval for this study was obtained from Colorado State University's (CSU) Institution Review Board (IRB). The study was considered exempt by CSU's IRB and the letter of consent reviewed along with the research methodology, instrument used for data collection as well as the procedure used for data collection and analysis. All data collected remained anonymous with no

identifying marks and data presented were done without compromise to individual research participants' confidentiality. Results of the data will only be shared in summarized format.

CHAPTER FOUR: RESULTS

The purpose of this quantitative study was to explore the relationship between project managers' ambiguity tolerance (AT) and preferred project dimensions based on novelty, technology, and complexity (NTC) in healthcare. This chapter begins with a review of the sample demographics, results for each research question, hypothesis, and test with descriptive narrative and tables where necessary. Population, sampling, and response rate along with reliability testing for each of the instruments was discussed in chapter three.

Sample Demographics

A total of 25 participants started the survey process with 24 participants ($N = 24$) completing the assessment. The sample consisted of 25% (6) of the participants in the 35-44 age group, 20.8%, (5) in the 45-54 age group, 45.8% in the 55-64 (11) age group, and 8.3% in the 65+ (2) age group. No one under the age of 35 answered the survey. Participant titles included 70.8% (17) as project managers, 12.5% (3) as program managers, and 16.7% (4) as other titles. Of the respondents, 58.3% (14) had the PMP® (Project Management Professional®) certification from the Project Management Institute® (PMI®), 25% (6) had no certification, and 16.7% (4) identified as having other certifications or educational endeavors.

Employment status included the following: 87.5% (21) employees, 4.2% (1) consultants, and 8.3% (2) contractors. Years of experience in project management included 29.2% (7) between one and 10 years, 16.7% (4) between 11-20 years, 41.7% (10) between 21-30 years, and 12.5% (3) held over 31 years of experience. Highest level of education included 12.5% (3) with general education development (GED) or high school diplomas, 58.3% (14) with bachelor's degrees, 29.2% (7) with master's degree and no participants answered the survey as having a doctorate degree. Please see Table 4.1 for demographic information descriptive statistics.

Table 4.1

Demographic Information: Descriptive Statistics

	Frequency	Percent	Valid Percent	Cumulative Percent
Age Range				
65+	2	8.3	8.3	8.3
55 – 64	11	45.9	45.8	54.2
45 – 54	5	20.8	20.8	75.0
35 – 44	6	25.0	25.0	100.0
Total	24	100.0	100.0	
Current Title				
Other	4	16.7	16.7	16.7
Project Manager	17	70.8	70.8	87.5
Program Manager	3	12.5	12.5	100.0
Total	24	100.0	100.0	
PMP® Certification?				
Other	4	16.7	16.7	16.7
Yes	14	58.3	58.3	75.0
No	6	25.0	25.0	100.0
Total	24	100.0	100.0	
Employment Status				
Employee	21	87.5	87.5	87.5
Consultant	1	4.2	4.2	91.7
Contractor	2	8.3	8.3	100.0
Total	24	100.0	100.0	
Years of Experience				
1-10 years	7	29.1	29.1	29.1
11-20 years	4	16.7	16.7	45.8
21-30 years	10	41.7	41.7	87.5
31+ years	3	12.5	12.5	100.0
Total	24	100.0	100.0	
Education Level				
GED/HS Diploma	3	12.5	12.5	12.5
BA or BS	14	58.3	58.3	70.8
MA or MS	7	29.2	29.2	100.0
Total	24	100.00	100.00	

Results

After an eight-week period of time, the total number of respondents was $N = 24$. The AT score was determined by summing participant responses to 13 questions based on a 5-point Likert scale. Again, the highest possible score attainable was 65 (most tolerant of ambiguity) and the lowest possible score attainable was 13 (least tolerant of ambiguity).

The preferred project dimension score based on novelty, technology, and complexity (NTC) score was determined by summing three preferred project dimensions (novelty, technology, and complexity) based on a 4-point scale (lowest difficulty to highest difficulty) for the highest possible score of 12 (most difficult projects preference) to lowest possible score of 3 (least difficult projects preference).

Descriptive statistics were generated for AT and NTC results and skewness was used to determine frequency distribution of the two main variables. AT was found to have a skewness statistic of .09 and kurtosis statistic of -.32, and NTC was found to have a skewness statistic of .14 and kurtosis statistic of -1.11. The distribution was found to be generally between +1.0 and -1.0, meaning that the two scale scores could be treated as approximately normal. Histograms were generated for both scales to provide a visual depiction of the frequency distributions. See Figure 4.1 for AT histogram and Figure 4.2 for preferred project dimensions based on novelty, technology, and complexity (NTC) histogram.

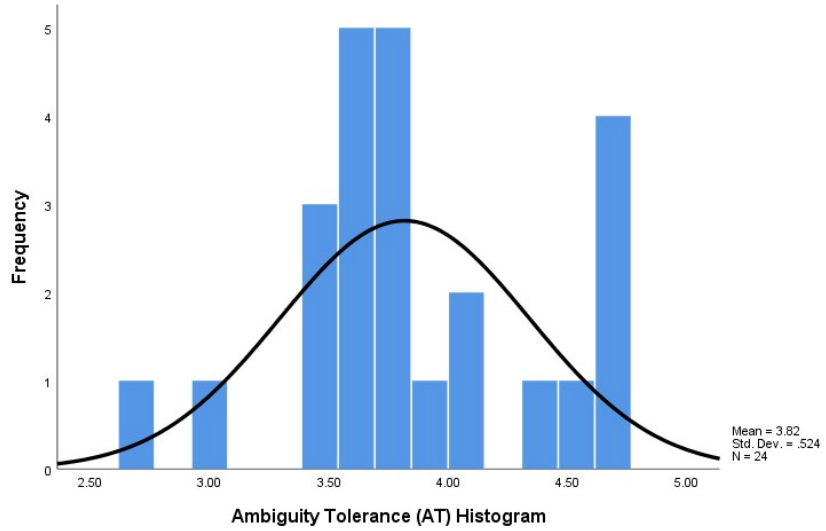

Figure 4.1. AT histogram.

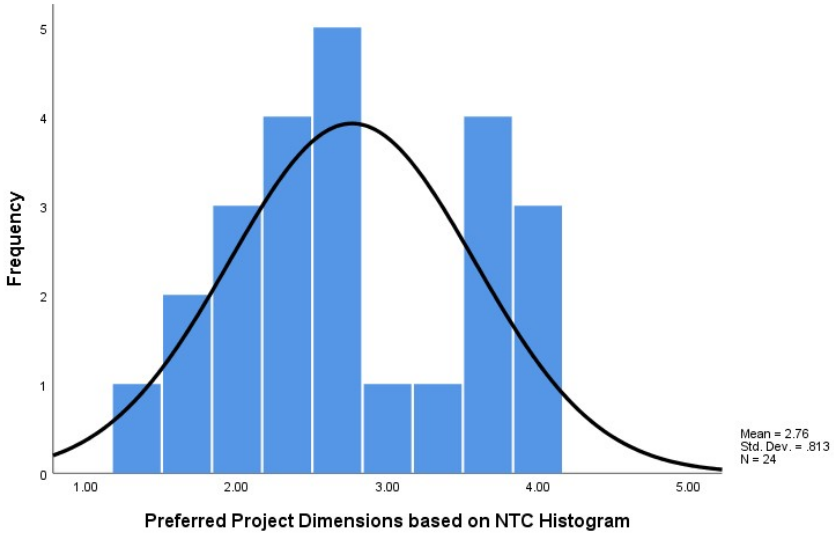

Figure 4.2. Preferred project dimensions based on NTC histogram.

Primary Research Question

The primary research question asked: Do healthcare project managers' ambiguity tolerance (AT) levels correlate to their preferred project dimensions based on novelty, technology, and complexity (NTC)? Because results from the two measures were approximately normally distributed and the assumption of linearity was not markedly violated. A Pearson

correlation was computed to examine the intercorrelations of the variables. Table 4.2 shows that the two variables were significantly correlated. The null hypothesis was rejected, because there was a positive correlation between AT and NTC, r (22) = .49, p =.02 when p was found to be less than .05. The effect size was considered large (Morgan et al, 2007, p. 94).

This correlation represents that healthcare project managers who have high AT are more likely to prefer projects with high project dimensions based on NTC and project managers who have low AT are more likely to prefer projects with low project dimensions based on NTC. Table 4.2 presents the correlation, means, and standard deviations for AT and NTC.

Table 4.2

Correlations, Means, and Standard Deviations for AT and NTC (N = 24)

Variable	AT	NTC	*M*	*SD*
AT	--	.49*	3.82	.52
NTC	--	--	2.76	.81

Note. * Correlation is significant at the .05 level (2-tailed).

A scatter plot shown in Figure 4.3 provides a visual depiction of a straight-line linear regression for AT and NTC. Note that the points fit the line in a relatively consistent manner in a positive direction. The approximate slope for the line of best fit is $y = 2.94 + .32 * x$. The R^2 = .24 or 24% represents the portion of the variation in AT that is explained by NTC. See Figure 4.3 for the AT and NTC scatterplot.

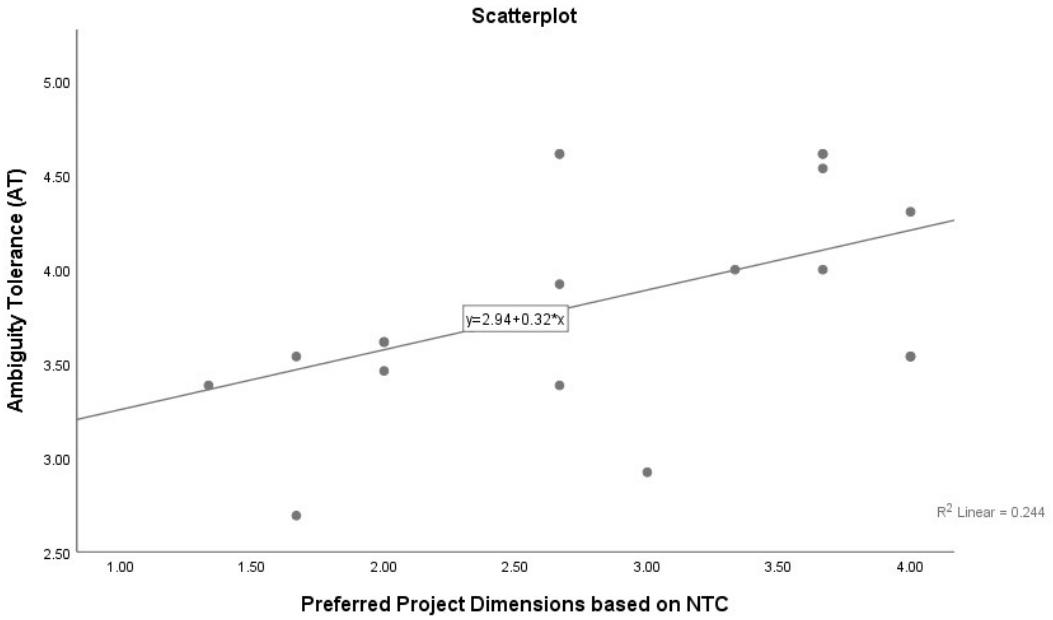

Figure 4.3 AT and preferred project dimensions based on NTC scatterplot.

Secondary Research Question

The secondary research question asked: Are there other modifiers such as years of experience or education level that may influence healthcare project managers' ambiguity tolerance (AT) level? Table 4.3 presents means, standard deviations, and intercorrelations.

Table 4.3

Means, Standard Deviations, and Intercorrelations for AT, Years of Experience, and Education Level (N = 24)

Variable	M	SD	Years of Experience	Education Level
AT	3.81	.52	.37	-.02
Years of Experience	2.37	1.1	--	-.07
Education Level	2.17	.64	--	--

Note. Ambiguity Tolerance (AT)

A multiple regression was conducted to investigate whether years of experience and education level could predict AT. The combination, years of experience, and education level were not statistically significant, $F(2, 21) = 1.71$, $p = .21$ when p was found to be greater than .05 and therefore, failed to reject the null hypothesis. Table 4.4 presents the beta coefficients.

Table 4.4

Simultaneous Multiple Regression Analysis Summary for Years of Experience and Education Level Predicting AT (N = 24)

Variable	*B*	*SEB*	ß
Years of Experience	.19	.10	.38
Education Level	.04	.17	.05
Constant	3.29	.49	

Tertiary Research Question

The tertiary research question asked: Are there other modifiers such as years of experience or education level that may influence healthcare project managers' preferred project dimensions based on novelty, technology, and complexity (NTC)? Table 4.5 presents the means, standard deviations, and intercorrelations.

Table 4.5

Means, Standard Deviations, and Intercorrelations for NTC, Years of Experience, and Education Level (N = 24)

Variable	*M*	*SD*	Years of Experience	Education Level
NTC	2.76	.81	.23	-.09
Years of Experience	2.37	1.10	--	-.16
Education Level	2.17	.64	--	--

Simultaneous multiple regressions were conducted to investigate whether years of experience and education level could predict NTC. The combination, years of experience and education level were not statistically significant, $F(2, 21) = .60$, $p = .56$ when p was found to be greater than .05, and therefore, failed to reject the null hypothesis. Table 4.6 presents the beta coefficients.

Table 4.6

Simultaneous Multiple Regression Analysis Summary for Years of Experience and Education Level Predicting NTC (N = 24)

Variable	*B*	*SEP*	ß
Years of Experience	.17	.17	.22
Education Level	-.07	.28	-.05
Constant	2.51	.78	

Consequently, neither variable (years of experience and education level) were found to be predictor variables for AT or NTC. The researcher was interested in looking at additional variable data collected during the research study. The next section, exploration of additional data collected is where these additional variables are examined.

Exploration of Additional Data Collected

Data also collected included the question: Have you ever left a project prior to the project go-live? Project managers are hired or assigned to lead project efforts to a successful conclusion and leaving the project before the project going live might be atypical. Because project manager personality characteristics can be a critical success factor in the implementation of projects (Pinto & Slevin, 1988, 1999; Thite, 2000), the researcher wanted to evaluate whether the results of this question had any influence on the primary variables AT and NTC.

Frequency statistics generated showed 62.5% (15) of healthcare project managers who responded to the survey had left a project prior to the projects' go-live and 37.5% (9) project managers did not leave. The reasons provided by participants for leaving included: surgery, company financial reasons and budget cuts, moved to a different state, contract canceled, new job opportunity, and project reassignment to rebalance the project portfolio. The most provided reason for leaving a project prior to the go-live was for a new job opportunity at 27% (4) responses and all other reasons seemed to be out of individuals' control.

Data also collected included the following question: Are you a project management professional (PMP®)? The PMP® certification is awarded after completing education, experience, and testing requirements from PMI®. The researcher wanted to evaluate whether the results of this question had any influence on the primary variables AT and NTC. Frequency statistics were generated to show 58.3% (14) of the healthcare project managers who responded were certified PMP® and 41.7% (10) were not certified. Table 4.7 presents the means, standard deviations, and intercorrelations.

Table 4.7

Means, Standard Deviations, and Intercorrelations for AT, Left Before Go-Live, and PMP® (N = 24)

Variable	M	SD	Left Before Go-Live	PMP®
AT	3.82	.52	-.13	.09
Left Before Go-Live	1.63	.49	--	.39
PMP®	1.58	.50	--	--

Simultaneous multiple regression was conducted to investigate whether if having left a project prior to the project go-live or being a PMP® could predict AT. The combination of

having left a project prior to the project go-live and being a PMP® were not statistically significant, $F(2, 21) = .47$, $p = .63$ when p was found to be greater than .05 and therefore, could not predict AT. Table 4.8 presents the beta coefficients.

Table 4.8

Simultaneous Multiple Regression Analysis Summary for Left Before Go-Live and PMP® Certification Predicting AT (N = 24)

Variables	*B*	*SEB*	ß
Left Before Go-Live	-.21	.25	-.20
PMP® Certification	.18	.24	.17
Constant	3.88	.45	

Simultaneous multiple regressions were conducted to investigate whether if an individual having left a project prior to the project go-live and being a PMP® could predict preferred project dimensions based NTC. Table 4.9 presents the means, standard deviations, and intercorrelations.

Table 4.9

Means, Standard Deviations, and Intercorrelations for NTC, Left Before Go-Live, and PMP® (N = 24)

Variable	*M*	*SD*	Left Before Go-Live	PMP®
NTC	2.76	.81	-.05	-.04
Left Before Go-Live	1.63	.49	--	.39
PMP®	1.58	.50	--	--

The combination of an individual having left a project prior to the project go-live and being a PMP® were not statistically significant, $F(2, 21) = .03$, $p = .97$ when p was found to be

greater than .05 and therefore, could not predict preferred project dimensions based NTC. Table 4.10 presents the beta coefficients.

Table 4.10

Simultaneous Multiple Regression Analysis Summary for Left Before Go-Live and PMP® Certification Predicting NTC (N = 24)

Variable	*B*	*SEB*	ß
Left Before Go-Live	-.07	.39	-.04
PMP® Certification	-.04	.38	-.02
Constant	2.9	.71	

Additional testing was performed to compare means for AT and NTC as grouped by the answer to the question: Have you ever left a project prior to a project go-live? The researcher wanted to know if there were any differences (or a mismatch between AT and NTC) based on these groups. Consequently, these data were grouped into "yes" and "no" answers and the means compared for differences.

For AT, an independent samples *t*-test revealed that healthcare project managers who did not leave a project prior to the go-live ($M = 3.90$, $SD = .60$) and those who did leave the project before a go-live were only slightly lower ($M = 3.76$, $SD = .49$) and were not significant, ($t = .63$, $p = .53$) at the $p = .05$ level (see Table 4.11).

For NTC an independent samples t-test revealed that healthcare project managers who did not leave a project prior to the go-live ($M = 2.82$, $SD = .77$) and those who did leave the project were only slightly lower ($M = 2.73$, $SD = .87$) and were not significant, ($t = .23$, $p = .82$) at the $p = .05$ level (see Table 4.11).

Table 4.11

Descriptive Statistics and Independent t-Test Results for Leaving Before a Project Go-Live, AT, and NTC

Variable	Left Before Go-Live	*N*	*M*	*SD*	*t*	*df*	*p*
AT					.63	.22	.53
	No	9	3.9	.60			
	Yes	15	3.76	.49			
NTC					.23	.22	.82
	No	9	2.8	.77			
	Yes	15	2.73	.87			

Additional testing was performed to compare means for AT and NTC as grouped by the answer to the question: Are you a project management professional (PMP®)? These data were grouped into "yes" and "no" answers and the means compared for differences between AT and NTC.

For AT, an independent samples t-test revealed that healthcare project managers who were not a PMP® (M = 3.76, SD = .58) and those who were a PMP® were only slightly lower (M = 3.86, SD = .49) and were not significant, (t = -.433, p = .71) at the p = .05 level (see Table 4.12).

For NTC, an independent samples *t*-test revealed that healthcare project managers who were not a PMP® (M = 2.80, SD = .82) and those who were a PMP® were only slightly lower, (M = 2.73, SD = .84) and were not significant, (t =.18, p = .86) at the p = .05 level (see Table 4.12).

Table 4.12

Descriptive Statistics and Independent t-Test Results for Are you a PMP®, AT, and NTC?

Variable	Are you a PMP®	*N*	*M*	*SD*	*t*	*df*	*p*
AT					-.43	.22	.67
	No	10	3.76	.58			
	Yes	14	3.86	.50			
NTC					.18	.22	.86
	No	10	2.80	.82			
	Yes	14	2.74	.84			

Participants were then asked to identify all of the healthcare regulatory projects they had worked as well as any others that may not have appeared on the provided list. Table 4.13 shows all of the participant responses for the question. The top five regulatory projects included: 3rd party integration / connectivity (20), meaningful use (MU) all phases (15), electronic health record (14), mergers / acquisitions / joint ventures (13), and secure patient record (10). The bottom five regulatory projects worked included: accountable care organization (2), clinically integrated networks (3), physician quality reporting initiative (5), e-prescribe (5), secure internet portal for patients and/or providers (7), and telehealth (7).

Participants were also asked to identify any regulatory projects that were not listed, these included the following: ANSI 5010, cancer registry SEER, charge description master (rev cycle), and provider immunization reporting. To summarize, participants selected all 12 projects on the provided healthcare regulatory list and four additional projects were identified from the subjective comments section.

Table 4.13

Have You Ever Worked on any of the Following Regulatory Projects? Demographic Information

	Frequency	Percent	Valid Percent	Cumulative Percent
Secure patient record (HIPPA)				
Yes	10	41.7	100.0	100.0
No	14	58.3		
Total	24	100.0		
Electronic health record (EHR)				
Yes	14	58.3	100.0	100.0
No	10	41.7		
Total	24	100.0		
3rd party integration / connectivity				
Yes	20	83.3	100.0	100.0
No	4	16.7		
Total	24	100.0		
e-Prescribe				
Yes	5	20.8	100.0	100.0
No	19	79.2		
Total	24	100.00		
Secure internet portal for patients and/or providers				
Yes	7	29.2	100.0	100.0
No	17	70.8		
Total	24	100.0		
Physician quality reporting initiative (PQRI)				
Yes	5	20.8	100.0	100.0
No	19	79.2		
Total	24	100.0		
Meaningful use (MU) any phase				
Yes	15	62.5	100.0	100.0
No	9	37.5		
Total	24	100.00		
Telehealth				
Yes	7	29.2	100.0	100.0
No	17	70.8		
Total	24	100.0		

Accountable care organization (ACO)				
Yes	2	8.3	100.0	100.0
No	22	91.7		
Total	24	100.0		
Clinically integrated networks (CINs)				
Yes	3	12.5	100.0	100.0
No	21	87.5		
Total	24	100.0		
Mergers / acquisitions / joint ventures				
Yes	13	54.2	100.0	100.0
No	11	45.8		
Total	24	100.0		
ICD-10				
Yes	9	37.5	100.0	100.0
No	15	62.5		
Total	24	100.0		

Summary

This chapter reviewed the data that were collected for this research study. Results included sample demographics, a review of each research question and associated hypothesis, tests performed, and subsequent results found. The primary research question was answered using Pearson's r to determine the correlational strength between ambiguity tolerance (AT) and preferred project dimensions based on novelty, technology, and complexity (NTC).

The secondary and tertiary research questions were answered using multiple regression testing to determine if other variables were predictive of AT and NTC. Also, additional data collected were analyzed using both multiple regression testing and independent samples *t* test to find any relationship and/or differences. Chapter 5 will include a discussion of the results in greater depth, limitations of the study, implications of the results found, along with recommendations for future research, and a conclusion.

CHAPTER FIVE: DISCUSSION

Organizations are frequently using project management methodologies to gain strategic competitive advantages (Shenhar, 2004, p. 578). Previous research studies have shown that project managers who prefer and whose personalities' align with project characteristics were more successful at delivering projects (Malach-Pines et al., 2009). Studies suggest that organizations may well use project dimensions to enhance project classification and possibly the selection of compatible project management leadership styles (Shenhar, 2004, p. 575). Project dimensions based on novelty, technology, and complexity among others may establish a framework for project classification (Shenhar & Dvir, 2007a, 2007b; Shenhar et al., 2005).

Several of the information technology projects generated under the healthcare federal legislation contained aspects of ambiguity (Bordenick et al., 2015; Detmer, 2010; Gold & McLaughlin, 2016; Thorpe et al., 2016). As a result, there have been some occasions where project managers have struggled with novel situations and vague project requisites. It is the opinion of this researcher that this environment may have caused a variety of personnel issues during key project timeframes suggesting that project managers may need special skills to deal with highly ambiguous projects.

A review of the literature showed that ambiguity tolerance is rising as a factor in project management (Atkinson et al., 2006; Hagen & Park, 2013; Hällgren & Maaninen-Olsson, 2005; Ylinen & Gullkvist, 2012). Though various researchers have investigated numerous project manager personality characteristics and skills associated with delivering successful projects (Creasy & Anantamula, 2013; Dvir et al., 2006; Malach-Pines et al., 2009; Smith, 2001), few if any studies were found to have examined ambiguity tolerance as a personality characteristic and preferred project dimensions in the domain of healthcare project management.

This study may have been one of the first to find a strong correlational strength between self-reported ambiguity tolerance levels and preferred project dimensions based on novelty, technology, and complexity in healthcare project managers. It appears that project managers may be aware of their ambiguity tolerance and preferred project dimensions and it is interesting that these variables self-report in the same positive theoretical direction. This means generally when project managers have high ambiguity tolerance they also prefer projects with high project dimensions (high novelty, high technology, and high complexity projects) and the reverse is also accurate, project managers who self-report low ambiguity tolerance also prefer projects with low project dimensions (low novelty, low technology, and low complexity projects).

It is important to remember that there are a plethora of healthcare information technology projects for all levels of ambiguity tolerance. Applying Shenhar and Dvir's (2007) NTCP Diamond Framework model is an effective way to classify projects at all levels of ambiguity tolerance. For example, a high novelty dimension project might be the implementation of the Electronic Health Record (EHR). The EHR may be new to a healthcare organization or possibly adopting an existing EHR to a different healthcare organization. A low novelty dimension project might be considered derivative such as a functional improvement to an existing software system or an incremental upgrade to an existing software system. Both types of projects are routinely accomplished by information technology project managers in healthcare and based on their ambiguity tolerance level, there may be an attraction to or an aversion of a project.

Based on this research, it is important to recognize the individual personality characteristics of healthcare project managers and their associated preferences for various projects. Many times the needs of the healthcare organization override personal preferences, but when able both healthcare project managers and organizational leaders should work towards the

alignment of ambiguity tolerance levels and preferred project dimensions. Caution is prudent at this point since the results of this study may not equal performance. However, based on Malach-Pines et al., (2009), project managers whose personalities match their project's dimensions may be more successful in the delivery of their projects.

Limitations of the Study

The following limitations pertained to this research. This study was designed specifically for project managers associated with a large not-for-profit healthcare system located in Denver, Colorado. Generalizability of results across other healthcare systems may be limited, therefore, research in other healthcare systems is recommended.

Although a strong significant correlation was found, greater participation may have increased the strength of the findings. As often is the case, time was also a limitation of this research study. Data collection took a total of eight weeks and more time may have resulted in additional participants and corresponding responses. Another possible limitation was the use of a self-report measure that may have contributed to problems inherent in this design.

As with all correlational research, the study was designed to identify any possible relationships between the primary variables and possible predictive variables. The research study was not designed to determine a causal relationship between any of the variables. Though some limitations do exist, the research study results may have important theoretical and practical value.

Implications

Malach-Pines results concluded that project managers whose personality matched their project dimensions were more successful than those whose personality did not match their project dimensions (Malach-Pines et al., 2009). When project managers were asked to self-

report their AT and NTC they typically align in a positive direction. This may have implications for assigning projects. Theoretically, if additional research is conducted to verify this relationship and to establish a connection to performance, it may be possible to align project managers to project dimensions. We use caution here and report that even though project managers appear to self-report these measures in a similar and positive direction, we do not know if these will align with actual project performance.

The results suggest that healthcare project managers who self-report to have a high tolerance of ambiguity may well prefer projects with high levels of project dimensions and those who self-report to have a low tolerance of ambiguity may well prefer projects with low levels of project dimensions. Possibly, when there is incongruity between ambiguity tolerance levels, preferred project dimensions, and assigned projects, there may be a risk since project managers are one of many key factors in the successful delivery of projects (Creasy & Anantamula, 2013; Hartman & Ashrafi, 2002; Pinto & Slevin, 1988, 1999; Thite, 2000).

Practically speaking, there may be multiple applications of the findings from this research for healthcare project managers and organizational leadership with the goal to improve project success. One recommendation is to possibly leverage ambiguity tolerance levels when looking to assign or to accept new projects while taking into consideration preferred project dimensions. Another recommendation is to look at the NTCP diamond framework to see where projects could be classified using this model. Organizational leadership could translate the results of this study into a few guidelines among others to help improve project fit for healthcare project manager selection and project assignments.

Participants in this study also identified the healthcare regulatory projects that they had worked from the list of provided projects. All 12 projects listed received responses of both yes

and no answers and four additional projects were identified in the subjective comments section of the survey. Below are some additional thoughts on the healthcare regulatory projects that were worked by the survey respondents.

An overwhelmingly large number of study participants (20) or 83% worked on the 3rd party integration / connectivity projects. Generally, these projects most likely came from the PPACA legislation and that legislation assumed that public and private computer systems could be effortlessly integrated. However, standards for interoperability and connectivity between IT systems were not provided in the legislation, and thus, are still an on-going challenge between various healthcare providers and medical vendors (Bordenick, Okubo, Kontur, & Siddiqui, 2015; Detmer, 2010; Gold & McLaughlin, 2016; Thorpe, Gray, & Cartwright-Smith, 2016).

The second and third most worked projects included meaningful use (15) or 62.5% and the electronic health record (10) or 41.7%. These projects were related since meaningful use signifies the meaningful use of the electronic health record. Some participants may have worked on projects associated with the implementation of the overall electronic health record and others worked on extending the use and functionality (several phases) associated with the electronic health record since the legislation required a report out on percent of functionality implemented and verification of utilization.

Some of the lower frequencies of note were the projects to implement accountable care organizations (2) or 8.3% and clinically integrated networks (3) or 12.5%. As part of the legislation, novel business relationships were introduced and healthcare providers were encouraged to create accountable care organizations (ACOs) and clinically integrated networks (CINs) through contracts to support specific populations (Glaser, 2010). Affected organizations included group practices, networks of individual physician practices, partnerships, and hospitals

participating as ACOs and CINs. These relationships resulted in mergers, acquisitions, and joint ventures. Low participation in these projects may be due to the highly specific nature of the development and implementation of contractual relationships.

Recommendations for Future Research

The results of this study were considered exploratory and preliminary. Research in other healthcare institutions is recommended to determine if similar results could be found and additional variables tested. Both of the scales, ambiguity tolerance (AT) and preferred project dimensions based on novelty, technology, and complexity (NTC) used in this study were not healthcare industry specific; consequently, another area for additional research would be to investigate project managers in other industries.

There were two individuals whose AT and NTC scales were less well aligned. It may be interesting to investigate these individuals and their experiences as project managers. Exploring why these project managers reported high AT but preferred low NTC projects may be noteworthy. Four individuals left projects prior to their projects going live for new positions. It may be interesting to further investigate why they were looking for new opportunities at this critical stage in the project. Also, additional personality measures could be tested along with using other methodologies such as: case studies, interviews, etc., to bring additional comprehension of AT and NTC. Experimental research is necessary to determine a causal relationship between AT and NTC.

Even though healthcare project managers were the prime focus of this research study, it may be valuable to consider stakeholders and organization leadership in healthcare for future AT studies. These individuals were the recipients and end-users of many regulatory projects. It may be interesting to understand how their ambiguity tolerance was affected by these highly complex

and novel projects that were completed within tight timelines to meet HITECH and PPACA legislation. Non-compliance of this legislation resulted in the loss of significant revenue (Gold & McLaughlin, 2016).

Conclusion

The study was conducted to determine if any relationships existed between healthcare project managers' ambiguity tolerance (AT) and preferred project dimensions based on novelty, technology, and complexity (NTC). A strong positive correlation was found between project managers who have a high tolerance of ambiguity and their preference for projects with high levels of project dimensions and project managers who have a low tolerance of ambiguity and their preference for projects with low levels of project dimensions. AT and NTC were explored with possible predictor variables including education level and years of experience with no significant relationships found. Additionally, other variables (having left a project prior to the project go-live and having a PMP certification) also resulted with non-significant relationships or differences found.

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APPENDIX A: CSU IRB APPROVAL

Colorado State University
Knowledge to Go Places

eProtocol
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011 eprotocol
TEL: (970) 491-1553
FAX:

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	June 11, 2019
TO:	Folkestad, James, School of Education
	Faircloth, Susan, School of Education, Clark, Kelli, School of Education, Sullivan, Michelle, School of Education
FROM:	Felton-Noyle, Tammy, Senior IRB Coordinator, BMR, CSU IRB Exempt
PROTOCOL TITLE:	EXPLORING THE RELATIONSHIP BETWEEN PROJECT MANAGERS' AMBIGUITY TOLERANCE AND PREFERRED PROJECTS IN HEALTHCARE: A QUANTITATIVE EXPLORATORY STUDY
FUNDING SOURCE:	NONE
PROTOCOL NUMBER:	19-8977H

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: EXPLORING THE RELATIONSHIP BETWEEN PROJECT MANAGERS' AMBIGUITY TOLERANCE AND PREFERRED PROJECTS IN HEALTHCARE: A QUANTITATIVE EXPLORATORY STUDY. The project has been approved for the procedures and subjects described in the protocol.
Full Board Review: This protocol must be reviewed for renewal at least annually for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.
Expedited Review: This protocol is approved for a duration of three years, unless otherwise notified. You remain obligated to submit amendments, deviations, unanticipated problems per policy.
Exempt Review: This protocol is approved for a duration of five years. You remain obligated to submit amendments, deviations, unanticipated problems per policy.

Important Reminder: If you will consent your participants with a signed consent document, it is your responsibility to use the consent form that has been finalized and uploaded into the consent section of eProtocol by the IRB coordinators. Failure to use the finalized consent form available to you in eProtocol is a reportable protocol violation.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

IRB Office - (970) 491-1553; RICRO_IRB@mail.Colostate.edu
Evelyn Swiss, Senior IRB Coordinator - (970) 491-1381; Evelyn.Swiss@Colostate.edu
Tammy Felton-Noyle, IRB Biomedical Coordinator - (970) 491-1655; Tammy.Felton-Noyle@Colostate.edu

Felton-Noyle, Tammy

Initial exempt determination has been granted June 7, 2019 to recruit with the approved recruitment and consent procedures. The above-referenced research activity has been reviewed and determined to meet exempt review by the

APPENDIX B: LETTER OF CONSENT

Colorado State University
College of Health and Human Sciences - School of Education
450 W. Pitkin St., Fort Collins, CO 80523-1588

Dear Participant,

My name is J. Michelle Sullivan and member of the organizational learning performance and change (OLPC) PhD program at Colorado State University (CSU) and we are conducting a research study on "exploring the relationship between project managers' ambiguity tolerance and preferred projects in healthcare."

The principle investigator is Dr. James Folkestad, Professor in the School of Education and my dissertation committee chair. I am the co-principle investigator and doctoral candidate for this important research study.

The survey will take less than 15 minutes to answer 30 questions (25 questions are multiple choice) and is completely voluntary and confidential. Within the survey, you will be asked for your permission for a follow-up phone call from the researcher on your survey responses.

You may withdraw your consent at any time by exiting the survey before completion. The data will be collected and coded and when we share survey results, the information will be summarized from all survey participants and not individually identified.

There are no known risks to you personally for participating in this anonymous survey and while there are no direct benefits to you, we hope to add these important results to the project management body of knowledge (PMI®).

If you have any questions about this research, please contact me at Michelle.Sullivan@colostate.edu; [redacted] or you may also contact Dr. James Folkestad at James.Folkestad@colostate.edu; [redacted]. If you have any questions about your rights as a volunteer in this research, contact the CSU Institutional Review Board at RICRO_IRB@mail.colostate.edu; [redacted].

Please indicate your electronic consent to participate in the survey and continue to Survey Monkey® by clicking the digital hyperlink below:

https://www.surveymonkey.com/r/L996C5H

James Folkestad, PhD
Professor

J. Michelle Sullivan
PhD Candidate

APPENDIX C: QUESTIONNAIRE

1. What is your name?

2. What is your email address?

3. What is your phone number?

4. Select your age group below:

65+
55-64
45-54
35-44
25-34
18-24
Under 18

5. Identify your current title below:

Project Manager
Program Manager
Project Director
Program Director
Other (please specify)

6. Are you a Project Management Professional (PMP)?

Yes
No
Other (please specify)

7. What is your current employment status?

Employee
Consultant
Contractor
Temporary
Other (please specify)

8. Total year of experience in project management?

1-5 years
6-10 years
11-20 years
21-30 years
31+ years

9. What is your highest education level?

GED or High School Diploma
BA or BS
MA or MS

DM or PhD

10. Have you ever left a project prior to the project going live?

Yes
No
If yes, please tell us why you left?

11. Have you ever worked on any of the following regulatory projects? Check all that apply.

Secure Patient Record (HIPPA)
Electronic Health Record (EHR)
3rd Party Integration / Connectivity
Secure Internet Portal for Patients and/or Providers
Physician Quality Reporting Initiative (PQRI)
e-Prescribe
Meaningful Use (MU) – Any Phase
Telehealth
Accountable Care Organizations (ACO)
Clinically Integrated Networks (CINs)
Mergers / Acquisitions / Joint Ventures
ICD-10
Other (please specify)

12. Based on Novelty, select one project type you would prefer to manage below.

Derivative: Improvement in an existing product.
Platform: A new generation on an existing product line.
New To Market: Adopting an existing product to a different market.
New To The World: Product that no one has seen before.

13. Based on Technology, select one project type you would prefer to manage below.

Low-tech: No new technology is used.
Medium-tech: Some new technology is used.
High-tech: All or mostly new, but existing technologies.
Super High-tech: Non-existent or never used technologies at time of project initiation.

14. Based on Complexity, select one project type you would prefer to manage below.

Component / Material: The product is a discrete component within a larger product or material.
Assembly: A subsystem, performing a single function.
Single System: A collection of subsystems performing multiple functions.
Array: Widely dispersed collection of systems with a common mission.

15. Based on Pace, select one project type you would prefer to manage below.

Regular: Delays not critical.
Fast-competitive: Time to market is important for the business.
Time-critical: Completion time is crucial for success-window of opportunity.
Blitz: Crisis project- immediate solution is necessary.

16. I don't tolerate ambiguous situations well (G1).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

17. I would rather avoid solving a problem that must be viewed from several different perspectives (I1).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

18. I try to avoid situations that are ambiguous (G2).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

19. I prefer familiar situations to new ones (N1).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

20. Problems that cannot be considered from just one point of view are a little threatening (I2).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

21. I avoid situations that are too complicated for me to easily understand (C1).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

22. I am tolerant of ambiguous situations (G3).

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

23. I enjoy tackling problems that re complex enough to be ambiguous (C2).

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

24. I try to avoid problems that don't seem to have only one "best" solution (I3).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

25. I generally prefer novelty over familiarity (N2).

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

26. I dislike ambiguous situations (G4).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

27. I find it hard to make a choice when the outcome is uncertain (U1).[c]

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

28. I prefer a situation in which there is some ambiguity (G5).

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

29. Would you be interested in participating in a follow-up phone call with the researcher on ambiguity tolerance and preferred projects?

Yes
No

30. Can you recommend any other healthcare project manager(s) who would be interested in participating in this survey?

Yes
No
If yes, please add their email address(es) below:

Please note that questions identified with a ([c]) are the questions that were negatively stated and therefore reversed scored.

Please note that the codes to the right of some of the questions indicate that the scale includes three items considered insoluble, illogical, irreducible, and internally inconsistent stimuli (I), two items address unfamiliar, new and novel stimuli (U), two items address complex stimuli (C), one item refers to uncertain stimuli (U), and five items correspond to ambiguous stimuli in general (G).

APPENDIX D: MSTAT-II APPROVAL FOR USE

COLORADO STATE UNIVERSITY

Michelle Sullivan <msulliva@rams.colostate.edu>

Request for Author Permission to Use - MSTAT-II Dissertation Research

5 messages

Michelle Sullivan <msulliva@rams.colostate.edu> Wed, May 9, 2018 at 3:27 PM
To: dmclain@alum.mit.edu

Hello Mr. McLain,

My name is J. Michelle Sullivan and I am working on a PhD in Organizational Learning, Performance and Change at Colorado State University.

I am contacting you to inquire about the possibility of using the MSTAT-II instrument for my doctorial research.

I am examining the relationship between project manager's tolerance of ambiguity (TA), project traits and project success within healthcare to drive change in project manager assignments.

With your permission, I will use this instrument in my research. I look forward to your response.

Thank you so much,

J. Michelle Sullivan

Doctoral Candidate, OLPC PhD Program

Colorado State University

David McLain <dmclain8@gmail.com> Wed, May 9, 2018 at 6:36 PM
To: Michelle Sullivan <msulliva@rams.colostate.edu>

9 May 2018

Hi Michelle,

You have permission to use the MSTAT-II as a research instrument. If you have any questions regarding its use or research more generally, don't hesitate to ask. I wish you the best of luck as you complete your doctoral work.

David McLain
Hamilton, NY
[Quoted text hidden]

Michelle Sullivan <msulliva@rams.colostate.edu> Thu, May 10, 2018 at 8:59 AM
To: David McLain <dmclain8@gmail.com>

I will certainly do that - thank you so much!!
[Quoted text hidden]

APPENDIX E: NTCP APPROVAL FOR USE

Michelle Sullivan

From: DvirD@som.bgu.ac.il
Sent: Wednesday, June 6, 2018 6:14 AM
To: Michelle Sullivan
Subject: Re: Permission to Use

Dear Michelle.

You may use the NTCP framework for your research.

Best regards,

Dov Dvir

From: Michelle Sullivan <michellesullivanhome@comcast.net>
Sent: Wednesday, June 6, 2018 1:06 AM
To: Dov Dvir
Subject: Permission to Use

Hello Dr. Dvir,

My name is J. Michelle Sullivan and I am working on a PhD in Organizational Learning, Performance and Change at Colorado State University.

I am contacting you to inquire about receiving your permission to use the NTCP Diamond Model / Project Classification Questionnaire / instrument for my doctorial research. I also reached out to Dr. Shenhar but, did not hear back.

I am examining the relationship between project manager's tolerance of ambiguity (TA) and project traits (where I will use the NTCP instrument) within healthcare to drive change in project manager assignments.

With your permission, I will use this instrument in my research. Thank you so much - I look forward to your response.

J. Michelle Sullivan
Doctoral Candidate, OLPC PhD Program
Colorado State University