An Empirical Study of the Relationships between Technology Managers Personality Traits and Successful Utilization of Radical Innovation in U.S. Industry

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Abstract

This study addresses the issue of how the Big Five personality traits of Technical Managers (TM) in U.S. firms impact successful utilization of radical innovation (SURI). A firm's ability to survive in the emerging global business arena depends on its ability to continuously produce market leading products, processes, services resulting in competitive advantage. A representative random sample of U.S. based TM were surveyed with a self-answer questionnaire instrument. A valuable new model of Big Five personality traits and (SURI) provided for testing of the research study's hypotheses. Openness of a TM can be predictive of a decrease in SURI and lower firm performance. Conscientious of a TM can be predictive of a decrease in SURI and lower firm performance. Extraversion of a TM can be predictive of a decrease in SURI and lower firm performance. Agreeableness of a TM can be predictive of a decrease in SURI and lower firm performance. Neuroticism of a TM can be predictive of an increase in SURI and raise firm performance. Firms should select, train and support TM with neurotic personality traits to lead the firm's innovation teams to increased SURI and sustain global competitive advantage.

Acknowledgements

Wow, this would have been a whole lot easier in my thirties. Here now at the age of 60 I can remember how many times I wanted to just quit and never again have to tell someone I couldn't attend other functions because of DBA duties. I now reflect upon the poem "Foot Prints in the Sand" and know that without God's word, grace and love I could not have completed this journey…thank you I Am that I Am. Thank you Winston Churchill for your famous words of "Never, never, never quit." I now thank my family for doing without me on lots of family events. So, with that said, to my eight children, Ty, Tamara, Matthew, Austin, Katherine, Sarah, Caleb and Noah, start your doctorate journey before you turn 40! And last but not least, to Marybeth, the love of my life, thank you for your patience, love and encouragement to, "get this wrapped up buttercup!"

Now to the heavy lifters. Dr. Marty Sutherland, you made me pivot to continue when I could not see going forward. Thank you, Dr. Marty! To Dr. Michael Voris, you extended me grace, guidance and encouragement while I was hospitalized several times and at the end of my rope. Without your kindness and tolerance, this journey would not have been completed. Thank you Dr. Voris! NCU has a rare and golden sage/mentor/teacher with you. Special thanks to Dr. Donnellan for doing so in a loving way, cracking the whip on me to get through my first doctorate level literature review.

Abraham Lincoln once commented he would rather be beaten with a fence rail than have to read! Me too. I read and write like a turtle. Perhaps that's the curse of a cerebral types. Special thanks to Dr. Sopko as well as, my academic reader. I hope this dissertation does you no harm. In closing, I hope what I have learned can be of use to the benefit others.

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Chapter 1: Introduction

The objective of this research proposal is to empirically compare Technology Manager's (TM) personality traits that are most suitable for Successful Utilization of Radical Innovation (SURI) in U.S. firms. U.S. firms face a rapidly increasing bandwidth of unfettered innovation competition as globalization increases. Thus, for top managers and the American government, it has become important to understand how to more efficiently promote Radical Innovation (RI) to gain substantial competitive advantage (Chen & Chen, 2009). Global executives stress the importance of continuous innovation for new products, services and processes, yet 94 percent of the global executives expressed dissatisfaction with their firm's innovation performance (Christiansen, Hall, Dillon & Duncan, 2016). RI advances the price-performance frontier much more than incremental innovation methods. RI innovation causes more fundamental change in the activities of firms and causes more project risk with regard to their development and commercialization than incremental innovations (Damanpour, 1996; Sorescu, Chandy & Prabbu, 2003). Firms developing radical innovations face greater uncertainty and risk of failure and often encounter unanticipated challenges that require the concerted efforts of the team as a whole to move the project forward rather than face termination (Alexander & Knippenberg, 2014).

Therefore, the personality traits of an innovation team TM may be important to SURI. There may be a close relationship between a firm's successful utilization of radical innovation and the organization's TM. Accordingly, the firm's human resources management team must closely adhere to the TM hiring protocols established by the firm's management and leadership team. Chen and Chen (2009) posit that the Human Resources (HR) manager of firms should focus on hiring technology managers who have Extraversion and Agreeableness.

Statement of the Problem

Globalization has increased competition through outsourcing, innovation value, and the need for lower pricing (Sampson & St. James, 2012; Varga, Allen, Strather, Rose-Anderson, Baldwin & Ridgway, 2009). As a result, continuous innovation has become a strategy for competitiveness and sustainability in U.S. industry (Grimaldi, Cricelli & Rogo, 2012). The problem is that although continuous innovation is needed for firms in the U.S. sector to be competitive and sustainable, certain organizational culture issues might hinder leaders from successfully innovating (Emory, 2010; Ramanigopal, 2012). The relationship between TM personality traits in successful continuous innovation remains unexplained; and the influence of environmental factors, such as the kinds of companies' goods at issue, remain ambiguous (Isada & Isada, 2016). In order to understand the relationships between TM personality traits producing SURI, this quantitative study will use a questionnaire designed using prior research on innovation management issued to TM at 105 U.S. firms to bring out details on U.S. firms TM traits and their firm's SURI.

Purpose of the Study

The purpose of this quantitative study is to assess the relationship between TM personality traits and SURI among U.S. firms in the U.S. The participants will be selected from U.S. firms in North America. The G*Power with an anticipated effect size of 0.15, a desired statistical power level of 0.08 the number of at predictors of 5 results in a minimum required sample size of 91 participants. A sample of 105 U.S. firms will be selected from existing U.S. based Qualtrics resource panels as a source for these firms.

The study will be conducted using a sample of 105 TM in U.S. industry who will receive electronic questionnaires using the 44 item Big Five Inventory for personality traits. These Big

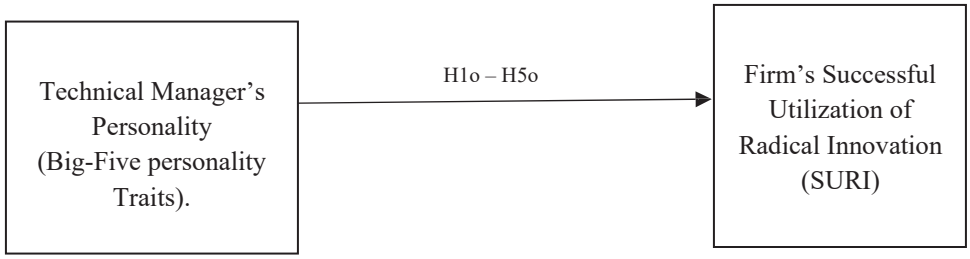
Five personality traits include Openness, Conscientiousness, Agreeableness, Extroversion, and Neuroticism.

Recent literature has proposed that Neuroticism, Extraversion, and Conscientiousness have strong positive relationships with work performance and the success of a firm's operation (Hurtz & Donovan, 2000). Some studies have indicated that a person who possesses Neuroticism will be more likely to have negative emotions (Sul, Green, & Hills, 1998), poor work performance (Tokar & Subich, 1997), low job satisfaction (Judge & Locke, 1993; Necowitz & Roznowski, 1994), and separation from colleagues (Brief, Butcher, & Roberson, 1995).

Conceptual Framework

As a result, the research methodology will be a quantitative, non-experimental design, collect primary data from a sample of 105 technology managers in U.S. industry. It is appropriate to collect the research data from TM to ascertain their Big Five personality traits to assess any relationship to their firm's use of RI in their operations. These Big Five traits are Extroversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to Experience and are believed by this researcher to be directly related to the RI dependent variable.

Figure 1. Proposed Conceptual Model for this Research Study



Quantitative methodology most often utilizes questionnaires to collect the required data which measures, analyses and provides numerical results from the data (Avgousti, 2013). Data for this study was collected by the 44-item Big Five Inventory and analyzed by SPSS, a well-known statistical software often used for quantitative research. Mean, median, mode and other useful statistical information is produced for distribution of scores and graphical data. IBM SPSS was selected for the research analysis as a result of its ability to interface directly with the Big Five Inventory questionnaire instrument.

This study will use the 5-point Likert scale for the BFI questionnaire. Factor analysis will be used to find major factors in two main dimensions: personality traits and successful utilization of radical innovation (SURI) success. Reliability analysis will be conducted to establish Cronbach's α value expected to ≥ 0.07 establishing sampling reliability. Correlation analysis will be used to explore the relationship of TM personality traits to SURI. Descriptive statics and regression analysis will be used to confirm any relationship of TM personality traits that significantly correlate with the firm's SURI. A Kaiser-Meyer-Olkin measure of sampling will be applied to establish sampling adequacy for personality traits before factor analysis begins. The quantitative results will be summarized to provide any clear and concise relationship and the related implications to TM traits and SURI.

Nature of the Study

The purpose of this quantitative case study is to assess the relationship of U.S. firms' TM personality traits and what impact they impart upon the success of a U.S. firm's SURI. The study will select 105 high tech firms from U.S. firms to collect data related to the Big Five personality traits of their TM performance, collective and individual (Hurtz & Donovan, 2000; Barrick, Mount & Judge, 2001). These Big Five personality traits include Openness, Conscientiousness,

Extroversion, Agreeableness, and Neuroticism. For reference convenience, the term firm or firms in the remaining research study, will be used to indicate U.S. firms.

This research proposal will also use the generic title of Technology Manager (TM) for reference convenience, however there are other titles used by many of the participants who will be invited to take the questionnaire. Some participant's title will be Technology Manager, Director of Research and Development, Chief Technical Officer, Manager of Research and Development, Product Manager, Process Managers, and Service Manager among several other titles referring to individuals who are charged by their firms with managing the firm's innovation teams for product, service and process innovation in advancing the company's products, services, and process to achieve and or sustain a competitive advantage with their global competitors.

Research Questions

The following five research questions and articulated hypotheses will guide the planned investigation of the study.

RQ1: What is the relationship between a technology manager's personality trait of neuroticism and the successful utilization of radical innovation in the firm's performance?

RQ2: What is the relationship between a technology manager's personality trait of extraversion and the successful utilization of radical innovation in the firm's performance?

RQ3: What is the relationship between a technology manager's personality trait of conscientiousness and the successful utilization of radical innovation in the firm's performance?

RQ4: What is the relationship between a technology manager's personality trait of openness to experience and the successful utilization of radical innovation in the firm's performance?

RQ5: What is the relationship between a technology manager's personality trait of agreeableness and the successful utilization of radical innovation in the firm's performance?

Hypotheses

H1a: There is a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H1o: There is not a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H2a: There is a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H2o: There is not a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H3a: There is a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H3o: There is not a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H4a: There is a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H4o: There is not a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H5a: There is a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H5o: There is not a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Significance of the Study

Although numerous research studies have been produced on organizational management culture's influence upon RI, there exists a gap on the influence of the Big Five personality traits of a TM on a firm's SURI. Robbins and Coulter (2002) define innovation as the process that adopts innovative ideas and translates those ideas into useful products, processes, and services. Additionally, innovations are defined as a new product, process, or service that business firms use (Lo, 2004; Chen, 2005). Generally, innovation can be seen as a new product (Damanpour, 1996), new process (O'Sullivan, 2000), or new invisible contribution to the working or living environment (Bantel & Jackson, 1989). The literature discussed above is a body of research that defines innovative operations as the combination between innovation and operations (Wu & Lai,

2006; Wu 2005; Chen, 2005). Innovative operation is intended to promote profit and a firm's competitiveness (Lo, 2004).

The findings of this research study will provide U.S. firm's executive leaders with novel insights on TM personality traits for increasing the success rates for their firm's SURI allowing for attainment and or sustainment of their competitive advantage in the global marketplace.

Definition of Key Terms

This section outlines and defines the important terms presented in this study.

Radical Innovation (RI). Radical innovations prompt significant subsequent technological development and exhibit novelty and "architectural" innovation, i.e., rearranging the way design elements are put together in a system (Kasmire, Korhonen, & Nikolic, 2012).

Successful Utilization of Radical Innovation (SURI). A firm's successful utilization of radical innovation to attain competitive advantage through market leading products, processes and services.

Incremental Innovation. A series of small improvements to an existing product or product line that usually helps maintain or improve its competitive position over time (Business Dictionary, 2012).

Competitive Advantage. Competitive advantage is the value that influences customers to choose an organization's products or services over the competitor's and serves as an imitation inhibitor (Christensen, 2010).

Openness to Experience. Managers indicating Openness to Experience play a critical role in job training (Barrick, Mount, & Judge, 2001; George & Zhou, 2001).

Conscientiousness. Managers indicating Conscientiousness positively relates to attention to detail, responsibility, work performance, and academic achievement (Paunonen & Ashton, 2001; Gray & Watson, 2000; Heaven, Mark, Barry, & Ciarrochi, 2002).

Extroversion. Managers indicating Extroversion generally have high job satisfaction (Watson & Slack, 1993; Tokar & Subich, 1997), and will be more likely to achieve top positions (Hurtz & Donovan, 2000; Hogan & Holland, 2003).

Agreeableness. Managers indicating Agreeableness have a positive relationship with successful performance because they foster cooperation (Hogan & Holland, 2003).

Neuroticism. Managers indicating Neuroticism will be more likely to have negative emotions (Suls, Green, & Hillis, 1998), poor work performance (Tokar & Subich, 1997), low job satisfaction (Judge & Locke, 1993; Necowitz & Roznowski, 1994), and separation from colleagues (Brief, Butcher, & Roberson, 1995).

Summary

A firm must produce new and beneficial products, processes and services to remain competitive as globalization accelerates the advance of competitors, or face becoming uncompetitive and obsolete. Adoption or acquisition of certain TM personality traits should increase a firm's SURI and will improve a firm's ability to meet global markets demands for innovative products, processes and services allowing the firm to maintain a competitive advantage. Therefore, in analyzing the optimal personality traits of a TM is important to U.S. firms.

Chapter 2: Literature Review

This chapter presents the conceptual frameworks of literature relevant to this research study while providing results of empirical studies to support the development of the conceptual research model in the following chapter. First, the chapter provides an in-depth discussion of Radical Innovation (RI) operations. Second, the chapter presents a background on various personality trait theories relevant to this research study and definition of the research study's targeted participants, Technology Managers (TM). Third, the chapter discuss instruments for measuring various personality traits including the Big Five Inventory (BFI) personality traits. Fourth, the chapter discusses RI and the impact TM personality traits may have on the Successful Utilization of Radical Innovation (SURI) of the firm. The chapter concludes with a discussion on the related literature of technology management of a firm's RI operations.

Conceptual Framework

Literature relating to TM personality traits and their relationships to innovation operations is presented. This research proposal used the generic title of technology manager for reference convenience, however there are other titles used by many of the participants who will be invited to take the questionnaire. Some participant's title will be Technology Manager, Director of Research and Development, Chief Technical Officer, Manager of Research and Development, Product Manager, Process Managers, and Service Manager among several other titles referring to individuals who are charged by their firms with managing the firm's innovation teams for product, process and service innovation in advancing the company's products, process and service to achieve and or sustain a competitive advantage with their global competitors.

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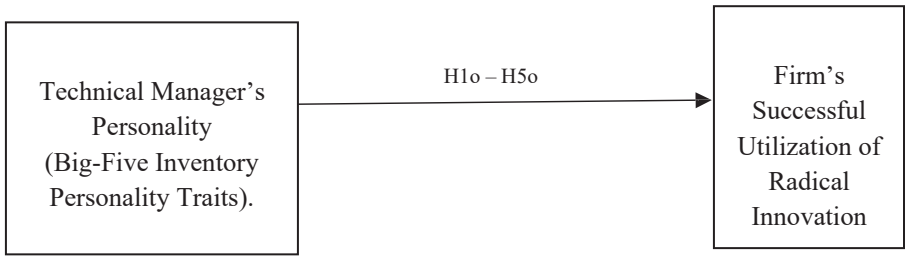

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Radical Innovation (RI)

According to O'Conner and Rice (2013), RI can be defined as an unprecedented change of feature or performance in a product, process or service with alterations in familiar features which allow application of new domains. Innovations may occur in incremental, open, discontinuous or radical formats where customers experience significant changes in perceived usage and familiarity when compared to previous versions (Bessant, 2003; Meyers & Tucker, 1989; Veryzer, 1998). An innovation can be said to be radical if it significantly changes or alters

consumer value perception and at the same time results in changes in market size, market share, pricing or revenues. RI is a process that entails innovation without comprehensive understanding, hence resulting in unprecedented outcomes (Starbuck, 2014). Historically, individuals who have made radical innovations such as Archimedes, Sir Isaac Newton, Leonardo Da Vinci, Nicola Tesla, Albert Einstein, Bill Gates, Steve Jobs and Elon Musk have had comprehensive understanding and vivid imaginations related to their RI projects from the beginning of the project inception. Einstein demonstrated an extraordinary clarity to radical thinking which began as a radical thought with his mind experiments. Einstein is credited with stating, "Imagination is more important that knowledge." Einstein's radical thoughts were used by many scientists to produce RI like the sustained nuclear reactions attained by Dr. Fermi in Chicago and later the production of atomic weapons by the Los Alamos team led by Dr. Oppenheimer. RI challenges existing or traditional organizational goals and activities with an evaluation of existing theories, beliefs or cultures in use (Argyris & Schon, 1997). They also challenge existing logics, mental models, behavioral norm and beliefs (Bettis & Prahalad, 1995). RI entails the transformation of new knowledge into current knowledge in a manner that adds value to organizations (Kelley, O'Connor, Neck, & Peters, 2011). This is characterized by ambiguity and risk due to the unknown nature of expected outcomes and the underdeveloped nature of the new knowledge. Operating in unfamiliarity also increases the risk portfolio significantly. RI is dependent on the risk-taking nature and persistence of a few individuals as management rarely has incentives to look beyond existing portfolios or incremental processes (Schon, 1967; Chandy & Tellis, 1998). Firms in the U.S. should have the ability to foster growth through identification of new external knowledge and assimilate it in commercial applications. A firm's ability to develop radical innovation is frequently seen as the key to success and long-term

survival (O'Connor & Rice, 2013). For a firm to be successful with radical innovation, a key requirement is for the firm to be deeply committed in the upfront works of structuring the radical innovation project and then enabling the project to move through the various phases of the initiative. The newness of a radical innovation makes its potential for success susceptible to the onerous corporate management concerns and marketplace obstacles. Consequently, many firms fail to develop radical innovation and often end up with incremental outputs despite bold intentions (Garcia & Calantone, 2002, Sandberg & Aarikka-Stenroos, 2014).

More and more companies are discovering that RI offers their firms substantial opportunities to survive the emerging onslaught of rapid advances in globalized technology. It is with management's adoption of RI, through thoughtful organization, thoughtful TM selection, thoughtful consideration and thoughtful funding for innovative ideas that this new and powerful tool called RI can be employed to sustain their firm's performance (Carcia & Calatone, 2002; Reid & de Brentani, 2004; Floren & Frishammar, 2012; O'Connor & Rice, 2013).

The art of RI is being studied at an increasing pace among universities, technical groups, industry, governments and various other organizations. What initially was relegated to a visionary's intellectual capability, is now being seen as more of a scientific approach. Techniques for developing RI programs to lead to unknown new scientific knowledge are being developed at an increasing rate. Project plans, RI methodologies, RI theories and RI project templates are now emerging within firms and becoming available through various venues including the global internet (Frishammar, Dahlskog, Krumlinde, & Yazgan, 2016).

Most RI projects are abandoned before completion due to a myriad of reasons, some general and others unique (Cooper, 2001). In order to achieve long-term sustainability and viability for these firms, it is critical that this persistent problem is solved. RI provides

organizations with opportunities to create new products, new processes, new services and new markets as well as expansion of existing markets. Firms should use their internal abilities to explore external markets and internal processes, to take advantage of opportunities and to eliminate existing threats (Makri & Scandra, 2010).

One novel approach to using RI as an engine for growth is a set of nine strategies. These strategies are known as culture-challenging and risk-reducing as listed on the following Table 1. (Nicholas, Ledwith, & Bessant, 2015). Firms are now defining and categorizing various RI methods and techniques to enable their firm's TM and teams to understand the structuring and methods for enabling their firms to achieve SURI. The once needed visionary dreamer for SURI is being alternatively replaced by tried and tested successful RI methods and emerging theories. As globalization brings about ever increasing networking, a new trend is presenting which surpasses crowdsourcing called global-sourcing which will provide even greater RI operations at an expanding rate.

Table 1.1 (Adapted from Nicholas, Ledwith, & Bessant, 2015).

Strategies Firms use for Electing Radical Innovations

Strategy	**Definition**	**Tools**
Culture-Challenging Strategies		
Building alternative visions	Imaging different potential Futures – in particular, futures that challenge the current trajectory and underlying paradigm	Scenario planning Story boards Trend extrapolation Constructed crisis techniques
Prototyping to build bridges In the selection process	Establishing connections between the current state of affairs and what might be and finding stepping stones to allow people to better understand, shape, and support the idea	Simulation Rapid Prototyping Outsourced prototyping Early-stage prototyping

Mobilizing sponsorship	Encouraging the emergence of sponsors and champions to support the innovation process	Inspiration Clubs Presentation rounds Corporate entrepreneurship
Using alternative implementation structures	Removing radical concepts from standard processes that may inhibit their development	Outsourcing Satellite SMEs Innovation hubs
Mobilizing entrepreneurship Inside and outside the firm	Encouraging the selection and development of radical ideas through specific interventions	Bootlegging policies Licensed dreamers Internal innovation councils Hiring querdenker (people Who think against the grain)
Using alternative decision-making pathways and championship	Recognizing that decision making for radical ideas require flexible process to nurture the idea	Virtual stock market models Dragons' Den-style funding Open evaluation platforms
Risk-Reducing Strategies		
Deploying alternative funding structures	Varying the source of funding depending on individual projects' needs, sharing funding to spread the risk and potential reward	Crowdfunding Open Innovation Innovation partnerships Equity finance

Table 1. continued **(Adapted from Nicholas, Ledwith, & Bessant, 2015).**

Strategy	**Definition**	**Tools**
Risk-Reducing Strategies		
Using probe-to-learn methods	Breaking decision making and risk into smaller increments through small, iterative learning steps that build over time	Pilot Testing Crowdsourcing Open-sourcing prototyping
Applying alternative evaluation and measurement criteria	Applying criteria that recognize need for flexibility in developing radical innovations	Relaxed measurement boundaries Maximum permissible loss

Currently, incremental innovation is the most dominant form of innovation for most organizations. It entails continuous improvement of existing products in order to meet emerging market expectations. Organizations are always seeking to use this form of innovation to counter competition and win market share. RI has emerged as a superior approach to incremental

innovation as rapid global scientific knowledge is exponentially expanding which can assist organizations to grow their market share, improve their product lines, processes and services to also create new markets and new market opportunities which did not exist before. Firms embracing RI are market leaders who can be emulated by others in the same industry and beyond. For instance, Apple Computers is the first company in the world to reach a market value of $1 trillion and is a perfect example of a firm engaging in aggressive RI (Thompson Reuters, 2018). This accomplishment by Apple is a result of a comprehensive understanding of their TM regarding radical innovation in the provisioning of services and products, like the simplified user interface in computing, iPods, iPhones, and iTunes among others. In an era of high competition, the firm has effectively been able to radically innovate.

This study focused on the BFI personality traits of TM and how they relate to different types of management traits that consequently have an impact on RI in U.S. firms. Management traits within organizations are essential for innovative practices and therefore the performance and long-term sustainability of such organizations. RI applications have seen high rates of acceleration in emerging economies such as China, Brazil, India, and Russia. It is therefore critical for U.S. firms to learn from their practices in their own contexts by leveraging RI operations on their own domestic markets as well as international markets. Firms that have showcased high levels of RI have shown exceptional leadership and management practices derived from certain TM personality traits which can be adopted elsewhere with the aim of replicating the success patterns and attainment of global competitive advantage.

It becomes imperative for U.S. firms to engage TM with the essential personality traits to sponsor and champion the firm's dedicated adoption and promotion of SURI. This research study clearly identifies through empirical studies and analysis, which of these BFI personality traits are

indicators of the right TM to lead their firms RI operations on an ongoing and successful basis as they plan and conduct operations into the hyper competitive and emerging global marketplace. Global connectivity and developing nations drive the hyper competitive nature of global business as we move forward into the future. RI will dramatically reduce the competitive value of incremental innovation as firms are forced to produce products, processes and services to maintain a competitive advantage, ensure firm survival and meet market demands globally on a routine basis. Firms must establish an ability to produce robust innovation repeatedly as existing Intellectual Property (IP) protections will become less important as technological leaps to entirely new technologies resulting from RI which obsolesce IP profit protection periods enjoyed by firms in the past.

The Background of Personality Trait Theories

Atkinson et al., (2000) draws upon the works of Sir Francis Galton from the late 1800's where in Galton posits that an individual's personality trait can be analyzed by a studying the individual's language known as lexical hypothesis. Lexical hypothesis is relied upon in psychology to develop the foundations of various personality types. It is one of the most important tools widely adopted in psychology and scientific theories (Ashton & Lee, 2004). Throughout the world, the use of language clearly demonstrates the cerebral thinkers, the peaceful leaders and the tyrants and their related personality traits. Psychology theorists created personality traits using various tools like Lexical hypothesis to quantify personality traits as these personality traits are generally understood to be stable overtime. Accordingly, researchers are able to distinguish the various personality traits and their related behaviors. This research study identifies and quantifies the personality types related to TM associated with U.S. firm's SURI. The use of lexical hypothesis is one valuable tool which will influence the results of this research

study. Another key tool factored into this research study is factor analysis often used in personality research to list personality traits (Maltby et. al., 2013).

An individual's personality is often established by a series of behaviors, thought patterns, social engagement, feelings and cultural influences both internal and external. These patterns and influences strongly influence an individual's attitudes, values, norms and self-perception which Winne and Gittinger (1973) posit as predictors of an individual's interactions with other people in various states of stressors. Phares and Chaplin (1997) describe personality as "the pattern of characteristic thoughts, feelings, and behaviors that distinguishes one person from another that persists over time and situations." Personality is defined by Ryckman (2008) as a "dynamic and organized set of characteristics possessed by a person that uniquely influences his or her cognitions, motivations, and behaviors in various situations." As this research discovered any relationship to TM personality and his or her potential influence on a U.S. firm's SURI, a study of various personality theories was warranted.

Maltby et al. (2013) find that studying personalities is best suited by analyzing these various personalities by various theories. These include evolutionary theory, personality behaviorist theories, social cognitive theories, humanistic theories and the independent variables of this research study of personality trait theories.

Evolutionary Theory. Evolutionary Theory (ET) is based upon the evolution of personality traits as derived from life history and ecological-evolutionary-development biology (Roberts, 2018). As an individual progress through life experiences coupled with his or her particular genetic structure, one will develop certain traits of value in certain fields of application. Michael Dell, Bill Gates and Steve Jobs are examples of genetically superior thinkers who mastered their life experiences to achieve personality traits favorable to innovation

management. ET posits that an individual is born with a certain DNA set that lends the individual to personality traits that are fixed, fluctuating, pliable or elastic (Robert, 2018). As the individual progresses through life and work environments, these life experiences can adversely or positively influence the individual's personality traits. This is seen as mainly an ongoing and expansive, verses regressive, evolution of the individual's personality traits.

Personality Behavioristic Theory. This theory is based upon a plethora of factors an individual is faced with, in this research study at work. "Social, mental, physical, communication, feed-back, feeling of solidary, acceptance, leisure time, status, leadership and power," (Osteraker, 1999), all combine to motivate managers to develop personality traits useful, or not, to the firm's innovation operations. A manager must spend the time with team members to understand and be aware of the team members personality traits resulting from the team member's life and then apply best practices to motivate, encourage and support best performance from the team member.

Social Cognitive Theory. Thomas and Lucianetti (2016) found that managers need to encourage innovative behavior in their employees. "Impressing the need for social cognitive behavior (SCB) resulted in increased creativity, persuasion, and change self-efficacy are related to increases in idea generation." This theory of personality management is complimentary to a firm's innovative operations in many ways. SCB drives the need for managers to understand the importance of innovative behavior within the firm. Managers build self-efficacy traits that steer the organization's personnel toward innovative operations without the fear of reprisals from risk resulting from RI thinking and actions. SCB warrants a relaxing of collective socialism among the firm's personnel regarding RI which can impede innovation. Technology managers in particular are to encouraged review and monitor innovative processes occasionally and adjust the

social setting to eliminate social impediments to the firm's SCB setting thus allowing the emergence of free thinkers and collective innovation. The firm's SCB promotes domain-specific self-efficacy beliefs that are important precursors of innovative behavior (Thomas & Lucianetti, 2015).

Humanistic Theory. Holford (2018) posits, "that resourced-based theory of competitive advantage argues that the long-term success of any business innovation is based upon the internal resources of the firm offering it, the firm's capabilities in using those resources to develop a competitive advantage over competing option." The human capital of any firm must be inclined by managers to focus on the wealth of human resources at every level to achieve a unified set of goals and then act to accomplish those goals on a recurring basis to innovative operations resulting in maintaining a competitive advantage. The firm's financial, physical, legal, human skills set, organizational model, informal market awareness and relationships with its suppliers and customers are all used together by the firm's mangers to conceive competitive ideas and then implement them successfully. This theory relies heavily on the human capital of the organization to manage for successful competitive advantage through normal operations and successful innovation operations.

Personal Trait Theory. Dynamic management emergence results in idea generation and idea enactment. Individual members dynamically "emerge" as managers over the course of team task accomplishment (Lee & Farh, 2019). Historical hierarchical management is being replaced with dynamic manager emergence. Firms encourage emergence of the best and the brightest to lead innovation operations. "Leadership emergence describes the extent to which a person who is not in a formal position of authority is perceived to "lead" other members of a group (Lord et al., 1986; Schieder & Goktepe, 1983; Taggar et. al. 1999). These are leaders, or managers, history

has already presented like Archimedes, Sir Isaac Newton, Leonardo Da Vinci, Nicola Tesla, Albert Einstein, Bill Gates, Steve Jobs and Elon Musk, to name a few, of the naturally emerging brilliant thinkers. Steep heavily in the traits of a leader-like personality, this theory focuses on the dynamic leadership traits of managers and their ability to motivate performance of their surrounding peers to achieve excellence often resulting in significant advances of technology and scientific knowledge.

Big Five Personality Traits

The Big Five personality traits, and their relationships to innovation operations are reviewed in the literature review. An evaluation of RI is also addressed in the literature review in order to create a foundation and contemporary understanding of the concept. The Big Five personality traits are also discussed with a focus on empirical studies that show relationships of the variables in different contexts. The following Table 2 provides the Big Five Inventory of personality domains and facets on the 44-item scale BFI.

Table 2.1 *Domain and Facet Scales of BFI* **(Adapted from John et al., 2009).**

Domains	**Facet**	
Openness to Experience	Intellectualism Idealism	Adventurousness
Conscientiousness	Orderliness Industriousness	Self-Discipline
Extraversion	Gregariousness Assertiveness/Leadership	Social Confidence vs. Anxiety
Agreeableness	Modesty vs. Narcissism Trust vs. Suspicion	Empathy/Sympathy Altruism
Neuroticism	Anxiety Irritability	Rumination-Compulsiveness Depression

Using these Big Five Inventory items of personality traits, this research proposal identified any relationship between a technology manager and a U.S. firm's SURI.

Hayes and Wheelwright (1984) found that U.S. TM have different characteristics from those of other developed countries. Their studies found that U.S. TM are more reserved than technology leaders in other countries. Risks and opportunities associated with new technology has a direct relationship with TM attitudes towards innovation (Simon, 1978). This reservation to take risks cause TM to align their firm's innovation operations with traditional incremental innovation. TM with a proactive attitude tend to favor innovation (Khan & Manopichetwattna, 1989).

The potential for loss of control, a trait strongly related to emotional stability in BFI personality traits, plays an important role in the TM willingness to accept additional risk not involved with incremental innovation but a large part of RI. Accordingly, TM with an internal locus of control empower them to endure and accept the change in changing the course of events. Alternately, TM that have an external locus of control believe destiny, fate or chance will direct the outcomes (Rotter, 1966). According to Miller and Toulouse (1986), TM with internal locus of control have a positive correlation with innovation that would allow for implementation of RI within their firms.

The five steps to adoption of innovation are: (a) becoming aware of the innovation under consideration, (b) forming a favorable and unfavorable attitude toward it, (c) deciding to adopt it, (d) implementing the innovation, and (e) deciding whether or not to keep the innovation after it has been implemented (Roger, 1985). Openness to experience, one of the Big Five personality traits has a positive relationship with TM adoption of risk relating to adoption of innovation (Miller & Friesen, 1982). It is posited by numerous researchers that several of the BFI

personality traits serve as strong predictors of a TM to accept risk, be aware of novel innovations and lead their firm's innovation operations into advance products, processes and services allowing their firms to maintain a competitive advantage in the global marketplace. Mobilizing the resources and firm's support are crucial tasks the TM must achieve to implement strategic change for the wellbeing of the firm in today's globally competitive marketplace. Incremental innovation will no longer suffice to maintain a firm's competitive advantage as technology is advancing at an ever-increasing pace and scale.

The BFI personality traits have been widely used to explain different personalities exhibited by different managers. People act and react differently in different scenarios due to varying personalities (Cobb-Clark & Schurer, 2012). The personality of every individual is determined by the immediate environments as well as their respective psychological settings. The model was developed in 1990 by M. Digman and was later extended by Goldberg in 1992. The model describes five broad personality traits which include openness, conscientiousness, extroversion, agreeableness, and neuroticism (Cobb-Clark & Schurer, 2012).

Openness. Openness has been described as a trait that is associated with characteristics such as imagination and insight. Individuals who score highly in this trait are likely to have a wide range of interests. They are curious in nature and explore new things from time to time. They are also eager to learn new things as well as enjoy new experiences. Creativity levels for people with this trait are highly associated with high degrees of abstract thinking as well. In this regard, organizations looking for innovative employees should look for those who are open minded and score highly in this trait. According to Cobb-Clark & Schurer (2012), individuals with high levels of openness are likely to seize new opportunities and generate value from an individual and organizational point of view (Hisrich & Shepherd, 2005). Openness to new

ideologies is at the heart of entrepreneurship and development of new products. This trait is important when seeking to break from normal routines and practices.

While some TM with a high Openness to Experience are found to be risk adverse from their observations of other failures, research finds that TM with seasoned experience are more likely to have seen and experienced success with other firms and are inclined to except risks regarding innovation operations (Khan & Manopichetwattna, 1989). Le Pint et al. (2000) found that openness to experience related positively to personality traits that involved with making dynamics decisions involving unknown changes.

Conscientiousness. Conscientiousness is associated with high levels of thoughtfulness and impulse control. Individuals with this trait have goal-directed behaviors which result in action in a specific direction or manner. The trait is also associated with high levels of organization and attention to details (Cobb-Clark & Schurer, 2012). Individuals with the trait plan and think ahead and factor in contingencies over different scenarios. They spend significant time in preparations before engaging in any action. They are also likely to complete assigned tasks on time and in the right way. Having planned schedules is important for goal achievement. High levels of efficiency, organization and working with established systems are associated with this trait (Goldberg, 1990; John, 1990; Saucier, 1994). This trait can be effective for an organization seeking high levels of innovation, especially in the planning and implementation process.

McCrae and Costa (1987) found that an individual displaying conscientious shows dependability, achievement orientation, perseverance, responsibility and abides by the rules of the firm. Herrmann and Nadkarni (2014) found that TM with high conscientiousness are reserved about change which leads to rely on incremental innovation approaches to limit risk and the

potential for failure. A TM conscientiousness is related to the individual's adaptability (Le Pine et al. 2000). Existing research indicates that high conscientiousness is related to an aversion of TM to the risk associated with radical innovation and a preference to eliminate risk through a reliance on incremental innovation or open innovation to advance the firm's competitive advantage.

Extroversion. Extroversion is associated with assertiveness and dominance. Extroverts get their energy from interacting with others where they get different ideologies and act on them. This is the opposite of introverts who tend to find energy from within (Milfont & Sibley, 2012). The trait is also associated with sociability and excitability with high levels of emotional expressiveness. Such individuals can collect a lot of information from interacting with different individuals at different capacities. In an organizational context, such individuals can effectively collect information regarding challenges and gaps that may require innovative ways to resolve. The interactive nature of this trait is also effective in instances where constant communication is required (Milfont & Sibley, 2012). Extroverts within organizations have been found to make good team leaders as well as overall leaders especially from a transformational leadership style point of view. Creating relevant relationships with employees can be an effective way of promoting inspiration, motivation, and innovation.

TM with high extroversion produce a positive atmosphere of creativity, confidence and enthusiasm among their team members thus encouraging risk taking, a belief that the unseen can be seen and that new products, services and processes that do not currently exist are there to be created discovered and created (Judge & Locke, 2002). If these TM with high extroversion can control their need for dominion, and allow subordinate team members the latitude to excel, the firm's ability to succeed with radical innovation projects are subject to increased successes.

Agreeableness. Agreeableness is associated with high levels of cooperation and compassion. Such individuals are easy to work and agree with. Agreeableness has its advantages and drawbacks. In an organizational context, the trait enables tasks to be completed as requested without resistance or opposition from employees (Milfont & Sibley, 2012). This trait is effective where employees receive clear instructions and are required to work without questioning. Employees working in a transactional leadership context are likely to have high levels of agreeableness. Agreeableness can also be seen when leaders give specific instructions to managers, who then pass them down to junior employees (Leutner et al., 2014). However, this trait is effective in instances where diplomacy, trust, patience, and cooperation are regarded highly. On the other hand, it is ineffective in instances or environments that are combative, demanding, domineering or ruthless.

TM with agreeableness encourage their teams to work together to become a unified force that is focused on a specific mission and socially connected for a cohesive and decentralized innovation operations (Peterson et. al., 2003). Augier and Teece (2009) posit that TM should be assertive and drive the innovation team forward into uncharted arenas of insight, imagination and new ideas. Strategic change must be driven in innovation teams to move into radical innovation and rely less on incremental and open innovation for the firm's competitive advantage stance.

Neuroticism. Neuroticism is sometimes referred to as stability in emotional character. Individuals who score highly in this trait are likely to be tense and moody, especially when in tight or demanding situations. It is also associated with anxiety and irritability especially when events do not turn out as expected or intended (Leutner et al., 2014). The opposite of this is resilience and ability to withstand demanding situations with high levels of tension. In an organizational context that requires high levels of innovation, low neuroticism is preferable. Low

neuroticism is associated with self-confidence and a sense of adventure, which are also desirable characteristics for innovative individuals (Leutner et al., 2014). This trait is important from a leadership and follower point of view. Both parties should have the ability to take risks and be ready to deal with the eventual consequences. Innovation in the contemporary context relies heavily on the ability to evaluate and take calculated risks.

As Huy (2011) posits that every organization incurs stress from strategic changes from personnel changes to product, service and process changes. Strategic change in of itself is leads to certain levels of leadership ship stress and is readily translated to middle management. Bono and Judge (2004) argue that technical managers that possess high levels of emotional stability, a component of neuroticism, that the personality trait of high emotional stability is favorable to organizational risk often associated with adopting radical innovation in place of incremental innovation.

Big Five Measurement Instruments for Personality Traits

Numerous personality traits measurement tools have been developed as far back as Allport and Odbert (1936). Mid nineteenth century researchers Cattell et al. (1957) refined earlier developed tools to simplify research on personality traits. Cattel (1946) developed factor analysis and went on to identify multi-level and hierarchical tools for establishing personality traits on a primary and secondary level; sixteen personality factors regarding analyzing personality traits were established. This tool will not be used in this research proposal but will used the 44-item BFI personality traits instrument.

Tupes and Christal (1961) and Norman (1963) posit that five major factors were sufficient to account for a large set of personality data. Eysenck and Eysenck (1975) posited that only three personality traits were needed to establish an individual's personality. These three

traits were Psychoticism, Extroversion, and Neuroticism. Of particular interest in a TM ability to manage SURI is neuroticism which indicates the technical manager is prone to anxiety, hostility, depression, self-consciousness, impulsiveness and vulnerability to stress (Costa & McCrae, 1992a). These traits are considered undesirable for a TM which needs to inspire and promote risk taking and optimism to the RI team and senior leadership which is crucial to win risk taking research and development funding. Often, RI are long term opaque commitments prior to RI in products, processes and services.

Goldberg (1981) posited that five factors of personality traits were sufficient to understand the personality of individuals. Thus, he coined the tool the "Big Five" personality factors. They are; Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (Costa & McCrae, 1992b). This research study adopts the BFI personality traits as the main study independent variables. Further explanation of the BFI personality traits will now be discussed.

Big Five Inventory (BFI)

This is a 44-item inventory that indexes the different traits with assigned facets to each trait. It is a self reporting tool where individuals can test their levels of personality traits within a short period of time (Facet, 2000). Different studies have shown that the tool yields satisfactory results and can be used to provide valid and reliable data on the personality of different individuals. The tool considers different facets associated with each trait. For instance, extraversion is associated with sociability, energy, and warmth among other facets. These facets were used to design the 44 items in the inventory to determine personality levels (Facet, 2000). The Big Five 44-item Inventory instrument provides the participant a quick and easy way to participate while limiting potential adverse impacts to validity and reliability. Multiple questions

for each personality trait were asked. The participants were asked to select from a five-point Likert scale (with 1 = disagree strongly, 2 = disagree a little, 3 = neither disagree or agree, 4 = agree a little, and 5 = agree strongly) for each of the instrument's 44-item questions. Neuroticism will ask eight questions, extroversion will ask eight questions, conscientiousness will ask nine questions, openness to experience will ask ten questions, and agreeableness will ask nine questions. The Likert scale ranks order of variables in nominal format (Cozby & Bates, 2012). Academic researchers are not required to receive permission to use the Big Five Inventory for research studies. The Qualtrics based questionnaire provide the participant with a web-page based document that was easy to use and complete and was presented in English only given the researchers data collection in the U.S. only. Although, if Qualtrics receives a request for the survey to be submitted in other languages to facilitate an expatriate's convenience working in a U.S. firm, the request was fulfilled to ensure validity and reliability were not impaired due to language barrier issues.

Radical Innovation (RI) and Technical Manager Personality Traits

Organizational performance is significantly determined by the development of specific management traits within an organization (Hickman & Silva, 1984). These traits are infused into the activity and process of an organization towards achieving excellence and long-term sustainability. Certain management traits foster innovation and contribute to progressive value addition to organizations. The U.S. has multiple firms that have showcased excellent management traits with significant contributions to RI. Some of these firms include Apple, Microsoft, Tesla, Hewlett-Packard, and Defense Advanced Research Projects Agency (DARPA), among others. Improvement of RI in organizations can be reached through different approaches such as the establishment of new projects, processes and programs engaging in lead user

research, development of new networks and creation of corporate ventures (O'Connor & Ayers, 2005; Kelly, 2009; Heiskanen & Lovio, 2010; Stringer, 2000; Maine, 2008; Junarsin, 2009). Based on the nature of the organization in question, engaging or improving RI can be approached from different angles based on organizational objectives. However, it is imperative to acknowledge the importance of organizational capabilities as it determines the scope and success of radical innovations.

Some of the most successful high-tech firms in the US have perfected the art of SURI and can, therefore, provide meaningful insights into the concept towards the development and adoption of best practices. Existing knowledge posits that SURI within organizations is driven by teams that are focused on the front to end of innovation (FEI) where high novelty and original products, services and processes are developed. They are developed from ideologies that are created within organizations and are motivated by the external market where their value is exhibited and showcased. Most research on RI is mainly focused on companies as opposed to project level. New Product Development (NPD) mainly emanates from incremental innovation which seeks to add value to already existing products. Theoretical models of innovation mention internal and external processes that either foster or inhibit RI. The Goal Orientation Theory (GOT) has been identified in recent research as a leadership framework that can be used to boost team efforts towards RI as posited by Vlok (2017).

U.S. firms have in the recent past realized the need for RI in a highly competitive domestic and international environment. As a result, different ways of introducing RI within organizations have been developed in established firms. For instance, firms are engaging in specialized programs and projects with the aim of eventually coming up with new and improved products, services or processes to compete in existing markets (O'Connor & Ayers, 2005; Kelly,

2009). Other firms have invested heavily in Research and Development (R&D), which has emerged as a strong driver of RI. Firms that have a high appetite for risk are likely to have higher levels of RI with equally promising rewards. It is the role of TM to allocate resources to innovation in a manner that puts into consideration the short term and long-term goals of the organization. Different management traits have varying levels of tolerance to risk and therefore directly impact the extent of innovation. In this regard, management should be flexible in order to allow healthy innovation levels that do not strain current operations but at the same time foster future aspirations and goals (Bessant, Oberg, & Trifilova, 2014). There are different options that the leadership of a firm can follow towards enhancing RI. One option is opening R&D to external players and stakeholders. This is important towards sharing of knowledge and sourcing of resources that may be necessary to transform ideologies into valuable RI. Leadership should also embrace internal innovation to relevant parties such as employees. This can be done through motivational programs such as contests which encourage innovation in different aspects of the organization. Opening innovation to more user inputs is also encouraged as it provides information and feedback that is essential towards innovatively solving user challenges and meeting their aspirations. User inputs can be a formidable source of ideologies that further enhance RI practices. Current research shows that firms are reluctant to risk intolerance due to their short-term financial performance and goals. The focus on periodic financial performance has its advantages such as ratings on Wall Street. However, it can be an impediment to RI due to inadequate commitment of resources to innovation-related activities. The few firms that opt to take a different channel are likely to have innovative breakthroughs which boost their long-term financial performance and ratings on Wall Street. However, this process requires the application of effective management and decision making as the level of risk is significantly higher. This

means that firms that plan on future products, processes and services are in better positions towards acquiring a competitive advantage in the long term. They can provide investors and analysts with forward-looking financial information that can trigger accelerated innovation and development of new products. Current management recognizes the importance of R&D investments, which are important when analyzing possible future positions for organizations. When seeking to engage investors in RI, there is a need to showcase future market positions, which justify the need for resources as well as the potential market for the products of innovation. Effective management should have the ability to balance short-term organizational needs with long-term RI requirements.

Existing literature reports the key role a TM personality have in a U.S. firm's RI. These traits are the focus of this research study with discussion on each key trait as follows.

Openness to Experience Trait. A TM which identifies highly with Openness to Experience is an individual with extensive experience with various methods of innovation over many years. These individuals have often worked in or in association with numerous firms, universities, professional organizations and are widely exposed to numerous innovation projects. They have experienced various forms of pressure a firm can issue directly or indirectly to avoid risk and also experienced firms that encouraged risk relating to innovation. This type of TM is a sponsor and champion of risk taking and encourages an environment of innovation.

Conscientiousness Trait. A TM which identifies highly with Conscientious is an individual with a clear and firm plan for following the firm's normal innovation program. These individuals are not regarded as risk takers rather they seek to avoid risk taking. They have experienced various forms of pressure a firm can issue directly or indirectly to avoid risk. This

type of technology manager is not a sponsor and champion of risk taking and present an adverse environment for RI innovation operations.

Extraversion Trait. A TM which identifies highly with Extroversion is an individual with a gregarious personality trait. These individuals have often worked in or in association with numerous firms, universities, professional organizations and are normally well liked, enthusiastic and dominant managers. They normally are encouraging to collective risk taking while requiring control of the team environment. If an individual with is type of trait can relax his or her dominant nature, then an innovative will ensue. This type of TM is a sponsor and champion of risk taking and encourages an environment of radical innovation.

Agreeableness Trait. A TM which identifies highly with Agreeableness is an individual who encourages the team to work well together. These individuals are drivers and supporters of innovation. They are known for being receptive to imagination and new ideas. If an individual with is type of trait can foster and find trust then innovation will ensue. This type of TM is a sponsor and champion of properly measured risk taking and will encourage an environment of radical innovation.

Neuroticism Trait. A TM which identifies highly with Neuroticism is an individual associated with moody and emotional instability at times. These individuals are not regarded as risk takers rather they seek to avoid risk taking. They have experienced various forms of pressure a firm can issue directly or indirectly to avoid risk. This type of TM is not a sponsor and champion of risk taking and present an adverse environment for RI innovation operations.

Technology Manager

A TM which identifies highly with Openness to Experience, Extroversion and Agreeableness is an individual with a high potential to manage a U.S. firm's RI operations.

These individuals will be professional manner, idealistic, possess a good imagination, be well liked, enthusiastic, competent, managers. They will encourage individual and collective risk taking by both the individualist and the team environments. This type of TM is a sponsor and champion of risk taking and encourages an environment of radical innovation. The U.S. firm's radical operations should be successful in the global marketplace.

Documents

The information for the literature review was selected from the online library of Northcentral University, the website Google Scholar and various books. ScienceDirect, ProQuest and EBSCO host databases were searched using the following keywords: radical innovation, Big Five personality traits, incremental innovation, open innovation, disruptive innovation, leadership traits and technology managers. Over 140 abstracts were read deriving 89 research articles that were selected for reading and analyzation to create the literature review.

Summary

RI is an important element for any organization seeking growth and long term sustainability in the contemporary scope. The level of competition among organizations is significantly high and RI is one of the ways to acquire an advantage. RI entails enhancement of consumer value through development of new products, processes and services that solve certain problems. Some of the most successful high-tech organizations such as Apple, Microsoft, and Google are associated with high degrees of RI. Most organizations do not have aggressive innovation strategies, hence minimal growth. RI challenges the existing status quo by looking at new and better ways of doing things. RI TM are risk takers with high risk appetites that are associated with high levels of returns and rewards. Developing a culture of innovation is the way forward for U.S. firms. In addition to this, having an innovation plan and managing the process is

essential for organizational success and long term sustainability. Management has an integral role to play in enhancing the level of innovation under their portfolios. Different techniques to promote innovation have developed and been tested in organizational contexts with varying degrees of success.

With the importance of RI being emphasized, the role of TM traits is pivotal. Different types of management support innovation in varying proportions. The nature of the TM in question is determined by their personalities and inherent traits associated with these traits. The Big Five personality traits can effectively evaluate the personality of TM personality traits towards determining individuals best suited for SURI. Different tools with high levels of reliability and validity have been developed towards determining different personalities. This can be resourceful when placing or assigning tasks and responsibilities in organizations.

Chapter 3: Research Method

Globalization has increased competition, outsourcing, innovation value, and the need for lower pricing (Sampson & St. James, 2012; Varga, Allen, Strather, Rose-Anderson, Baldwin, & Ridgway, 2009). As a result, continuous innovation has become a strategy for maintaining competitive advantage and sustainability of U.S firms (Grimaldi et al., 2012). The problem is that although continuous innovation is needed for firms in the U.S. to remain competitive and sustainable, certain management personality traits might hinder TM from successfully adopting and employing the best practice of RI (Emory, 2010; Ramanigopal, 2012). The relationship between management traits in successful continuous innovation remains unexplained; and the influence of environmental factors, such as the kinds of companies' goods at issue, remain ambiguous (Isada & Isada, 2016). This quantitative study will utilize an online questionnaire to assess the relationship between TM personality traits at U.S. firms and their firm's adoption and SURI to sustain competitive advantage.

The study will unitize the well-established 44-item Big Five Inventory instrument for determining personality traits. This instrument created by John et al., (1991) will used to statistically assess the TM personality traits that move firms beyond incremental innovation and onto opportunities generated by RI that have become so important to business success in the global marketplace.

This chapter presents a description of the research methodology and design, a description of the target population and sample size, the materials and instrumentation for collecting the TM personality traits data, the operational definitions of the study procedures and the data collection and analysis. The chapter concludes with discussions on the research assumptions, limitations, delimitations, ethical assurances and summary.

Research Methodology and Design

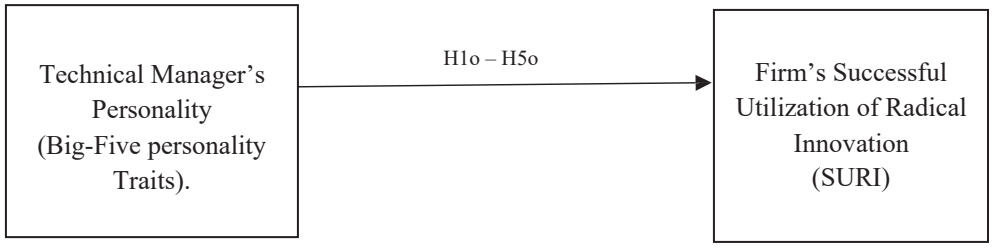
There are many options available to researchers when deciding upon the type of methodology they will employ. Qualitative methodology is often employed when non-numeric data is being examined to make sense of what individuals have experienced and how they make sense of it (Merriam, 2002). A mixed methodology may be employed when the information includes both numeric and non-numeric data the latter of which presents in a qualitative format. In quantitative studies, researchers test theories as an explanation for answers to their research questions that bridge the relationship among variables (Black, 2005; Vogt, 2007).

The research study is a quantitative correlational study. The research study used a quantitative methodology due to the nature of the variables measured by a well-established instrument with proven validity and the goal to test a set of hypotheses.

The study discovered relationships in personality traits of TM and U.S. firms with SURI. Hennink et al., (2012) posit using quantitative methodology for identifying correlations, statistical patterns, frequencies and averages for numerical data.

As a result, the research methodology will be a quantitative, non-experimental design, collect primary data from a sample of 105 technology managers in U.S. industry. It is appropriate to collect the research data from TM to ascertain their BFI personality traits to assess any relationship to their firm's SURI. These Big Five traits are Extroversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to Experience and are directly related to the dependent variable.

Figure 1. Proposed Conceptual Model for this Research Study



Quantitative methodology most often utilizes questionnaires to collect the required data which measures, analyses and provides numerical results from the data (Avgousti, 2013). Data for this study was collected by the 44-item Big Five Inventory and analyzed by SPSS, a well-known statistical software often used for qualitative research. Mean, median, mode and other useful statistical information is produced for distribution of scores and graphical data. SPSS was selected for the research as a result of its ability to interface directly with the BFI questionnaire instrument.

Population and Sample

The Qualtrics panels average 30,000 members of U.S. based firms in 2019 are actively involved in domestic and global markets managing product, service and process innovations. From this population, the researcher solicited 105 respondents' that meet the following criteria: (1) the respondents were 18 to 65 years of age, (2) their firm was located within the U.S., and had at a minimum of 50 employees, and (3) meet the definition of a TM. These qualified TM of U.S. firms are uniquely experienced in either incremental innovation, open innovation, disruptive innovation or radical innovation in the U.S. It is appropriate and ethical to collect the research data from qualified TM to ascertain their BFI personality traits that will provide the necessary data to establish any relationship to their firm's SURI. The research study used the generic title of technology manager for reference convenience, however there are other titles used by many of

the participants who will be invited to take the questionnaire. Some participant's title will be Director of Research and Development, Chief Technical Officer, Manager of Research and Development, Product Manager, Process Managers, among several other titles referring to individuals who are charged by their employers with managing the firm's technology teams or product and process innovation in advancing the company's products, processes or services to retain a competitive advantage with their global competitors.

Instrumentation

The study will unitize the well-established 44-item Big Five Inventory instrument for determining personality traits. This instrument created by John et al., (1991) will used to statistically assess the TM traits that move firms beyond incremental innovation and onto opportunities generated by SURI that have become so important to business success in the global marketplace.

The Big Five Inventory instrument provides the participant a quick and easy way to participate while limiting potential adverse impacts to validity and reliability. Multiple questions for each personality trait will be asked. The participants will be asked to select from a five-point Likert scale (with 1 = disagree strongly, 2 = disagree a little, 3 = neither disagree nor agree, 4 = agree a little, and 5 = agree strongly) for each of the instrument's 44-item questions. Neuroticism will ask eight questions, extroversion will ask eight questions, conscientiousness will ask nine questions, openness to experience will ask ten questions, and agreeableness will ask nine questions. The Likert scale ranks order of variables in nominal format (Cozby & Bates, 2012). This study discovered statistical relationships between SURI the dependent variable, and five independent variables of the BFI personality traits.

Respondents were required to read the following definitions prior to answering questions about their employers Strategic Business Units (SBU) RI operations:

The following paragraphs provides an explanation of the difference between radical innovation and incremental innovation.

Radical innovation (RI) can be defined as an unprecedented change of feature or performance in a process, product or service with alterations in familiar features which allow application of new domains (O'Conner and Rice, 2013). An innovation can be said to be radical if it significantly changes or alters consumer value perception and at the same time results in changes in market size, market share, pricing or revenues. RI is a process that entails innovation without comprehensive understanding, hence resulting in unprecedented outcomes (Starbuck, 2014).

Incremental Innovation (II) can be defined as normalized incremental changes of feature or performance in a process, product or service that do not significantly alter market size, market share, pricing or revenues significantly.

Operational Definitions of Variables

Openness. Openness has been described as a trait that is associated with characteristics such as imagination and insight. Individuals who score highly in this trait are likely to have a wide range of interests. They are curious in nature and explore new things from time to time. They are also eager to learn new things as well as enjoy new experiences. Creativity levels for people with this trait are high with high degrees of abstract thinking as well. In this regard, organizations looking for innovative employees should look for those who are open minded and score highly in this trait. According to Cobb-Clark & Schurer (2012), individuals with high levels of openness are likely to seize new opportunities and generate value from an individual

and organizational point of view (Hisrich & Shepherd, 2005). Openness to new ideologies is at the heart of entrepreneurship and development of new products. This trait is important when seeking to break from normal routines and practices.

While some TM with a high Openness to Experience are found to be risk adverse from their observations of other failures, research finds that technical mangers with seasoned experience are more likely to have seen and experienced success with other firms and are inclined to except risks regarding innovation operations (Khan & Manopichetwattna, 1989). Le Pint et al., (2000) found that openness to experience related positively to personality traits that involved with making dynamics decisions involving unknown changes.

Conscientiousness. Conscientiousness is associated with high levels of thoughtfulness and impulse control. Individuals with this trait have goal-directed behaviors which result in action in a specific direction or manner. The trait is also associated with high levels of organization and attention to details (Cobb-Clark & Schurer, 2012). Individuals with the trait plan and think ahead and factor in contingencies over different scenarios. They spend significant time in preparations before engaging in any action. They are also likely to complete assigned tasks on time and in the right way. Having planned schedules is important for goal achievement. High levels of efficiency, organization and working with established systems are associated with this strait (Goldberg, 1990; John 1990; Saucier, 1994). This trait can be effective for an organization seeking high levels of innovation, especially in the planning and implementation process.

McCrae and Costa (1987) found that an individual displaying conscientious shows dependability, achievement orientation, perseverance, responsibility and abides by the rules of the firm. Herman and Nadkarni (2014) found that TM with high conscientiousness are reserved

about change which leads to rely on incremental innovation approaches to limit risk and the potential for failure. Conscientiousness is also related to the individual's adaptability (Le Pine et al., 2000). Existing research indicates that high conscientiousness is related to an aversion of TM to the risk associated with radical innovation and a preference to eliminate risk through a reliance on incremental innovation or open innovation to advance the firm's competitive advantage.

Extroversion. Extroversion is associated with assertiveness and dominance. Extroverts get their energy from interacting with others where they get different ideologies and act on them. This is the opposite of introverts who tend to find energy from within (Milfont & Sibley, 2012). The trait is also associated with sociability and excitability with high levels of emotional expressiveness. Such individuals can collect a lot of information from interacting with different individuals at different capacities. In an organizational context, such individuals can effectively collect information regarding challenges and gaps that may require innovative ways to resolve. The interactive nature of this trait is also effective in instances where constant communication is required (Milfont & Sibley, 2012). Extroverts within organizations have been found to make good team leaders as well as overall leaders especially from a transformational leadership style point of view. Creating relevant relationships with employees can be an effective way of promoting inspiration, motivation, and innovation.

TM with high extroversion produce a positive atmosphere of creativity, confidence and enthusiasm among their team members thus encouraging risk taking, a belief that the unseen can be seen and that new products, services and processes that do not currently exist are there to be created discovered and created (Judge et. al., 2002). If these TM with high extroversion can control their need for dominion, and allow subordinate team members the latitude to excel, the firm's ability to succeed with RI projects are subject to increased successes.

Agreeableness. Agreeableness is associated with high levels of cooperation and compassion. Such individuals are easy to work and agree with. Agreeableness has its advantages and drawbacks. In an organizational context, the trait enables tasks to be completed as requested without resistance or opposition from employees (Milfont & Sibley, 2012). This trait is effective where employees receive clear instructions and are required to work without questioning. Employees working in a transactional leadership context are likely to have high levels of agreeableness. Agreeableness can also be seen when leaders give specific instructions to managers, who then pass them down to junior employees (Leutner et al., 2014). However, this trait is effective in instances where diplomacy, trust, patience, and cooperation are regarded highly. On the other hand, it is ineffective in instances or environments that are combative, demanding, domineering, or ruthless.

TM with Agreeableness encourage their teams to work together to become a unified force that is focused on a specific mission and socially connected for a cohesive and decentralized innovation operations (Peterson et. al., 2003). Augier and Teece (2009) posit that TM should be assertive and drive the innovation team forward into uncharted arenas of insight, imagination and new ideas. Strategic change must be driven in innovation teams to move into RI and rely less on incremental and open innovation for the firm's competitive advantage stance.

Neuroticism. Neuroticism is sometimes referred to as stability in emotional character. Individuals who score highly in this trait are likely to be tense and moody, especially when in tight or demanding situations. It is also associated with anxiety and irritability especially when events do not turn out as expected or intended (Leutner et al., 2014). The opposite of this is resilience and ability to withstand demanding situations with high levels of tension. In an organizational context that requires high levels of innovation, low neuroticism is preferable. Low

neuroticism is associated with self-confidence and a sense of adventure, which are also desirable characteristics for innovative individuals (Leutner et al., 2014). This trait is important from a leadership and follower point of view. Both parties should have the ability to take risks and be ready to deal with the eventual consequences. Innovation in the contemporary context relies heavily on the ability to evaluate and take calculated risks.

Radical Innovation. According to O'Conner and Rice (2013), RI can be defined as an unprecedented change of feature or performance in a process, product or service with alterations in familiar features which allow application of new domains. Innovations may occur in incremental, open, discontinuous or radical formats where customers experience significant changes in perceived usage and familiarity when compared to previous versions (Bessant, 2003; Meyers & Tucker, 1989; Veryzer, 1998). An innovation can be said to be radical if it significantly changes or alters consumer value perception and at the same time results in changes in market size, market share, pricing or revenues. RI is a process that entails innovation without comprehensive understanding, hence resulting in unprecedented outcomes (Starbuck, 2014).

Research Questions and Hypothesis

The purpose of this research study was to study all five of the Big Five personality traits, neuroticism, extraversion, conscientious, openness to experience, agreeableness, and their relationship to successful TM and unsuccessful TM managing their firm's SURI to attain global competitive advantage.

Recent literature has proposed that neuroticism, extraversion, and conscientiousness have strong positive relationships with work performance and the success of a firm's operations (Hurtz & Donovan, 2000). Some studies have indicated that a person who possesses neuroticism will be more likely to have negative emotions (Sul, Green, & Hills, 1998), poor work

performance (Tokar & Subich, 1997), low job satisfaction (Judge & Locke, 1993; Necowitz & Roznowski, 1994), and separation from colleagues (Brief, Butcher, & Roberson, 1995).

The BFI identifies attributes beneficial to various managerial roles. Conscientiousness predicts universal successful performance across a variety of positions within firms. John et al., (2008) posits that extroversion predicts success in sales and management positions within firms. Neuroticism and agreeableness predict success in group environments within firms. Innovation, creativity, and artistic attributes are predicted by (Herbison, 2015), within a firm's operation.

The main question this research answered is as follows: What is the relationship of personality traits for neuroticism, extraversion, conscientiousness, openness to experience, and agreeableness with a TM in the firm's SURI.

The following research questions and underlying articulated hypotheses will guided the investigation of the study.

Q1: What is the relationship between a technology manager's personality trait of neuroticism and the successful utilization of radical innovation in the firm's performance?

H1a: There is a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H1o: There is not a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Q2: What is the relationship between a technology manager's personality trait of extraversion and the successful utilization of radical innovation in the firm's performance?

H2a: There is a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H2o: There is not a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Q3: What is the relationship between a technology manager's personality trait of conscientiousness and the successful utilization of radical innovation in the firm's performance??

H3a: There is a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H3o: There is not a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Q4: What is the relationship between a technology manager's personality trait of openness to experience and the successful utilization of radical innovation in the firm's performance??

H4a: There is a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H4o: There is not a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Q5: What is the relationship between a technology manager's personality trait of agreeableness and the successful utilization of radical innovation in the firm's performance?

H5a: There is a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H5o: There is not a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

Data Collection and Analysis

A Qualtrics electronic questionnaire (see Appendix C and D) was sent to approximately 30,000 potential U.S. based TM candidates from Qualtrics panels. The respondents identified as a firm's TM managers meeting the research selection criteria and were asked to provide answers after answering the screening questions appropriately on the questionnaire.

The research study received permission to use the existing literature-based Big-Five Inventory personality-based instrument, which has demonstrated it contains adequate questions to support the purpose of the study, prior to its use of this research manuscript.

The research questionnaire link from Qualtrics included a consent form (see Appendix A) and questionnaire along with a support email address for the technical managers who had requests for additional information. Responses were to be sent to any inquiries from the target sample and were to be held in a confidential format in the encrypted folder throughout the research until final destruction occurred at the end of the research. No such inquires or responses were created during this research study.

The Big Five Inventory instrument provides the participant a quick and easy way to participate while limiting potential adverse impacts to validity and reliability. Multiple questions for each personality trait were asked. The participants were asked to select from a five-point Likert scale (with 1 = disagree strongly, 2 = disagree a little, 3 = neither disagree or agree, 4 = agree a little, and 5 = agree strongly) for each of the instrument's 44-item questions. Neuroticism will ask eight questions, extroversion will ask eight questions, conscientiousness will ask nine questions, openness to experience will ask ten questions, and agreeableness will ask nine questions. The Likert scale ranks order of variables in nominal format (Cozby & Bates, 2012). Academic researchers are not required to receive permission to use the Big Five Inventory for research studies. The Qualtrics based questionnaire provide the participant with a web-page based document that was easy to use and complete and was presented in English only given the researchers data collection in the U.S. only. Although, if Qualtrics receives a request for the survey to be submitted in other languages to facilitate a expatriate's convenience working in a U.S. firm, the request was fulfilled to ensure validity and reliability were not impaired due to language barrier issues.

Over a 4-week period, data collection was administered through the Qualtrics website and exported to the researcher in Microsoft Excel deliverables. The use of the Qualtrics platform provides many research benefits including researcher and participant ease of use and convenience. This methodology of research data collection produces high-quality, built-in data quality logic checks and elimination of extraneous undesirable and corrupted data (Aaker et al., 2013). The researcher engaged Qualtrics to administer the identical questionnaire until the 105 responses needed are attained.

Data collected during this research study was analyzed using descriptive statics and regression analysis. Regression analysis is a statistical tool that allows various attributes to be statically compared. It is widely used when determining any relationship between a dependent variable and several independent variables. This study describes any statistical relationship between SURI, the dependent variable, and five independent variables of the BFI personality traits.

Assumptions

Assumptions are an important part of any research study. The researcher hypothesizes about certain things and thus creating an initial foundation on how he or she might discover any relationships about the research topic (Leedy & Ormrod, 2005). Assumptions may lead to great discoveries through thorough research and yet lead a researcher astray with the best of intentions (Leedy & Ormrod, 2005). One assumption applicable to this research study is that the solicited TM would accept their invitations to participate and provide high quality answers to the questionnaire surveys. Moreover, assumptions can be viewed as something the researcher accepts as true without concrete proof. Berg (1998) reinforces that assumptions are a vital part of research. According to Williams and Colomb (2003), novice researchers are particularly vulnerable to assumptions leading their research astray. Much deliberate thought is required to find the proper use and formulation of assumptions that will begin the process of a research study. Novice researcher must do due diligence and provide careful consideration upon their assumptions. Many unknowns and knowns can lead researchers to improperly constructed research methods and results. It is crucial to become masterful in the art of controlling assumptions verses assumptions control one's research (Leedy & Ormrod, 2005).

A researcher must ensure the research assumptions are reasonable and believable by other potential researchers as they review and consider the research findings (Williams & Colomb, 2003). In light of the proceeding, this researcher will maintain an unbiased position on what constitutes the personality traits that has provided RI from antiquity through modern times. It is assumed as well that the solicited TM are skilled in the different forms of innovation and should provide a specialized data source focused toward answering the research questions resulting in findings that fail to support the alternate hypothesis proposed in this research study.

Limitations

Every research study is also viewed and scrutinized by other researcher for its proper valuation of various (Leedy & Ormrod, 2005), or defects in the researcher's research structure, assumptions and findings (Creswell, 2005). Validity is of utmost importance to the researcher in his or her attempt to advance scientific knowledge. Properly recognizing the limitations early on in the research proposal is crucial to other researcher to validate the research study's finding (Creswell, 2005). Additionally, by explicitly stating the limitations of the research, a researcher can help other researchers "judge to what extent the findings can or cannot be generalized to other people and situations" (Creswell, 2005).

It is recognized within this research study that the solicited TM may elect to decline to participate resulting in inadequate data collection and that the participants that do elect to participate provide quality data. Furthermore, participants may assign participation to less knowledgeable participants resulting low quality data collection. Further limitation may result from this research study failing to present its findings in a clear and concise format allowing for the dissertation committee to draw unsound conclusions on the research findings.

Delimitations

Delimitations refer to "what the researcher is not going to do" (Leedy & Ormrod, 2005). The scholarly researcher will set out the goals of the research and then frame in the research so as to focus on the intended research study. Carefully excluding non-related areas allowing for a focused research project devoid of extraneous data is vitally important to any worthy and successful research. The absence of high-quality delimitations will adversely impact the external validity and generalizability.

Participation in the study will be limited to TM who work for U.S. firms. Additional delimitation will occur from firms who restricted TM from answering questionnaires to protect their firm's IP and secrecy requirements from Governmental organizations like Defense Agency Research Projects Agency (DARPA).

Ethical Assurances

This research received approval from Northcentral University's Institutional Review Board (IRB) prior to any attempt at research data collection. The researcher acquired permission from Qualtrics to use their platform for transmission of electronic data will use encryption via Secure Sockets Layer to ensure anonymity and confidentially of all electronic information and data exchanges between the researcher, Qualtrics and the participants. The first page of the Qualtrics invitation to the participant will be a researcher generated, Northcentral University Internal Review Board approved consent for allowing the selected participant the right to participate or opt out of the research.

The researcher gave due diligence to the potential risks should participants somehow unexpectedly become identified. No adverse risks where identified. Participation is voluntary and no proprietary or intellectual property is requested nor will be forwarded to the researcher

through the Qualtrics platform. Participant compensation will be provided through normal methods by Qualtrics.

The research proposal sought and received the approval of the Northcentral University Internal Review Board prior to data collection. All data collected during this research will be retained for a maximum of 4 years and will be destroyed by shredding services provided by Iron Mountain, Inc., at such time. Qualtrics will not retain any data collected during the research study once Qualtrics has completed their contractual obligations and certify to the researcher that no collected pertaining to this research study remains. Additionally, all IRB specified criteria for data storage, retention, and destruction of electronic and hardcopy is being strictly adhered to.

Each solicited TM will be assigned a numerical identity number which shall be recorded and locked away from all others by the researcher and password protected for this study. This assurance of confidentiality or anonymity shall was conveyed by the researcher before any data collection began through the Qualtrics program to the participants allowing all collected data to be stored securely in compliance of the Northcentral IRB requirements.

The researcher in this research study has been granted six U.S. patents by the U.S. Patent and Trade Office for radical innovations and is fully aware of his biases toward RI verses other methods of innovation from antiquity to modern times. The researcher has elected to use proven existing data collection tools and analysis tools to produce scientific findings absent of his personal beliefs.

Summary

This chapter began with presenting the development of the research conceptual model regarding five research questions. The five research questions were followed by five research hypotheses. Research design and selected instrumentation for data collection and analysis were

described and focused on a quantitative analysis through correlation study. Data sampling using a 44-item Big Five Personality traits questionnaire instrument distributed and collected by Qualtrics. Sampling size and analysis techniques were provided along with reliability and validity assurances. The analysis of this research study shall be presented following in Chapter 4.

Chapter 4: Findings

The purpose of this research study is to determine any relationships of Technical Managers (TM) Big Five Inventory (BFI) personality traits, openness to experience, conscientious, extraversion, agreeableness and neuroticism, to a business unit's successful utilization of Radical Innovation (RI). A technical manager's personality traits may play an important part of successful utilization of RI in U.S. firms. U.S. firms face a rapidly increasing bandwidth of unfettered innovation competition as globalization increases. Thus, for top managers and the American government, it has become important to understand how to more efficiently promote innovation to gain substantial competitive advantage (Chen & Chen, 2009). An electronic survey instrument consisting of four qualification questions, forty-four personality questions, seven questions regarding their firm's successful or unsuccessful utilization of radical innovation to attain and sustain global competitive advantage. The final question sought the Time In Position as TM to establish demographic data for the sample. The survey was completed by one hundred and five respondents. IBM SPSS (version 26) software was used to perform the statistical analysis reported within this research study.

The chapter begins with the analysis of validity and reliability of the collected sample data using Cronbach's *a*. Next it describes the results of various analysis of the BFI personality factors of TM and any relationships to SURI. Finally, this chapter provides an evaluation of the findings and summary section.

Trustworthiness of the Data

The research instrument asked four qualifying questions regarding the potential respondent's qualifications to meeting the specified definition of a Technical Manager as follows:

A Technology Manager for the purpose of this research is defined as person identified in their current employment role as a Director of Research and Development, a Chief Technology Officer, a Manager of Research and Development, a Product Manager, a Process Manager or Service Manager among other titles referring to individuals who are charged by their organizations with managing innovation. The respondents were also required to be of 18 to 65 years of age and be employed with U.S. based high tech business employing at least 50 or more employees.

Respondents who did not meet the qualification requirements were excluded from further participation in the research. This approach eliminated non-Technical Managers from participating.

The Big Five Inventory is a well-established reliable and valid measure (McCray & Costa, 1990) and as such all items of the Big Five Inventory will be included in further analysis. Arterberry, Martens, Cardigan, and Roher (2014) examined Big Five Inventory score reliability using a sample of 264 participants over a three measurements occasion and found that BFI score reliability was acceptable. Additionally, reliability for SURI was checked using Cronbach's alpha, *a*, the statistic which is the most common measure of scale reliability (Field, 2013). The researcher designed SURI questionnaire has an alpha reliability of 0.745, exceeding the recommended alpha of 0.700 (Field, 2013).

Results

The purpose of the research study is to examine possible relationships between TM BFI personality traits and SURI operations. As such, descriptive statistics, a factor analysis and hierarchical regression analysis was conducted to explore any relationship between TM personality traits and SURI.

Demographic Information

The survey instrument was presented to TM working in U.S. high tech industries. Only those TM within the range of 18 and 65 years of age qualified for the research study. The instrument also solicited the Time In Position (TIP) of the technical manager for each respondent. Per Table 4.1 below, the TIP indicates that the average time in position is 2.8 years.

Table 4.1 *Descriptive Statistics*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I have been in my role at my current role as Technical Manager at my current SBU for the following number of years.	105	1	4	2.80	.870

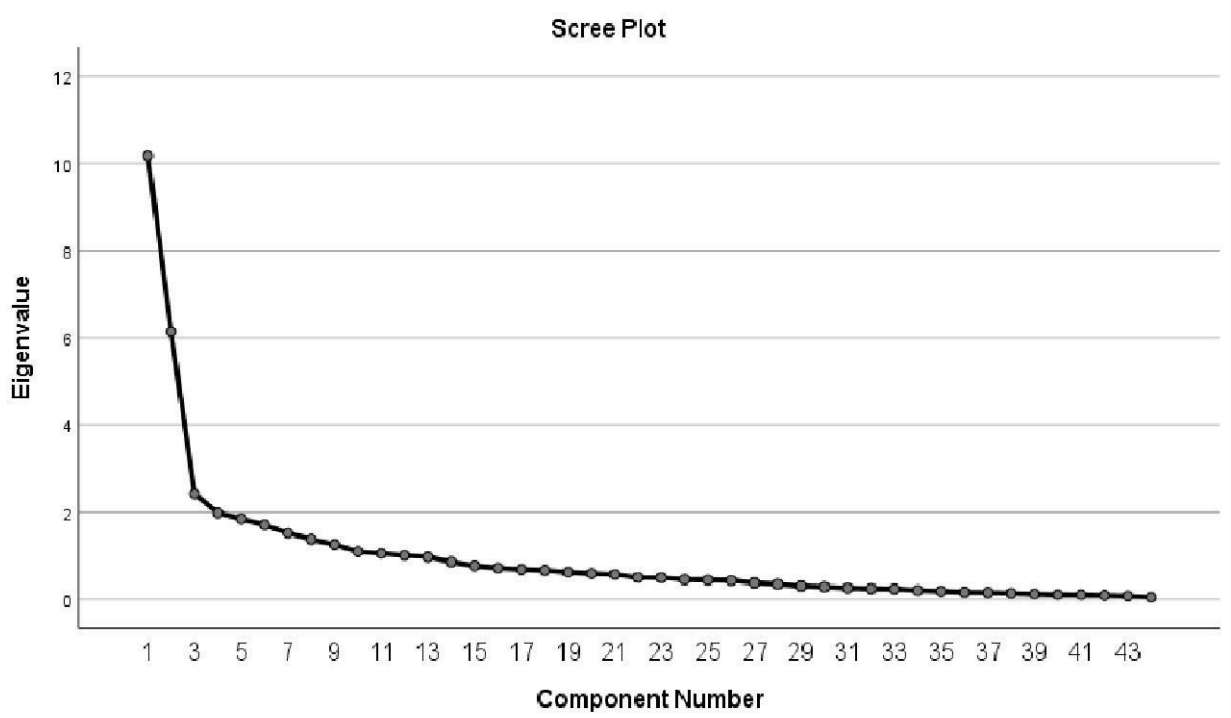
Factor Analysis

Multicollinearity was checked by scanning the correlation matrix for values ($r < 0.9$) and none were found (Field, 2013). The researcher also checked the determinate which was 5.62 which is well over the recommended value of 0.00001. In summary, all the questions correlate well with the others with no correlation coefficients being found as excessively large.

KMO was found to be 0.755 and ranked as 'Middling' (Field, 2013). This indicates that the sample size is adequate for this analysis. Bartlett's measure was significant therefore no massive issues were found.

An analysis of the scree plot as shown below in Figure 4.1 below indicates a possible 4 factor solution.

Figure 4.1 *Scree Plot of Factor Analysis Data*



Existing research indicates that typical factor analysis usually fails to support the a priori 5-factor structure of Big Five self-report instruments (Chiorri, Marsh, Ubbiali, & Donati 2016).

Results for each Research Question

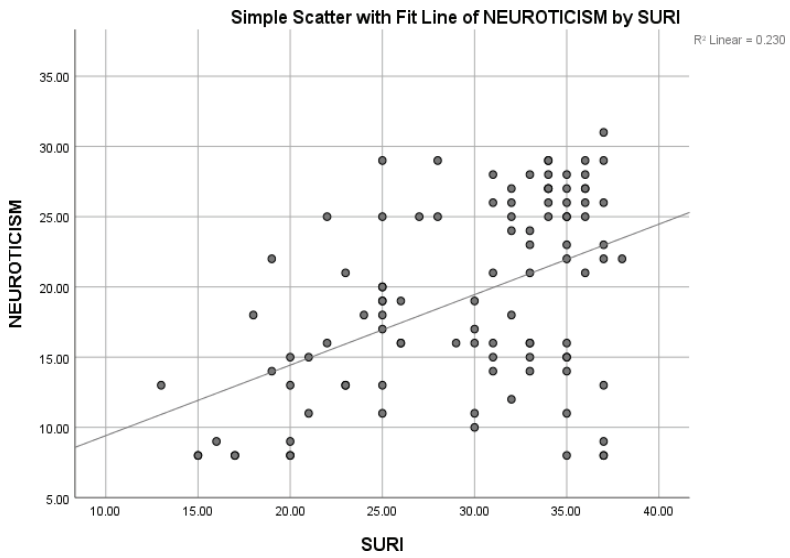
Research Question 1: What is the relationship between a technology manager's personality trait of neuroticism and successful utilization of radical innovation in the firm's performance?

H1a: There is a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H1o: There is not a direct relationship between neuroticism having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

As indicated in Figure 4.2 below, the relationship between neuroticism and SURI are statistically significant and positively correlated ($r = 0.479$, $p = 0.000$). A Pearson's correlation coefficient, r, of 0.479 indicates a large size effect (Field, 2013). This suggests that as a technical manager's neuroticism increases, so does firm SURI performance. Therefore, the null hypothesis is rejected.

Figure 4.2 *Neuroticism SURI Plot of Data*



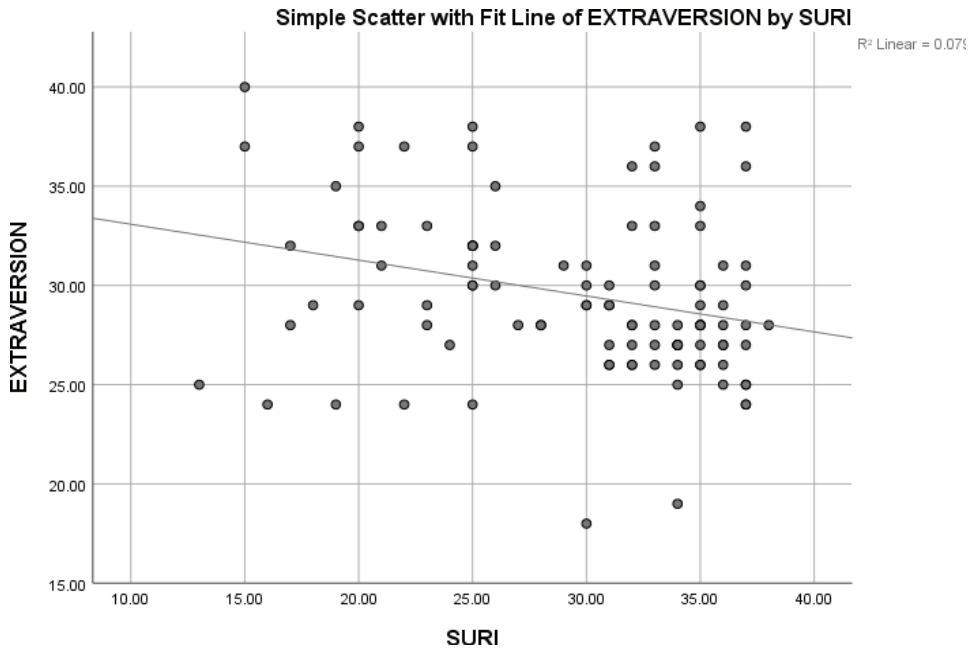
Research Question 2: What is the relationship between a technology manager's personality trait of extraversion and successful utilization of radical innovation in the firm's performance?

H2a: There is a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H2o: There is not a direct relationship between extroversion having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

As indicated in Figure 4.3 below, the relationship between extroversion and SURI are statistically significant and negatively correlated (r = - 0.281, p = 0.004). A Pearson's correlation coefficient, r, of - 0.281 indicates a medium size effect (Field, 2013). This suggests that as a technical manager's extroversion increases, the SURI performance decreases. Therefore, the null hypothesis is rejected.

Figure 4.3 *Extroversion SURI Plot of Data*



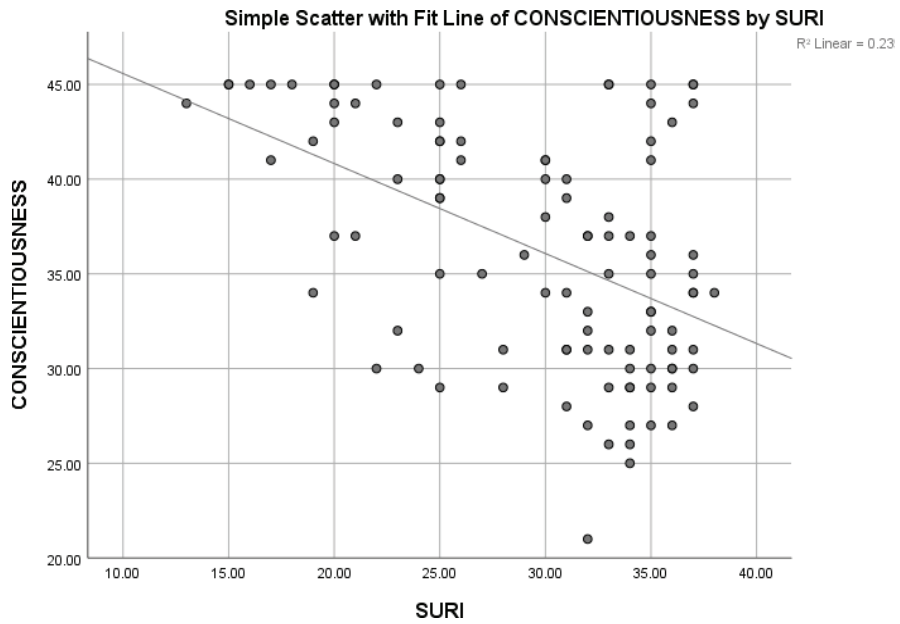
Research Question 3: What is the relationship between a technology manager's personality trait of conscientiousness and successful utilization of radical innovation in the firm's performance?

H3a: There is a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H3o: There is not a direct relationship between conscientiousness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

As indicated in Figure 4.4 below, the relationship between conscientiousness and SURI are statistically significant and negatively correlated (r = -0.489, p = 0.000). A Pearson's correlation coefficient, r, of - 0.498 indicates a large size effect (Field, 2013). This suggests that as a technical manager's conscientiousness increases, the SURI performance decreases. Therefore, the null hypothesis is rejected.

Figure 4.4 *Conscientiousness SURI Plot of Data*



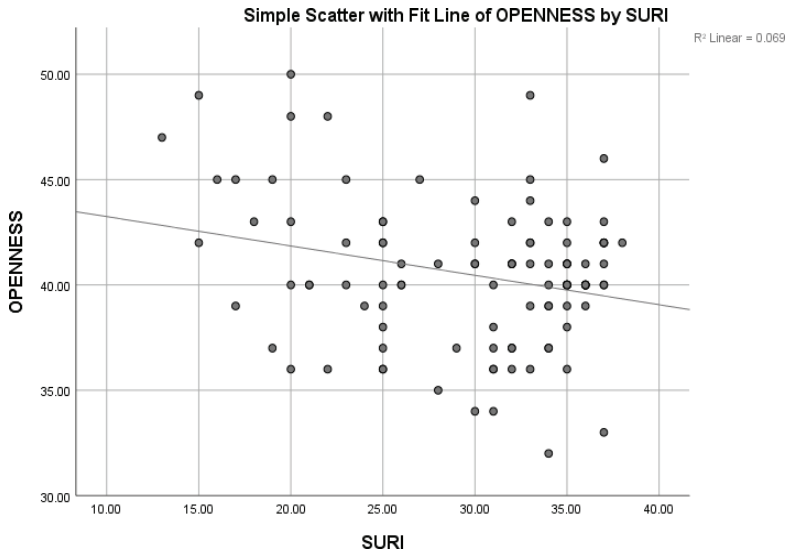
Research Question 4: What is the relationship between a technology manager's personality trait of openness to experience and successful utilization of radical innovation in the firm's performance?

H4a: There is a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H4o: There is not a direct relationship between openness to experience having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

As indicated in Figure 4.5 below, the relationship between openness to experience and SURI are statistically significant and negatively correlated (r = -0.262, p = 0.007). A Pearson's correlation coefficient, r, of - 0.262 indicates a large size effect (Field, 2013). This suggests that as a technical manager's openness to experience increases, the SURI performance decreases. Therefore, the null hypothesis is rejected.

Figure 4.5 *Openness to Experience SURI Plot of Data*



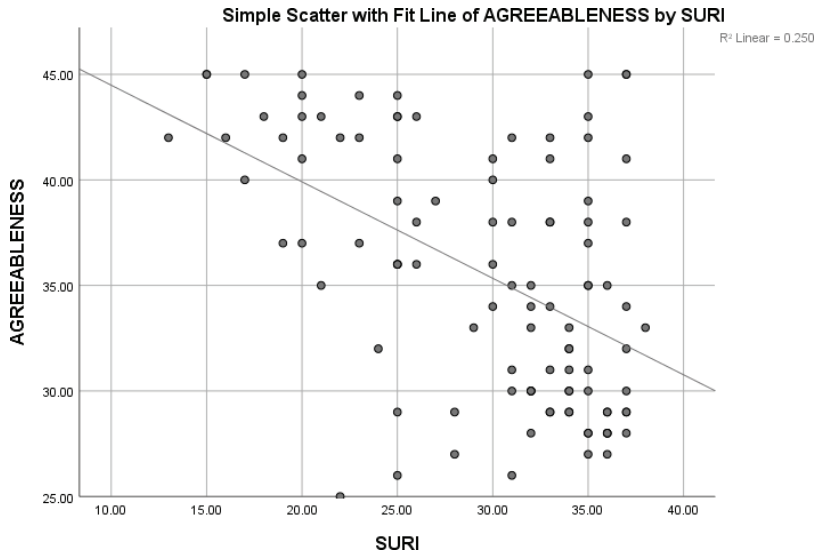
Research Question 5: What is the relationship between a technology manager's personality trait of agreeableness and successful utilization of radical innovation in the firm's performance?

H5a: There is a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

H5o: There is not a direct relationship between agreeableness having a significant impact on a business unit's successful utilization of radical innovation as measured by the Big Five Inventory.

As indicated in Figure 4.6 below, the relationship between agreeableness and SURI are statistically significant and negatively correlated (r = -0.500, p = 0.000). A Pearson's correlation coefficient, r, of - 0.500 indicates a large size effect (Field, 2013). This suggests that as a technical manager's agreeableness increases, the SURI performance decreases. Therefore, the null hypothesis is rejected.

Figure 4.6 *Agreeableness SURI Plot of Data*



Evaluation of the Findings

Research Question 1: What is the relationship between a technology manager's personality trait of neuroticism and successful utilization of radical innovation in the firm's performance? Analysis finds that as a technical manager's neuroticism increases, so does firm SURI performance.

Research Question 2: What is the relationship between a technology manager's personality trait of extraversion and successful utilization of radical innovation in the firm's performance? Analysis finds that as a technical manager's extroversion increases, the SURI performance decreases.

Research Question 3: What is the relationship between a technology manager's personality trait of conscientiousness and successful utilization of radical innovation in the firm's performance? Analysis finds that as a technical manager's conscientiousness increases, the SURI performance decreases.

Research Question 4: What is the relationship between a technology manager's personality trait of openness to experience and successful utilization of radical innovation in the firm's performance? Analysis finds that as a technical manager's openness to experience increases, the SURI performance decreases.

Research Question 5: What is the relationship between a technology manager's personality trait of agreeableness and successful utilization of radical innovation in the firm's performance? Analysis finds that as a technical manager's agreeableness increases, the SURI performance decreases.

Table 4.2 below provides a summary of correlations of the Big Five Inventory traits to SURI. The Big Five Inventory traits of Agreeableness, Conscientiousness and Neuroticism have the strongest relationship with SURI. Neuroticism was the only BFI trait to show a positive correlation. The other four BFI traits showed a negative correlation to SURI. All were statistically significant.

Table 4.2 *Summary BFI/SURI Correlation*

Variable	r value	p value
Openness	-0.262	0.007
Conscientiousness	-0.489	0.000
Extroversion	-.281	0.004
Agreeableness	-0.500	0.000
Neuroticism	0.479	0.000

Interestingly, the research indicated neuroticism as being positively correlated to SURI. This was an unexpected finding.

Tett et al (1991) and Ryckman (2000) found that negative relationships based on neuroticism (e.g., traits: moody, jealous, envious, touchy, fretful) with performance elements often do not provide positive results conducive to organizational operations. However, modern research finds that neuroticism can be associated with successful managerial methods (Antoncic, Antoncic, Grum, and Ruzzier, 2018).

This research used a conceptual research model of analyzing the BFI personality traits of 105 US based high tech TM and their employer's successful utilization of radical innovation. The TM collective personalities traits, once analyzed, were to then correlated to SURI. The

analysis indicates that as a TM neuroticism increases the firm's SURI also increases. Whereas the other four BFI personality traits indicated a decrease in SURI as these traits increase in TM.

Summary

The chapter provides for the testing for validity, reliability and the analysis of the data set using the conceptual model and statistical analysis. The results of the analysis of TM BFI personality traits and relationships of these traits to SURI operations are provided in this research study. A technical manager's personality traits may play an important part of successful utilization of RI in U.S. firms. U.S. firms face a rapidly increasing bandwidth of unfettered radical innovation competition as globalization increases. Thus, for top managers and the American government, it has become important to understand how to more efficiently promote radical innovation through the hiring of TM with the research derived personality traits.

Chapter 5: Implications, Recommendations, and Conclusions

Introduction

This research study makes an important scientific contribution by empirically comparing technology managers (TM) personality traits that are most suitable for successful utilization of radical innovation (SURI) in U.S. firms. U.S. firms face rapidly increasing and unfettered innovation competition as globalization increases. For U.S. business executives, it has become important to understand how to more efficiently promote innovation within their firms to gain competitive advantage (Chen & Chen, 2009). Global executives stress the importance of continuous innovation for new products, processes and services, yet 94 percent of the global executives expressed dissatisfaction with their firm's innovation performance (Christiansen, Hall, Dillon, & Duncan, 2016).

The relationship between TM personality traits in successful continuous innovation remains unexplained (Isada & Isada, 2016). In order to understand the relationships between TM personality traits producing SURI, this quantitative study used a self-answered questionnaire designed using prior research on innovation management. It was issued to TM at 105 U.S. firms.

Therefore, the personality traits of an innovation team's TM may be important to SURI. There may exist a close relationship between a business' SURI operations and its TM. Accordingly, the firm's strategic human resources management must closely adhere to the hiring protocols established by its's leadership team to support SURI.

Implications

As globalization continues to accelerate, U.S. businesses must maintain their competitive advantage to ensure their survival in the global business arena. These organizations must utilize

Radical Innovation (RI) to sustain product, process and service innovations creating market leadership and profitable operations.

This research study used a new model of Big Five Inventory personality traits induced SURI performance that provided some interesting findings. The research methodology was a quantitative, non-experimental, 5-point and 7-point Likert scale design to collect primary data from a sample of 105 technology managers in U.S. firms. The research instrument surveyed technology managers to ascertain their Big Five personality traits to assess any relationship to their firm's SURI. These Big Five traits are Extroversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to Experience and are believed by this researcher to be directly related to the SURI dependent variable. The study sought to discover, through five research questions, any relationships of the Big Five Inventory personality traits of (Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism) of TM in U.S. firms wherein RI was observed. The implications are addressed regarding each research question.

RQ1: *What is the relationship between a technology manager's personality trait of neuroticism and the successful utilization of radical innovation in the firm's performance?* The research failed to support the null hypotheses H1o and found that a TM identified with the personality trait of neuroticism predicts an increase in a firm's SURI.

RQ2: *What is the relationship between a technology manager's personality trait of extraversion and the successful utilization of radical innovation in the firm's performance?* The research supported the null hypotheses H2o and found that a TM identified with the personality trait of extroversion predicts a decrease in a firm's SURI.

RQ3: *What is the relationship between a technology manager's personality trait of conscientiousness and the successful utilization of radical innovation in the firm's performance?* The research supported the null hypotheses H3o and found that a TM identified with the personality trait of conscientiousness predicts a decrease in a firm's SURI.

RQ4: *What is the relationship between a technology manager's personality trait of openness to experience and the successful utilization of radical innovation in the firm's performance?* The research supported the null hypotheses H4o and found that a TM identified with the personality trait of openness to experience predicts a decrease in a firm's SURI.

RQ5: *What is the relationship between a technology manager's personality trait of agreeableness and the successful utilization of radical innovation in the firm's performance?* The research supported the null hypotheses H5o and found that a TM identified with the personality trait of agreeableness predicts a decrease in a firm's SURI.

Of particular interest to a TM personality and his or her ability to manage RI successfully is neuroticism which Costa and McCrae (1992a) found to be undesirable. However, this research study found that neuroticism is a desirable personality trait for TM and SURI, a divergent result. Bono and Judge (2004) argue that TM with a high emotional stability, a component of neuroticism, favors organizational risk often associated with adopting RI in place of incremental innovation. A possible explanation for this divergent result considers history wherein certain individuals associated with the neuroticism have achieved radical innovative results. The neurotic elements of anxiety, hostility, depression, self-consciousness, impulsiveness and vulnerability to stress are associated with radical ideals that are often were considered highly unusual or non-mainstream thinking at a particular time in history. Perhaps the neurotic personality trait produces both constructive radical innovation thoughts, as seen with Leonardo

Da Vinci, and destructive radical innovation thoughts, as seen with Adolf Hitler among others viewed historically and contemporary.

Additional divergent results regarding openness and extroversion were found not to increase SURI. According to Cobb-Clark & Schurer (2012), individuals with high levels of openness are likely to seize new opportunities and generate value from an individual and organizational point of view (Hisrich & Shepherd, 2005). Judge and Locke (2002), posit that TM with high extroversion produce a positive atmosphere of creativity, confidence and enthusiasm among their team members thus encouraging risk taking, a belief that the unseen can be seen and that new products, services and processes that do not currently exist are there to be created discovered and created. Existing literature support the proposition that openness and extroversion should have the potential to increase SURI.

This research study's results aligned with existing literature regarding the personality trait of conscientiousness and agreeableness not having the potential to increase SURI. Herrmann and Nadkarni (2014) found that TM with high conscientiousness are reserved about change which leads to rely on incremental innovation approaches to limit risk and the potential for failure. Agreeableness can also be seen when leaders give specific instructions to managers, who then pass them down to junior employees (Leutner et al., 2014). However, this trait is effective in instances where diplomacy, trust, patience, and cooperation are regarded highly. On the other hand, it is ineffective in instances or environments that are combative, demanding, domineering or ruthless.

Recommendations for Future Practice

Considering the importance of TM personality traits, firms should consider conducting personality testing with instruments such as the Big Five Inventory (BFI) of potential candidates

for filling TM roles involving SURI. As another example, Personality testing using the Meyers Briggs (MBTI) method would help the organization further reveal the personality traits of the TM candidate in relation to their use of sensation, intuition, feeling and thinking to perceive the world. There are several other well-known personality tests like Disc Assessment, Winslow Personality Profile, Process Communication Model, The Holtzman Inkblot Technique, Hexaco Personality Inventory, The Revised Neo Personality Inventory, the Personality Assessment System, The Birkman Method and the Enneagram that can be administered to a TM candidate for extensive personality vetting to provide the highest possible potential for successful TM selection. Many historical innovators are known for their eccentric personalities. A candidate's eccentric personality traits associated with neuroticism should be further investigated to understand if the candidate has a neurotic type personality trait with constructive tendencies or neurotic type personality trait with destructive tendencies or both. Bono and Judge (2004) argue that TM who possess high levels of emotional stability, a component of neuroticism, are favorable to organizational risk often associated with SURI. However, Tett, et al., (1991) found through organizational psychology research that there is a negative link between emotional stability and organizational performance. This suggests that the neuroticism-performance relationship can also be positive. While TM associated with neuroticism may be difficult to understand and manage at times, firms should weight the advantages of TM that can be dominant and foster change thus increasing SURI. Organizations should foster psychological support and training for TM to proactively manage the neuroticism trait elements of anxiety, hostility, depression, self-consciousness, impulsiveness and vulnerability to stress for maximin SURI organizational benefit.

Organizations seeking robust SURI will need to understand and support radical out-of-the box thinkers and visionaries who may present as eccentric with neurotic personality traits to foster radical products, processes and service advances in their businesses sectors. Organizational culture needs to embrace and reward constructive risk-taking TM and team members that historically have been discouraged. Annual TM evaluations should be implemented to factor in positive or negative contributions to SURI through established metrics inclusive of publications, patents generated and other intellectual property generated by TM and their team. Annual SURI evaluations must account for long term market innovations that will present as RI evolutions winning market share in the future.

Educational organizations from primary to tertiary-level should provide for the nurturing and facilitating of neurotic personality traits as these students may be highly intelligent individuals frustrated in main stream learning curriculum. Business organizations may seek out TM candidates from high intelligence schools or even naturally intelligent individuals that didn't find higher education particularly necessary for SURI like Bill Gates, Michael Dell and Steve Jobs.

Recommendations for Future Research

This research study used only the poplar BFI test which is limited in its ability to attain discrete, yet potentially relevant personality traits, of visionary individuals. McAdams (1995) posits that the BFI is too broad, superficial, only descriptive and lacks the ability to reveal the finer aspects of a TM personality and how personalities evolved which would provide germane unique personality insights and their impact on SURI. Future researchers should consider inclusion of other independent variables like the use of additional personality traits testing instruments to reveal and validate other personality traits. Additional independent variables like a

TM educational background would provide additional insights. Some notable contemporary leaders in RI like Michael Dell, Bill Gates and Steve Jobs bypassed higher education. However, many RI have been produced by well educated people as well. Inclusion of creativity divergent and convergent thinking elements of a TM personality are important to creativity a major component of RI inclined individuals and idea generation. IQ test results would also provide a TM candidates cognitive ability compared to the general population. The IQ test score of RI individuals may reveal a discrete genius or visionary variable. Historical records of a firm's SURI, as measured by the number of relevant RI publications published, like the number of patents issued to the firm's personnel would be useful as well. Measurements of the business unit's research and development annual budgets and the firm's price and earnings history would be another contributory variable in TM performance for SURI. History provides written evidence of individuals associated with the neuroticism personality trait that have produced both constructive and destructive RI. There exists a significant opportunity to research the personality trait of neuroticism and its impact on historical and contemporary individuals in light of their impact on society and the arena of RI. Understanding these neurotic individuals better will allow businesses to hire and properly manage and support TM with a high probability of meeting business needs for increasing SURI and the sustainment of global competitive advantage.

The study has limitations. The data was collected from U.S. based TM so future research should be collected in various other countries to provide global insights incorporating cultural influences of the TM role and the implications to SURI. Additional insights into SURI are warranted to expand upon the BFI model revealing early identification of personality traits in individuals that will excel in the role of a TM thus enhancing a firms ability to attain sustainable RI and competitive advantage. This research study used questionnaire items and resulting data

that were subjective answers. Objective data from organizational records, U.S. Patent Office and foreign patent office records would be useful data additions for SURI indicators. Additional data could also be collected from senior management types of TM and global business executives. A mixed or qualitative research study would present additional insights on identifying any rare and unique personality traits of genius or visionary individuals who have produced RI.

Conclusions

The purpose of this research study determined any relationships of Technical Managers (TM) and the Big Five Inventory (BFI) personality traits (openness to experience, conscientious, extraversion, agreeableness and neuroticism) to a U.S. firm's Successful Utilization of Radical Innovation (SURI). A TM personality trait play an important part of increasing SURI in U.S. firms. An electronic survey instrument consisting of four qualification questions, forty-four personality questions, seven questions regarding their firm's successful or unsuccessful utilization of radical innovation was used. The survey was completed by one hundred and five respondents. IBM SPSS (version 26) software was used to perform the statistical analysis reported within this research study.

The problem is that although continuous innovation is needed for firms in the U.S. firms to be technically competitive and economically sustainable, certain organizational culture issues might hinder leaders from successfully innovating (Emory, 2010; Ramanigopal, 2012).

This study makes an important scientific contribution by developing a new model of the Big Five Inventory (BFI) personality traits of technical managers (TM) and how these traits effect successful utilization of radical innovation (SURI) at U.S. firms. It finds that as neuroticism increases SURI increases. It also finds that increases in openness to experience, conscientiousness, extraversion and agreeableness are related to a decrease in SURI.

This study indicates that a TM with a neurotic personality trait increases SURI and that businesses should seek to hire and manage these unique TM for sustaining RI and global competitive advantage.

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Appendix A: Informed Consent Form

Informed Consent

Introduction:

My name is Stephan Findley. I am a doctoral student at Northcentral University. I am conducting a research study. This study compares the relationships between Technology Managers personality traits and innovation operations in U.S. industry. I am completing this research as part of my doctoral degree. Your participation is completely voluntary. I am seeking your consent to involve you. Reasons you might ***not*** want to participate in the study include being prohibited by your employer. You may want to participate in the study to further scientific knowledge. I am available to address your questions or concerns during the informed consent process.

PRIVATE INFORMATION

Certain private information may be collected about you in this study. I will make the following effort to protect your private information. Each participating Technology Manager is assigned a numerical identity number which will be recorded and locked away from all others using a password protected file. Even with this method, there is a chance that your private information may be accidentally released. The chance is small but does exist. You should consider this when deciding whether to participate.

Activities:

If you choose to participate in this research, you will be asked to:

1. Answer initial qualification questions taking about 3 minutes.
2. Answer forty-three questions from the standard Big Five Personality Traits questionnaire taking about 20 minutes.

3. Answer several questions about your organization's innovation operations taking about 5 minutes.

Eligibility:

You qualify to participate in this research if you meet the following conditions:

1. In your current employment role, you meet the definition of a Technology Manager as defined in the following definition;

   A Technology Manager for the purpose of this research is defined as person identified in their current employment role as a Director of Research and Development. A Chief Technology Officer. A Manager of Research and Development. A Product Manager. A Process Manager or Service Manager among other titles referring to individuals who are charged by their organizations with managing innovation.

2. Do you work for a U.S. organization employing 50 employees or more?

3. Are you between the ages of 18 and 65?

You are not eligible to participate in this research if you:

1. If in your current role you do not meet the definition of a Technology Manager.
2. If you do not work for a U.S. base firm.
3. If you are younger than age 18 or older than age 65 at the time you are considering participating in this research study.

I hope to include 100 people in this research.

Risks:

There are minimal risks in this study. Some possible risks include; inadvertent release of participant's identity.

To decrease the impact of this risk, you can skip any question, and stop participation at any time you choose.

Benefits:

If you decide to participate, with a full survey completion, you will be compensated from your respective panel's provider.

The potential benefits to others are increased scientific knowledge about which personality traits of Technology Managers are most beneficial to an organization's successful innovation operations.

Confidentiality:

The information you provide will be kept confidential to the extent allowable by law. Some steps I will take to keep your identity confidential will be the use of a number to identify you as well as keep your name separate from your answers. A password protect file accessible only by myself and my dissertation committee will store your data.

The people who will have access to your information are; myself and my three-member dissertation committee. The Institutional Review Board may also review my research and view your information.

I will keep your data for 7 years. Then, all will be electronically deleted.

Contact Information:

If you have questions for me, you can contact me at: s.findley1195@o365.ncu.edu or (903) 926-3626.

My dissertation chair's name is Dr. Michael Voris. He works at Northcentral University and is supervising my research. You can contact him at: mvoris@ncu.edu or (813) 993-8825.

If you contact us you will be giving us information like your phone number or email address. This information will not be linked to your responses as the study is anonymous.

If you have questions about your rights in the research, or if a problem has occurred, or if you are injured during your participation, please contact the Institutional Review Board at: irb@ncu.edu or 1-888-327-2877 extension 8014.

Voluntary Participation:

Your participation is voluntary. If you decide not to participate, or if you stop participation after you start, there will be no penalty to you. You will not lose any benefit to which you are otherwise entitled.

Future Research

Any information or specimens collected from you during this research will **not** be used for other research in the future, even if identifying information is removed.

Compensation/Incentives:

When participants are invited to take a survey, they will be informed what they will be compensated.

You will be compensated the amount you agreed upon before you entered into the survey.

Appendix B: Demographic

Demographic

Q1. Does your current employment role meet with the identifying definition of a Technology Manager as defined in the following definition?

A Technology Manager for the purpose of this research is defined as a person identified in their current employment role as a Director of Research and Development, Chief Technology Officer, Manager of Research and Development, Product Manager, Process Managers and Service Manager among other titles referring to individuals who are charged by their firms with managing their firm's innovation teams for product, service and process innovation in advancing the firm's products, services and processes to achieve and or sustain a competitive advantage with their global competitors.

- **Yes**
- **No**

Q2. Do you work for a U.S. company employing minimally 50 employees with technology innovation operations?

- Yes
- No

Q3. Are you between the ages of 18 and 65?

- Yes
- No

Survey Personality Questions

Q4. I see myself as someone who is talkative.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q5. Tends to find fault with others.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q6. Does a thorough job.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q7. Is depressed, blue

- Strongly agree

- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q8. Is original, comes up with new ideas.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q9. Is reserved.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q10. Is helpful and unselfish with others.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree

- Somewhat disagree
- Strongly disagree

Q11. Can be somewhat careless.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q12. Is relaxed.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q13. Is curious about many different things.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q14. Is full of energy.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q15. Starts quarrels with others.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q16. Is a reliable worker

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q17. Can be tense.

- Strongly agree
- Somewhat agree

- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q18. Is ingenious, a deep thinker.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q19. Generates a lot of enthusiasm.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q20. Has a forgiving nature.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q21. Tends to be disorganized.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q22. Worries a lot.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q23. Has an active imagination.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q24. Tends to be quiet,

- Strongly agree
- Somewhat agree

- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q25. Is generally trusting.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q26. Tends to be lazy.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q27. Is emotionally stable, not easily upset.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q28. Is inventive.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q29. Has an assertive personality.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q30. Can be cold and aloof.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q31. Perseveres until the task is finished.

- Strongly agree
- Somewhat agree

- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q32. Can be moody.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q33. Values artistic, aesthetic experiences.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q34. Is sometimes shy, inhibited.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q35. Is considerate and kind to almost everyone.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q36. Does things efficiently.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q37. Remains calm in tense situations.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q38. Prefers work that is routine.

- Strongly agree
- Somewhat agree

- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q39. Is outgoing, sociable.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q40. Is sometimes rude to others.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q41. Makes plans and follows through with them.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q42. Gets nervous easily.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q43. Like to reflect, play with ideas.

- Like a great deal
- Like somewhat
- Neither like nor dislike
- Dislike somewhat
- Dislike a great deal

Q44. Has few artistic interests.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q45. Likes to cooperate with others.

- Like a great deal
- Like somewhat
- Neither like nor dislike

- Dislike somewhat
- Dislike a great deal

Q46. Is easily distracted.

- Definitely yes
- Probably yes
- Might or might not
- Probably not
- Definitely not

Q47. Is sophisticated in art, music, or literature.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Appendix D: Survey SURI Questions

SURI Questions

Q48. This paragraph provides an explanation of the difference between radical innovation and incremental innovation.

Radical Innovation (RI) can be defined as an unprecedented change of feature or performance in a process, product or service with alterations in familiar features which allow application of new domains (O'Conner and Rice, 2013). An innovation can be said to be radical if it significantly changes or alters consumer value perception and at the same time results in changes in market size, market share, pricing or revenues. RI is a process that entails innovation without comprehensive understanding, hence resulting in unprecedented outcomes (Starbuck, 2014).

Incremental Innovation (II) can be defined as normalized incremental changes of feature or performance in a process, product or service that do not significantly alter market size, market share, pricing or revenues significantly.

Q50. Strategic Business Unit (SBU) Definition: Strategic Business Unit (SBU) Definition implies an independently managed division of a large company, having its own vision, mission and objectives, whose planning is done separately from other businesses of the company. Retrieved August 27, 2019 from www.businessjargons.com/strategic-business-unit.html on

My Strategic Business Unit (SBU) lags behind competitors (or the industry) in introducing radical innovation of products, services and processes.

- ○ Strongly agree
- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree
- ○ Strongly disagree

☐ Q52. My SBU emphasizes incremental innovation over radical innovation.

- ○ Agree
- ○ Somewhat agree
- ○ Neither agree nor disagree
- ○ Somewhat disagree
- ○ Disagree

Q53. My SBU has difficulty in developing Radical Innovation products, services or processes.

- Agree
- Somewhat agree
- Neither agree or disagree
- Somewhat agree
- Disagree

Q56. I believe my SBU needs to pursue Radical Innovation more vigorously.

- Strongly agree
- Agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Disagree
- Strongly disagree

Q57. I try to promote or emphasis the need for radical innovation within my SBU, but I receive resistance from those above me in the organization.

- Strongly agree
- Agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Disagree
- Strongly disagree
- × N/A

Q58. The culture of my organization impedes efforts to promote radical innovation.

- Agree
- Somewhat agree

- Neither agree or disagree
- Somewhat disagree
- Disagree

Q54. As a Technical Manager, my SBU supports and encourages my efforts in achieving successful Radical Innovations projects.

- Strongly agree
- Agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Disagree
- Strongly disagree

Q55. I have been in my role at my current role as Technical Manager at my current SBU for the following number of years.

- 0-1 years
- 1-3 years
- 3-7 years
- Greater than 7 years