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Healthcare leadership styles, competencies and affinity for technology in the digital era

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HEALTHCARE LEADERSHIP STYLES, COMPETENCIES AND AFFINITY FOR TECHNOLOGY IN THE DIGITAL ERA

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DEDICATION

I dedicate this project to God my creator, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout the course of this project. I also dedicate this work to my mom, who has encouraged me all along the way, and whose encouragement has ensured that I give it all that it takes to finish what I have started. To my daughter, Kiana who always pushed me and said “Mom You can do it” and to Rooba, my business partner who has been affected in every way possible by this quest and stood by me every step of the way.

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ABSTRACT

Digital technology has become a continuous disruptor in healthcare research, education, record keeping, and communication, resulting in both opportunities and challenges. The purpose of this study was fourfold, to (a) identify the leadership practices of healthcare executives, (b) measure the attitudes of healthcare leaders toward technology, (c) explore the relation between leadership styles and attitudes toward technology, and (d) examine the relation between demographic factors (gender, age, practice type) and attitudes toward technology. Healthcare leaders in the United States were recruited from different specialties. They were asked to respond to 3 survey instruments: The Multifactor Leadership Questionnaire (MLQ5X), Affinity for Technology (ATI) scale, and a demographic survey. The goal of this research project was to use quantitative analysis to identify the leadership styles that may contribute to acceptance of (or resistance to) healthcare digital technology. Previous researchers had found that increased transactional, transformational, and adaptive leadership skills were associated with engagement with institutional transformation. These leadership skills also tended to be associated with belief in ethical-social responsibility and continuous talent development of all stakeholders. Thus, these particular leadership skills were expected to be relevant to attitudes toward the adoption of new technology in the workplace. Results supported this, showing that in isolation both transactional and transformational leadership were associated with increased affinity for technology.

Chapter 1: Objective

Introduction

According to management guru, Peter Drucker, the U.S. healthcare system may well be "altogether the most complex human organization ever devised" (Drucker, 2006, p. 54). University of California, San Francisco (UCSF) Medical Center Director, Robert Wachter pointed out that the U.S. healthcare community has successfully managed matters of life and death through systematic practices and scientific research, but it has been slow to embrace the cost in time and money incurred by adopting digital healthcare technology (Wachter, 2015). Although electronic health records (EHR) are the best known aspect of digital healthcare technology, it can also include changes in how appointments are made, how patients are billed, how patients can access their health records, and how different care providers interface with one another—just to name a few. The U.S. Federal Government Health Information Technology for Economic and Clinical Health (HITECH) Act increased federal investment in digital healthcare technology and made record keeping a major facet of economic recovery (Kane et al., 2018; Menachemi & Collum, 2011; Wachter, 2015). Since the passage of the HITECH Act, large hospitals have steadily adopted government certified EHR systems. Consequently, over 90% of hospitals are connected with their physicians, vendors, and patients through online portals (Kane et al., 2018; Wachter, 2015). Yet, because HITECH required care providers to match funds or independently finance system-wide installation and upgrades, few small and medium sized hospitals, clinics, and private practices could afford them (Kane et al., 2018; Wachter, 2015). Hospitals were forced to change their structure in response to the disruptive demands of entering the *digital era* (Kane et al., 2018; Wachter, 2015; Weinman, 2015). Driven by federal regulations and *meaningful use* incentives, the initial effectiveness of digital health record adoption was

noisome and difficult to measure (Payne, 2016). *Healthcare leaders* needed to be tech savvy in order to handle the many digital changes taking place in healthcare—those who lacked this technical background and interest may have failed to properly coordinate and adapt their systems (Kane et al., 2018; Kanter, 1997; Wachter, 2015). Thus many physicians in private practices, clinics, and smaller hospitals resisted or postponed the implementation of digitized healthcare (Wachter, 2015). Moreover, given the steep cost of transitioning to digital systems, some smaller practices have opted to close rather than transition to the new system mandated by Medicare records.

Statement of the Problem

Healthcare leaders are now under pressure to execute their healthcare digital technology strategies in order to keep pace with the speed of innovation that is the norm in today's competitive healthcare industry. According to MIT researcher, George Westerman, focusing on technology alone can steer the organization into trouble, given that without proper infrastructure digital transitions are unlikely to be successful (Westerman, 2017). Technology is changing the face of medicine in many ways, for instance telemedicine is making it possible for providers to build relationships with patients before they physically enter the practice and continue them long after they are discharged. Once set correctly, digital technologies, such as EHR, billing, appointments, patient portals, interfacing with other service providers, appointment reminders, and patient management, can make work much easier.

In fact, there is no facet of healthcare that technology is not transforming. Technology has the potential to improve efficiency, lower personnel costs, and improve the patient experience, but tech savvy healthcare leaders are needed to spearhead these transitions. Thus, the challenge in the healthcare field is to identify technologically competent leaders who have strong affinity

for technology (i.e., a positive orientation toward new technological advancements), and cultivate technological skills through leadership development. This is critical because healthcare leaders who have an affinity for technology will be more receptive to technology implementation, and consequently will prioritize technology and budget for it. Yet little is known about how healthcare leadership styles relate to affinity for digital technology. Personality characteristics are thought to play an important role in interactions with technology (Franke, Attig, & Wessel, 2018). That is, users' affinity for technology interaction (ATI), can be used to assess whether an individual will tend to actively approach interactions with technical systems or avoid them. Therefore, ATI can be viewed as a resource to assess potential healthcare leader's interest in utilizing new technology (e.g., EHR, telemedicine). Leaders typically set the tone in the organization, and if they care about technology that should impact the extent to which they invest time, money, and resources into digital technology. In order to drive changes in digital healthcare, there is a need for leaders who embrace technology, that can foster a culture of innovation and transformation.

Examining these relations specifically within the healthcare field is important given that healthcare is a unique business, which is not just about the bottom-line. Healthcare leaders need to balance patient care with budgeting and profits. Thus, the life and death nature of business, place additional burdens and constraints on healthcare leaders. Given these unique expectations, there is a need for empirical work that explores the relation between interests in technology and individual differences in leadership styles and sociodemographic variables, specifically within the context of healthcare. Better understanding this relation could be highly advantageous, helping to inform future recruitment efforts of leaders who will adopt and support digital healthcare technology.

The Digital Shift in Healthcare, 2000–2018

The traditional hierarchical style of leadership in healthcare has been commonly discussed in the literature. Under this authoritative structure, physicians at the top of the pyramid have the authority and it is passed down to the lower-level rank. Most physicians are promoted to leadership positions on the basis of their clinical expertise, but may lack qualities necessary for effective leadership, particularly in this digital era (Lobas, 2006; Stoller, 2009). It is becoming increasingly apparent that doctors need to be competent leaders to manage the complex system of healthcare. Healthcare providers tend to be siloed off from one another, yet increasing communication between healthcare providers has the potential to improve patient care by providing more holistic collaborative care and increasing treatment continuity. The Joint Commission advises healthcare leaders not to think of healthcare organizations as collection of individual units, but as part of a larger interactive system (Schyve, 2009).

Ewens (2002) contended that clinicians could no longer avoid the importance of effective leadership, and Cooper (2003) called upon physicians to gain leadership expertise to implement positive changes in decision-making about patient-centered care. Oliver (2006) argued that healthcare leaders should seek insight into their own leadership styles and responsibilities to gain a deeper understanding of the attributes and skills needed to develop leaders within an organization. According to Natt och Dag (2017), Vice President of Leadership and Executive Director for Physicians Leadership for the Medical Society of North Carolina, the healthcare landscape is still experiencing tumultuous waves of rising costs and changes in care delivery and payments. She points out that all levels of the healthcare system are facing new professional demands and ways of working that shift healthcare away from traditional roles and structures, toward new leadership competencies. Many researchers see physician leadership as the core

element in ensuring that political and organizational agendas remain patient-centered and focused on value-driven care (Angood & Birk, 2014; Gunderman, 2009; Porter & Teisber, 2007; Stoller 2009), yet there remains a high level of uncertainty among physicians about the roles in system changes (Natt och Dag, 2017). Moreover, digital disruptions in healthcare—system-level changes in requirements and recordkeeping—have created new inefficiencies and disorganization, while improving and expanding in other areas (Dye, 2017). In 2008, about 47 million individuals in the U.S. were uninsured, and by 2009 it was 50.7 million (approximately 16.7% of the population). The number of uninsured residents rapidly decreased following the passage of the Affordable Care Act (ACA; Cohen & Martinez, 2016). After the full implementation of the ACA in 2015, only 9.1% of the U.S. population remained uninsured, despite population growth of almost 15 million people, from 2009 to 2015 (Organization for Economic Cooperation and Development, 2017). A 2017 report from the Organization for Economic Cooperation and Development (2017) indicates the U.S. spent 17.2% of its GDP on healthcare in 2017, 8.2% more than the average of all other countries combined, nearly all due to costly inefficiencies with regard to administration, pharmaceutical, diagnostic imaging, and regulatory requirements (Organization for Economic Cooperation and Development, 2017). This suggests that wholesale adoption of new highly efficient digital technology could be key to lowering costs and improving the efficiency and quality of healthcare available to the U.S. population.

Thus, one of the key solutions to overcoming some of the challenges described in the previous paragraph is to train and hire highly competent, digital healthcare leaders. Digital healthcare technology provides automation, standardization and speed, resulting in increased efficiency, reduced errors, and improved quality and safety of care. As such, research is needed

to identify the characteristics and practices of those healthcare professionals who can successfully and effectively lead the way in this new digital market landscape (Schyve, 2009; Kane, 2015; Wachter, 2015)

To advance in the digital health era, physicians everywhere must change their leadership styles and strategy. Healthcare digital technology alone does not provide value to a practice, instead the technology's value comes from doing business differently, because digital technology opens up new possibilities (Westerman, 2017). Healthcare leaders now need to motivate teams to set goals, collect data, and engage in analysis. Healthcare teams must develop the competencies they need to ride the crest of the technological and organizational curve of their industry, accepting new leadership and digital roles and responsibilities that will improve patient rapport, comfort, trust, and make their practices financially successful (Schyve, 2009; Kane et al., 2018; Wachter, 2015). In short, healthcare leadership needs to know how to develop technological affinity in themselves and their teams.

Purpose of Research

The purpose of the present study is to examine what leadership styles and competencies are associated with technological affinity. Technological affinity in this context means; how a leader behaves when it comes to new technology. Do they fully utilize all the features of the new technology or only use the basics? That is, what leadership qualities predict who is motivated to learn all the capabilities and fully utilize all the features of new technology. This is important because although numerous theories about leadership have been presented as solutions, few empirical studies have been conducted to confirm the optimal styles of leadership in digital era healthcare. Without empirical research on this topic, it is impossible to conclude with any certainty what characteristics are needed in modern leaders in the medical field. The current

study will empirically explore this question. As such, this study will provide the first analysis of healthcare leadership styles that may contribute to the acceptance of or resistance to technology.

The results of this study will help shed light on targets of intervention for improving quality technological leadership in the field of medicine. This includes educational and training programs for healthcare leaders and medical personnel.

Research Questions

This study will have the added benefit of providing information about the leadership styles of healthcare leaders. The following research questions (RQs) will serve as the focus of this study:

RQ-1 What sociodemographic characteristics among healthcare leaders are predictive of an affinity for technology?

RQ-2 Which leadership styles and competencies are predictive of affinity for technology?

In order to answer those questions, the researcher will design and distribute a survey instrument to healthcare leaders with experience in *digital transformation* of their organizations. Individual respondents' surveys will be obtained through an online survey platform (Qualtrics). Once received and compiled, all data will be analyzed to identify the leadership styles associated with affinity for technology among healthcare leaders.

Significance

The significance of this study rests on the information it provides to healthcare and other leadership executives in their efforts to incorporate digital technology into high demand organizations whose products or services require a high level of accuracy and employee performance. This information will assist recruiters and human resources departments in finding the best candidates to address their technological challenges. The results of this research may

also help administrators determine how to adjust aspects of their current organizations to support technological transition. Once people know the link between leadership styles and affinity for technology, they could potentially make structural changes to support technological transition. Findings are expected to benefit a wide variety of healthcare specialists, advocates, regulators, students, and patients seeking to learn how to navigate today's ever-changing *healthcare environment*. It is aimed primarily at meeting needs among the following groups: healthcare executives and physicians who seek to identify candidates with interest in technology and cultivate those leaders' digital leadership competencies to best suit their specific corporate environments; emerging teachers and students of medicine who are mapping digital leadership competencies for the next generation of healthcare leaders; and human resources managers in healthcare settings who seek more effective methods for screening and assessing executives' and other employee candidates' *digital competencies*. In sum, the overall goal of this research is to shed light on the link between healthcare leadership styles and orientations toward technology. In the long run this information has the potential to inform interventions, by developing educational or training programs to teach leadership skills that are most relevant to affinity for technology.

Assumptions

This study assumes that leaders who are experienced in managing both healthcare digital technologies and patient care will be best able and most willing to describe the challenges and benefits of the relevant innovations and praxes, and that they have applied, assessed, and evaluated the factors that have led to their successes and failures. The present research also assumes that executives leading digital implementation teams in other industries are likely to have at least some practical experience relevant to this research. Survey participants will be selected based on their having had enough executive or organizational leadership experience

with digitalization to provide intelligent feedback. The survey participants will be assumed to be qualified by the researcher based on three criteria. First, participants must have some experience with digital health technology (e.g., deploying or managing healthcare digital record keeping and communications, social media, and patients). Second, they must have healthcare leadership experience and some knowledge or awareness of the digital environment.

Study Limitations

Healthcare is a large industry filled with a wide variety of professionals and leadership challenges. The existing literature on leadership methods in healthcare is small and is short on empirical data, and statistically-based studies are largely non-existent. U.S. government and professional organizations can, however, provide some related statistics gleaned from those compiled for other purposes. The number of survey participants cannot yet be guaranteed and may not be representative of the overall population of healthcare executives in the U.S. Recruiting survey participants who are representative of the diverse segments of the industry, including clinicians and administrators in hospitals, clinics, and private practice, may prove challenging because they are busy professionals.

Definition of Terms

- *Healthcare leaders*: Hospital CEOs and similar executives, administrators, and physician-administrators in corporate and individual practices and other clinical settings.
- *Healthcare practitioners:* Qualified professionals engaged in patient-centered medicine and/or providing services for which they are exclusively qualified through specialized education, organizational certifications, and federal, state, and/or county licensure.

- *Healthcare environment:* The physical and social contexts in which healthcare practitioners provide services, including physicians' offices, hospitals, clinics, inpatient home care, outpatient rehabilitation facilities, residential and rehabilitation facilities, clinical or pharmaceutical offices, or retail providers supervised by qualified medical practitioners.
- *Informatics:* A field of medicine addressing the interactions among information systems, their tools, and the humans who use them. It is now an official specialty with its own board certification. (Wachter, 2015).
- *Consensus:* Designing a decision for action through collaborative communication. In healthcare, patient-family-caregiver consensus requires effective collaboration, building trust among stakeholders, and allowing patients to direct their own care in harmony with personal culture or values so that diagnosis and treatment proceed uninterrupted (Frampton et al., 2017).
- *Professional development:* Also called PD or continuing education, professional development in healthcare is most often focused on clinical best practices, but recent voices are calling for best practices in the e-culture competencies needed for leadership, team collaboration, innovation, and strategic-task performance (eLearning, 2018). Whether from knowledgeable in-house employees, outside educators, or tech consultants, PD allows personnel access to strategies and tactics that they need to achieve corporate goals and objectives in the changing digital world (Kane et al., 2018).
- *Big data:* According to Doug Laney of Gartner Research, big data has "volume," "velocity," and "variety" (Beyer & Laney, 2012, p. 54). Healthcare data has

become massive (volume), changes hourly (velocity), and may be structured, relational, or unstructured (variety). Although it now exists in many industries, healthcare's big data is still most probably the largest and least analyzed (Wachter, 2015; Beyer & Laney, 2012).

- *Digital communication:* Data exchange through wireless or wired digital transmission, including any hardware that uses digital computation (e.g., a cell phone or network server).
- *Digital era or age:* The digital era began in 1969 at select universities and aerospace and electronics corporations that were researching, developing, using, and communicating through the Department of Defense's Advanced Research Project Agency's electronic network. In 1981, the National Science Foundation (NSF) funded the Computer Science Network (CSNET). When scientists and programmers developed Internet Protocol Suite (TCP/IP) in 1982, NSF interconnectivity projects began at UCLA and Stanford. Throughout the 1980s and 1990s, alpha and beta users tested the information processing, data imaging, transmission, and storage of new hardware as it was improved and miniaturized. By 2000, computers and cellphones had become light and small enough to serve as necessary business and personal tools. Since then, accelerating data transmission speeds, touch-screens, GPS applications, live streaming, interactive video, record-keeping, and new quality control applications have transformed life (Rao & Scaruffi, 2013).
- *Digital information technologies:* Weinman offers five key conceptual categories of digital information technologies, including those that 1) manage information

about and motivate people, 2) manage information about and motivate things, 3) mine data and information, 4) sort, track, summarize, analyze data, and 5) tie the other four technologies together into networks (Weinman, 2015).

- *Digital disruption:* The new hardware and software continuously generated by computer industry research and development interrupts or restarts the product cycles of existing hardware or software and the industries that depend on them. It can significantly shift the usefulness or desirability of a product or service, challenging the life spans of even the largest, otherwise untouchable organizations (Weinman, 2015).
- *Digital transformation*: How organizations experience or manage digital disruption and restructuring of their internal operations, human and physical resource responsibilities, and executive leadership roles. It may require changes in corporate values, social attitudes, product and service processes, communications methods, or other competencies to accommodate the advantages while reducing the disadvantages of the device or software (Rao & Scaruffi, 2013; Weinman, 2015).
- *E-culture (or digital) competencies*: The acquirable knowledge and skills needed to accommodate the ongoing professional, cultural, social, and financial challenges posed by digital disruption and organizational transformation (Kane et al., 2018).
- *Mobile technologies:* Wireless digital communication devices with ranges and collaborative connections that significantly improve the location of human communication so that successful digital-era firms are always where the client is.

The most intimate mobile devices are medical implants, like the wireless pacemaker (Weinman, 2015).

- *The Internet of Things* (IoT): The adding of digitally "smart" appliances or tools to the Internet by Bluetooth or WI-FI allows their functions to be much more easily controlled, especially when the things are microscopic, like nanoparticles, or huge, like driverless cars, smart homes, or entire industrial plants. An IoT transmits data to and from people and computers in order to make increasingly better decisions. Interconnectivity supports innovation and experimentation through data collection, filtering, and analyses, which give programmers and IoT controllers new insights into user needs and behaviors (Weiman, 2015).

Chapter 2: Review of Literature

U.S. Healthcare

According to healthcare officials, we are fast approaching an era wherein access to technologically advanced healthcare will be a primary determinant of life expectancy (Healthcare Leadership Council, 2017). Yet, the continually changing healthcare landscape in the U.S. presents new challenges for physicians, practitioners, and medical teams. Arguably one of the greatest challenges is adaptation to digital healthcare technology. In recent decades, U.S. healthcare costs, social inequities, and lack of prompt and equitable delivery have caused U.S. healthcare to fall in international ranking (Schneider, Sarnak, Squires, Shad, & Doty, 2017; Wachter, 2015). In 2013, the Organization for Economic Opportunity and Development (OEOD) reported that life expectancy in the U.S. ranked eleventh in the world (Powell, 2016). Relatedly, in 2017, researchers at The Commonwealth Fund ranked the U.S. eleventh in healthcare quality, even though its Gross National Product is twice those of other developed nations (Schneider et al., 2017). Two years ago, Dr. Ichiro Kawachi, Loeb Professor of Social Epidemiology at the Harvard T. H. Chan School of Public Health, alongside other leaders at Harvard Medical School, expressed concerns that socioeconomic disparities are increasing inequalities in access to healthcare (Powell, 2016). Inequality is increasing due to inconsistencies in hospital policies and procedures, insurance coverage, and medical technology, in addition to the patients' inability to pay, thus increasing gaps in patient outcomes and life expectancies (Powell, 2016). When the Commonwealth Fund provided an analysis of OEOD findings in June 2014 and called for improvement to primary care delivery (Commonwealth Fund, 2014), the medical community began earnestly attempting to make U.S. healthcare competitive again through integrated,

comprehensive care and smooth information transfer across providers to eliminate duplication efforts and streamline care (Davis, Schoenbaum, & Audet, 2005).

History of Digital Health

Digital transformation has taken longer in the U.S. than in other nations, largely because of its diffuse organization and fiscally competitive stakeholders. However, because healthcare ethics regarding delivery of care are regulated by a variety of factors—laws, professional organizations, hospital administrations' fiscal limitations, insurance company requirements, and government agencies—the healthcare industry cannot rightly be viewed as a free market (Wachter, 2015). Moreover, patients and healthcare consumers who support them are by far the most vulnerable participants in the market (Heifetz, Grashow, & Linsky, 2009; Wachter, 2015). By the early 2000s, reason and compassion pointed toward the need for more viable healthcare industry practices that would reduce the fiscal, social, and human costs of continuous change (Healthcare Leadership Council, 2017; Heifetz et al., 2009). According to UCSF Director Robert Wachter, M.D., who has done the only recent, thorough historical analysis of the progress of the industry during the past 50 years—U.S. hospitals and insurers in the 1970s and 1980s used a variety of approaches that ultimately incentivized doctors to make patients appear sicker and led to accusations from insurers and politicians that hospitals were intentionally padding invoices for higher reimbursement. In the 1980s, paper patient files became too thick, complex, and vulnerable to malpractice suits because medical language differs for clinical, patient, and legal use (Wachter, 2015), so UCLA and Stanford medical centers' administrators began to collect, store, and retrieve some of their medical records digitally (Bauer, 2002). By this time many in medical research had already adopted email for professional purposes (Wachter, 2015). In 1990, American Medical *Informatics* began to use telemedicine to enable patients to interact with

clinicians. In-home patients and nurses began to enter vital and other clinical data into electronic files later viewed by clinicians so that the distance and time barrier was breached and the pathway to digitalization laid (Bauer, 2002).

However, digitalization was disincentivized by the structures of the healthcare industry. Physicians now in their 40s had little or no formal digital training until their college years, and many had no formal leadership training in medical school (Dye, 2017; Weinman, 2015). Since 2000, hospitals have been shifting away from inpatient to in-home care by their visiting nurses and therapists, enabled by *digital information technologies* (Bauer, 2002). Doctors, insurers, and patients also began adjusting to online medical research and e-medicine so that online hospital and physician portals began to be viewed as assets that add value by improving efficiency and enhancing care provider-patient relationships (Bauer, 2002). Nonetheless, many digitally competent physicians still viewed EHRs as poorly designed and hastily purchased. Those first systems were plagued with "frozen screens and user-unfriendly, even dangerous interfaces," some failed to bill insurers, and all forced clinicians and administrative staff change the way they did things (Wachter, 2015, pp. 66-67). According to one hospital director at Maine Medical Center in Portland, the new EHR caused them "a 6-month $13.4 million operating loss by failing to bill insurers for many services" (Wachter, 2015, pp. 66-67). One week after Cedars-Sinai installed its new Patient Care Expert (PCX) software system, doctors went on strike because it increased patient processing time by 500%. When Cedars-Sinai abandoned the $34 million system after a month, the media message was that EHRs were "risky" (Wachter, 2015). Healthcare IT Czar David Braler told the Washington Post, that up to 30 percent of EHR transitions fail (Orstein, 2003; Wachter, 2015). Now, EHR procedures have been integrated into large hospital procedures: when a physician overrides an alert and the floor nurse is not sure that

it should have been overridden, she is empowered to intervene, medical teams confer both through the system and face-to-face, and all responsibility no longer lies solely with the physician or hospital administrator (Wachter, 2015). Moreover, some liability now rests on hardware and software developers and purveyors to tailor their systems to the needs of the medical organization. Nonetheless, failures in initial implementation and employee *consensus* regarding readiness, and negative experiences have led many practitioners to delay their engagement with advanced digital technologies.

Slow digital adoption frustrated former computer scientist Dr. David Blair who helped the Mayo Clinic digitally transform, he believed that vendors were not sufficiently supporting doctors, nurses, and patients, as they largely focused on hospital CEOs (Wachter, 2015). Blair was the first IT Czar in the Office of the National Coordinator of Health Information Technology (ONCHIT), who fought long and hard for $42 million of federal money to set standards for digital "interoperability," but by 2008 only 9.5% of hospitals had EHR technology (Wachter, 2015). In 2008, former U.S. Surgeon General Dr. Everett Koop argued that many financial and social dilemmas in U.S. healthcare care delivery could be solved through digital systems, moving care from medical offices and hospitals into homes, facilitating cyber consultations and preventive strategies (Koop et al., 2008). However, some physician leaders objected, asserting that high quality patient care relies too greatly on physical presence, touch, and the personal diagnoses to be reduced to numbers and statistics like the stock market (Verghese & Horwitz, 2009; Wachter, 2015). Today, many are still concerned that digitalization will have unintended consequences, increasing harm to patients, lowering staff morale, or wasting clinicians' time, even though there is much evidence to the contrary (Friedberg et al., 2013; Wachter, 2015). Some complained that clinicians were looking at computers instead of patients, which was

supported by a research study at Johns Hopkins, which indicated that 12% of medical interns' time was spent talking with patients whereas over 40% of their time was spent on computers (Verghese & Horwitz, 2009; Wachter, 2015). Verghese remarked that "...without much discussion or forethought, the practice of medicine had been utterly transformed from work whose backbone was the exchange of information occurring through personal, physical interactions with patients and colleagues, to work chiefly mediated by information technology" (Wachter, 2015, p. 28).

Near universal adoption among large hospitals arrived with top-down government funding: the $30 billion HITECH economic stimulus allotment to healthcare in the 2009 great recession package jumpstarted digital infrastructure in U.S. healthcare (Watcher, 2015). By 2014, 76% of U.S. hospitals had EHRs, a 27% increase from 2013 (Watcher, 2015). Growth continued at 11.1% annually, until 2015 when 95% of large hospitals had adopted EHRs, 97% of which were government-certified (Charles, Gabriel, & Searcy, 2015). Because U.S. medicine is always chronically understaffed, effective digital technology has been welcomed since 2010, but the top-down command structures and lack of attention to frontline user needs in U.S. hospitals, damaged the process of digital technology implementation (Watcher, 2015). Physicians and nurses needed and wanted the convenience of mobile apps, teleconferencing, PACS, and the EHR, especially in emergency situations (Wachter, 2015). "A large hospital healthcare system processes about 10 million computer transactions daily, double that of NASDAQ," asserts Wachter (2015, pp. 43-44). "Computerization offered the hope of a "perfectly organized medical record" (Wachter, 2015, pp. 43-44). Yet administrators and software developers were in such a hurry to cash in on federal funding that fact-finding, research and development, testing, and systemic introduction were pushed too fast with too little (and often-ignored) user feedback.

Software companies and administrators also tried to use existing, outdated systems, and few involved grasped how disruptive digitalization would be to their previous top-down hierarchical organizations. Soon physicians were arguing in the media about who was practically and legally responsible for the snafus and implying sabotage due to job loss fears, and healthcare leaders were repressing feedback from doctors and nurses, blaming them for wasted time and problems so that processing issues were very slow to be addressed (Wachter, 2015). All those problems were the result of imposing such rapid change upon a complex, existing system without adequate and well-distributed leadership training among all stakeholders.

Since about 2009 or 2010, professional medical organizations have been reexamining strategies, training, and leadership and management approaches related to EHR and digital technology. By 2013 nearly every professional organization in medicine, including the American Medical Association (AMA), the Accreditation Council for Graduate Medical Education (ACGME), the National Board of Medical Examiners (NBME), and many specialist licensing boards were calling for improvements in the competencies training and standards of healthcare professionals, especially in technology (Harder, 2013). The increasing population began burdening U.S. healthcare and economic resources, and the millennial generation demanded healthcare leaders embrace digital technology (Frey, 2011).

In the past healthcare landscape, most small to medium healthcare organizations were entirely left out of the digital transition. Now, they are beginning to adopt EHRs, patient portals, and digital social media communications, however many report that it is a burden due to multiple or slow, non-interfacing systems, concerns about downsizing, and educational and leadership challenges (Watcher, 2015). Without digital support, small practices, clinics, hospitals, and pharmacies are stagnating and dying (Dye, 2017; Wachter, 2015).

Congressional changes to Medicare and ACA-based open-market insurance payment methods have shifted insurance reimbursement requirements from volume-based to "bundled" value-based payments that address rising costs (Miller, 2009). Value-based payments reward efficiency and effectiveness, not volume, an approach which supports quality care and digital technology adoption (Wachter, 2015). The new shift to value-based performance and payments, however, is now supporting digital access for more healthcare providers.

Smaller hospitals and practices must now use digital systems to reduce paperwork and increase personnel in clinical support in order to compete with vertically-integrated, high-value care and financing networks of providers and insurers that are entirely reliant on digital technology, enabling almost immediate online communications (Dye, 2017; Healthcare Leadership Council, 2017). The CVS/Aetna merger, for instance, resulted in e-enabled value-based provider networks and sufficiently disrupted retail pharmacy markets to induce others to do likewise. In January 2018, Amazon, Berkshire Hathaway, and J.P. Morgan announced in that they would create a tech-savvy, nonprofit insurance organization that was "free from profit-making incentives," disturbing the stock market valuations of established insurers, including Express Scripts, Cigna, CVS, UnitedHealth, and Aetna. President Adam Fein of Pembroke Consulting points out that "technology will be necessary but not sufficient to make positive changes" because such disruptions and transitions raise organizational and legal questions, including how to expand security, increase fraud protection and update abuse statutes to enable cross-sector partnerships (LaVito & Cox, 2018). Katherine Benjamin, an independent expert in online research and informational technology, reminds leaders that the healthcare market cannot be "one-size fits all" because consumer behavior is too diverse, asserting that the extent to which patients and practitioners can self-serve depends on their digital skills and access, health literacy,

and personal confidence (Benjamin & Potts, 2018, p. 2). Yet, healthcare costs may motivate digital adoption. Where basic healthcare is free, like in the U.K., patients in lower socioeconomic strata prefer face-to-face visits, but in the U.S. they might choose online services if that would lower out-of-pocket costs (Benjamin & Potts, 2018).

Digital Healthcare Challenges

Healthcare is now also facing security challenges as far-reaching effects of HITECH-ARRA (2009). Large scale digitized databases of patient information and new smaller EHR systems are shifting the volume and complexity of healthcare data that is digitally available, increasing vulnerability to data breaches (Kerr, Lau, Owens, & Trefler, 2012; Patil & Seshadri, 2014). A benchmark study on U.S. healthcare data security showed that over 90% of providers had had some kind of data breach (Khan & Latiful Hoque, 2016). Anthem Inc., for instance, suffered massively in 2015 when hackers gained access to the personal information of 80 million patients. The most significant patient data security challenge may be that so many business and technical entities are working together over heterogeneous networks (Majumdar & Bansal, 2010). Another impending threat is the Internet of Medical Things, a temptation to cyber-attacks because of its potential wealth of private data (Gross, 2018). Healthcare leaders must take on another, active role in keeping clinical and office staff informed and prepared to respond to digital security challenges (Schiano, Sherman, & McClean, 2018). Healthcare security and all personnel must monitor both endpoint devices and critical servers to protect patient data, yet healthcare leadership has historically under-emphasized information security training (Schiano et al., 2018). Only 30% of healthcare workers have training in data protection and only 38% know their security policies, in fact many organizations still don't have them, which means staff are taking needless risks (Schiano et al., 2018). To adequately protect medical data, healthcare

leadership must conduct regular risk assessments and systematic investigations for missing or manipulated data, identify desirable security behaviors and establish norms, eliminate extraneous security alerts, and train staff to be aware of cybercriminal digital and social tricks, how to foil attacks, run security tests, install critical pop-up alerts, and post signs where security errors often occur (Schiano et al., 2018)

Opportunities in the Digital Healthcare Era

The *big data* accumulating through EHRs and patient portals promises opportunities and another paradigm shift. Wachter identifies five big data sources that will change the face of medicine: clinical EHRs, genetic mapping, government demographics, physician billing records, social media, and digital sensors. (Wachter, 2015). Moreover, physician and researcher participation in professional online publishing has created a huge online bank of research studies, data sets, and diagnostic descriptions (Ovretveit et al., 2017). Since 2012, over 85% of physicians have been using smartphones apps in clinical practice to access drug guides (79%), textbook/reference materials (55%), classification/treatment algorithms (46%), medical knowledge (43%), medical calculators (18%), coding and billing apps (4%) and the use of such apps is projected to continue to rise (Franko & Tirrell, 2012; Wachter, 2015; Weinman, 2015). By 2014, about 95% of hospitals had adopted certified, electronic EHR systems that enable physicians to use their laptops, tablets, and smartphones to conduct research and report data (Wachter, 2015; Weinman, 2015). From 2011 to 2018, private and government healthcare researchers and practitioners in the U.S. conducted online documentary and patient research, treatment and medication trials, publishing the results (Mold, 2017). Regulatory and governmental organizations responded to this research by improving and streamlining standards of promptness, safety, and quality of care, gathering research data and analyses via digital

technologies which are now used by everyone to achieve the healthcare community's ongoing goal-setting (Mold, 2017). Dizon and colleagues reported that Internet-based *mobile technology* is contributing increasingly effective tools for medical applications, website information, and social media to aid clinicians and patients in participating in new clinical trials (Dizon et al., 2018). Already, computers have prevented diagnostic errors and patient deaths, but big data will hugely amplify that success (Wachter, 2015). New AI programs are already greatly increasing the accuracy and speed of diagnosis, meanwhile drastically reducing the diagnostic errors that contribute to up to 80,000 deaths annually in the U.S. (Wachter, 2015). In all those ways and more, the digital healthcare community is poised to use its big data as new digital tools continue to appear.

As the U.S. population grows so does medical data, and healthcare IT personnel are now working on ways to access and analyze that data and use it to improve patient care (Wachter, 2015). In 2015, the medical literature was estimated to include 24 million journal articles and was growing at a rate of 2,100 articles daily (Wachter, 2015). Currently, a conservative estimate is that at least 25.33 million medical journal articles are available for study and research. Sensor data and wireless transmission will provide even more data about homecare, inpatients, and outpatients as medical information is monitored automatically and transmitted through patient and professional portals to hospitals or doctors (Wachter, 2015). The leadership challenge is how to access and analyze so much data for specific purposes and how to engage artificial intelligence to mine data and use that information to test various medical approaches, assess new data sources with complex models, and use that information to continually update the provision of healthcare (Wachter, 2015).

Since not all industries digitalize the same way, new apps promise to continuously create new opportunities for disrupting existing models and industries, and render them obsolete (Buescher & Viguerie, 2014). Healthcare leaders must develop an affinity for technology to engage AI systems in data analyses, teach and lead medical technology researchers to eliminate errors, and improve their own human decision accuracy by finding ways to prevent multiple inadvertent decision errors that can cause massive accidents (Wachter, 2015). They must learn to apply sophisticated, multiple probability models to healthcare systems and medical practice in order to increase effectiveness, reduce overhead, and lower costs. (Wachter, 2015).

In short, digitalization of data will continue to create new healthcare industry challenges, opportunities, expectations, and criteria through repeated disruption and transformation of its organizational models, thus its leadership must embrace continuous change and chart their future technological success (Wallin, 2006). Healthcare leaders seeking success must learn to recognize those opportunities posed by new hardware, software, and the data gained through them in order to adjust their business models and better serve their patients. In addition to recognizing the opportunities, they also need to be trained in how to manage challenges for the sake of the patients.

As digital technology continues to disrupt pharma, clinical medicine, and the healthcare industry in general, its successful leaders learn from the experiences of others in various industries (e.g., banking), that have faced similar upheavals (Buescher & Viguerie, 2014). Many U.S. *healthcare practitioners* now make decisions much more rapidly than they did 5 years ago. Using big databases, mined from their own EHRs and those of others, they refine best practices, promote integrated *professional development* in technical literacy as well as sociocultural and cognitive skills, improve medical and organizational procedures, raise standards, and recursively

improve patient outcomes. In short, healthcare practitioners using cutting edge digital healthcare technology can now lead their organizations into a new era of efficient, and effective, professional performance (Eshet, 2005; Wachter, 2015). Those who do not are increasingly out of the loop and risk obsolescence.

History of Leadership Styles

Responsible and responsive leadership have always been lauded and highly-valued (Northouse, 2016). As the process of influencing or directing a group toward the achievement of a common goal, effective leadership must be fluid, living, and dynamic according to purpose (Dye, 2017; Hersey, Blanchard, & Natemeyer, 1979). Although some leaders do make the decisions that determine the course of organizations' or even human history, many others help people and organizations succeed, collaborating and making lesser decisions to influence, advise, support, interpret, and implement organizational changes (Heifetz & Laurie, 1997). Until the mid 19th century leaders were generally born into leadership or groomed for it by the socioeconomic elite. Once early industrialism allowed middle-class men (and a few women) to rise to success through their practical knowledge, business acumen, luck, and persistence—business and political leaders in particular—began to be viewed as possessing a unique combination of nature and nurture. When at the start of the 20th century German sociologist Max Weber wrote about the benefits of organizing people into specialized groups, the idea that the captains of industry had special talents and genius had already taken root in western culture (Dye, 2017). And, as the second wave of industrialization gathered and broke into World War I, many leadership theorists were still traditional, elite historians who still assumed that the best leaders were born to be great men (Dye, 2017). The individualist, sexist, genetic, "great man theory" had continued on the non-empirical and tautological observation that the decisions of extraordinary leaders were

determining the course of history (Dye, 2017). Through the 1930s, leadership literature emphasized leaders' modes of control, centralizing power, and the traits that made them great (Landis, Hill, & Harvey, 2014; Northouse, 2016).

As the middle class and industrial competition grew after the second world war years, "trait theory" became the study of mental, physical and social characteristics (Dye, 2017). Partly because so many men, like Churchill and Eisenhower, had risen from humble origins to leadership during and after World War II, Stogdill raised a critique of the trait theory in 1948, contending that leaders' circumstances and opportunities must also be considered. His research started a new "skills approach" that focused on how leaders apply specific skills and behaviors to given situations (Northouse, 2016). Still an individual leader based perspective, it began a new emphasis on leadership competencies rather than purported genetic gifts. The early work of Robert L. Katz (1974) categorized the skills of effective leaders as technical, human, and conceptual. He viewed lower management as employing mostly technical skills, middle management, mostly human skills, and upper management mostly conceptual skills, although his model allowed for considerable overlap, as well as learning and mentoring (Katz, 1974). Since then there have been multiple attempts to refine Katz's skill categories (Kalarygyrou, Pescosolido, & Kalargiros, 2012; Katz, 1974; Northouse, 2016). For instance, Mumford, Zaccaro, Harding, Jacobs, and Fleishman (2000) expanded the skills approach by attributing success both to skills and to traits that enable leaders to solve complex social problems in their organizations using their personal attributes, environmental influences, competencies, career experiences, and leadership outcomes.

Northouse has remarked that by 1930 some theorists viewed leadership as interactive and dependent upon follower support, and that that view increasingly surfaced after World War

II—as leadership was more openly defined as an acquired skill set used to direct group activities (Northouse, 2016). In 1960, Douglas McGregor's *The Human Side of Enterprise* influenced behavioral psychologists' theories of leadership, which were already focusing on the nature of human cognition, learning and performance, social relationships, and achieved output (Bolden, Gosling, Marturano, & Dennison, 2003). MacGregor's thesis (called Theory X and Theory Y) was that leadership strategies are based in the leader's assumptions about human nature (Bolden et al., 2003). Theory X leaders believe humans naturally dislike work and so must be controlled, whereas Theory Y leaders believe people can and will exercise self-direction to achieve their objectives (Bolden et al., 2003). Another 1960s behavioral approach was the Blake-Mouton *Managerial Grid*, which proposed that leaders help organizations reach their objectives using two measurable factors 1) concern for production, and 2) concern for people (Northouse, 2016). For that reason, Blake and Moulton proposed, *team management* as the most effective leadership method (Bolden et al., 2003).

Up through 1969, leadership theories tended to be generalize descriptions of individual researchers', non-empirical observations that gave minimal guidance about which leadership behaviors were most effective in handling various organizational challenges, but as the new *situational leadership* and *continuum leadership* theories developed, managers began to view individuals' executive and management strengths as contingent upon circumstantial factors like the task to accomplish, existing organizational structures, and available personnel (Bolden et al., 2003). One of the most widely recognized situational leadership approaches was advised by Hersey and Blanchard (1969), who offered leadership recommendations that executives and managers should include specific mixes of directive and supportive behaviors based on their knowledge of their employees' levels of development (Bolden et al., 2003; Northouse, 2016).

Directive leadership was defined as one-way communication, that is, explaining what must be done and/or how to do it. Supportive behavior was conceptualized as two-way communication that provided the employee with social and/or emotional support (Northouse, 2016). According to Ken Blanchard, who has long taught situational leadership, the key variable in determining an appropriate leadership style is effectively social, that is, leaders must identify followers' developmental (educational and experiential) readiness (Bolden, 2003).

By the mid-1970s, most leadership theorists were discussing interdependencies among leaders and followers. *Team or collaborative leadership theory* was a post-war phenomenon carried over from the military and was most relevant to design and project engineering of all kinds, especially aerospace and construction, medical practitioners, and most, recently educators. It is also an approach employed and theorized by transformational and adaptive leadership theorists (Heifetz et al., 2009; Heifetz & Laurie, 1997; Wachter, 2015). According to Northouse (2016), the ideals, values, and outcomes of team leadership differ from those in traditional top-down organizations. Team leadership must also be flexible; functions can be distributed by a formal team leader, temporarily or permanently, or may be shared mutually by team members (Northouse, 2016). In any case, advocates of collaborative work styles say shared team leadership increases their possibility of success (Northouse, 2016). In a 1977 article, Robert J. Greenleaf, defined *servant leadership* as a social reciprocation that mobilizes leaders and followers with specified and shared motives and values to realize their goals, independently or mutually, consciously or otherwise (Northouse, 2016). He emphasized a) the servant leader's ethical responsibility for attending to and empathizing with followers' needs, concerns, education, support, and nurturance, and b) that their first priority should be to serve others, not to promote their own agendas over the good of their followers (Northouse, 2016).

The term *transformational leadership* was originally coined by sociologist, political scientist, and teacher James V. Downton in 1973. In 1978, military historian, business leadership writer, professor, and biographer James MacGregor Burns characterized FDR's moral and motivational approach to the Presidency as *transformational* because his intention was to inspire the citizens to change their ideas, perspectives, expectations, and motivations, take the nation's foundational philosophies seriously, and make sacrifices for the common good (Burns, 1978). Burns argued, however, that transformative (i.e., transformational) leaders reject the *give and take* deal-making of the transactional leadership model. Instead, they lead through virtue and charisma. Burns (1978) proposed that transactional and transformational leadership were mutually exclusive because transactional leaders focus only on deal-making, strategies, tactics, support structures, hard data, and systems to reinforce the bottom line to ensure their position or power. Transformational leaders identify and develop the needs, values, and beliefs of followers to promote their personal development and professional advancement (Northouse 2016). Psychologist Bernard M. Bass (1990) expanded on Burns' theory by defining transformational leaders as those who lead with acumen, persuasion, and compassion, thus inspiring the respect, admiration, and trust of followers. He also claimed that leadership success could be measured comparatively by assessing followers' motivation and performance by using rational logic and emotional appeals to provide followers with a vision and mission that offered belonging or identity, challenged outdated norms, and adapted to recreate success. Unlike Burns, Bass (1990) believed that transformational leaders used transactional methods to adapt to the individual values and needs of followers (Bass, 1990). He extended transformational leadership into a communication skill through which the leader expands the followers' profile of needs, expectations, and confidence to encourage behavioral change (Bolden et al., 2003).

Leadership that transforms others' lives responsibly, requires higher level psychological, social, and organizational knowledge and skills (Bass, 1990; Burns, 1978; Heifetz et al., 2009). The theory of *adaptive change* and *adaptive work* in a changing digital and economic world was coined by Ronald Heifetz, M.D. and his colleagues in 1993, just 30 years after Olivetti sold the first desktop computer at the New York World's Fair (Highmore, 2003). Heifetz (1993) posited that traditional business tended to resist change in order to withhold power, defend positions, and prolong profits, but in the end were probably causing significant damage to themselves, their employees, their organizations, and the national economy. In wasn't until 2000, however, that Mumford and colleagues attempted to develop a comprehensive, *skills model of leadership* in hopes of building a measurable set of cognitive *competencies* that leaders could use to formulate solutions to complex and novel social problems (Mumford et al., 2000; Northouse, 2016). Focusing on cognitive problem-solving, social judgment, personal motivation, and personality style, Mumford's team recognized that leadership skills that were interactive could not provide strong measures for individual traits or leadership experience (Kalargyrou et al., 2012). At the same time, Goleman (2000) claimed that leaders who master his leadership styles are more likely than others to achieve success and that the impact of his authoritative, democratic, affiliative, and coaching leadership styles on an organization's atmosphere and performance could be measurably identified.

Cameron and Green (2004) seconded Heifetz, pointing out that many traditional leaders in top-down organizations were not well-disposed or well-trained for *change management*. They suggested that leaders expand into team collaboration and pay attention to more than just outcomes. Instead, they advised that leaders should embrace change, to shape their interests and manage followers' emotions (Cameron & Green, 2004). From 2000 through 2013, other

leadership theories arose that seemed relevant to healthcare. Popularized by Bill George, the former chair of Medtronix (George, 2003; 2007), *authentic leadership* revised previous proposed psychological-ethical theories (Ladkin & Taylor, 2010). Authentic leaders, George asserted, promote trusting relationships with followers through self-awareness, transparency, and data-driven decision-making (Gardner, Avolio, Luthans, May, & Walumbwa, 2005). George included *charismatic leadership* as a specific leadership subcategory (Ebert & Griffin, 2009, as cited by Sajjadi, Karimkhani, & Mehrpour, 2014) and provided evidence of discriminant validity relative to other leadership constructs, such as transformational leadership (Gardner, Cogliser, Davis, & Dickens, 2011; Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008). Over the following years, Heifetz and colleagues developed *adaptive leadership theory* through anecdotal analysis and adopting others researchers' conclusions, drawing multiple elements from the servant, responsible, transactional, transforming, transformative, team-collaboration, and skills-competency models of leadership (Heifetz, & Laurie, 2011).

Leadership in Healthcare

As successive waves of digital systems implementation hit large hospitals after 2009, traditional top-down leadership theories were severely challenged in the public eye. Questions about the profit motives of hospitals, physicians, and insurers; government oversight and outright control over U.S. medicine; and the commitment of physicians and hospitals to patient care became major controversies. All of this was fueled by special interests for and against government subsidized and regulated healthcare. The results was increased calls for the type of responsible leadership that ethics literature has long recommended, that public leadership should be the legitimate construction of viable solutions that meet the needs of all stakeholders

(Voegtlin, Patzer, & Scherer, 2012 as cited by Sajjadi et al., 2014; Waldman & Galvin, 2008 as cited by Sajjadi et al., 2014).

In response, a revised and improved Adaptive Leadership Theory was devised (Heifetz et al., 2009; Heifetz, & Laurie, 2011), designed to address the challenges of healthcare management and administration (Wachter, 2015). Its methods are easily aligned with the processes of *digital disruption* and digital-human interface and a possibly endless series of successive innovations in e-communications, EHR development, healthcare portals, online telemedicine, the *Internet of Things*, and other smart medical devices and digital data interfaces (Wachter, 2015). Defined as "the practice of mobilizing people to attack tough challenges and thrive" (Heifetz et al., 2009, p. 14), adaptive leadership theory addresses organizational change, risks, purposes, and opportunities using a post-Darwinian biological evolutionary model that distinctly appeals to healthcare professionals (Heifetz et al., 2009; Wachter, 2015). He posits that adaptive leaders have *three core responsibilities*, to provide direction (offering vision and clarifying roles), protection (ensuring that the group is not vulnerable), and order (Heifetz et al., 2009). To manage change, adaptive leaders must sometimes take social risks and "raise the heat" in order to motivate the team to engage with neglected but important problems they would otherwise avoid (Heifetz et al., 2009, p. 18).

A study of physicians in individual practice and those who supervise clinical teams concluded that physicians are unique among leaders in their variability of leadership style (Chapman, Johnson, & Kilner, 2014). This qualitative analysis showed that physicians use multiple leadership styles (e.g., Goleman's authoritative, democratic, and affiliative approaches, as well as coaching, commanding, and pace-setting) and identified none as being typical (Chapman et al., 2014). Chapman's team found that surgeons were most often found to use pace-

setting and authoritative styles, perhaps due to their roles in leading teams to achieve precise results. Physician age was also a determinant factor: the eldest, most experienced clinicians often avoided commanding and autocratic styles, recognizing the value of using more flexible leadership styles (Chapman et al., 2014). As healthcare executives, physicians' awareness of their own styles and those of their associates can be used to match individuals to projects and develop effective teams where individual knowledge, interests, and traits merge to strengthen the team as a whole. For instance, an affiliative chief executive can foster team spirit, a pace-setting deputy can ensure targets are met, and individual team members' expertise or interests can drive goal-specific achievement. Overall, medical leaders who are able to broaden and adapt their own leadership styles promise to be the most effective in meeting the diverse professional and personal needs of their teams, colleagues, patients, and families, resulting in the best possible patient care (Chapman et al., 2014).

Many leaders in large healthcare, education, and other fully digitalized industries can offer newly digitizing healthcare leaders advice about how they have effectively piloted their companies through the organizational challenges of full digitalization (Kane, Palmer, Phillips, Kiron, & Buckley, 2018; Wachter, 2015). In June 2018, an MIT-Deloitte Research team interviewed some industry leaders, including several healthcare executives, about what they have learned from their digital and organizational transformations over the past 20 years, finding that leadership flexibility and creativity (not money) are key to increasing digital competencies across transforming companies (Kane et al., 2018). Kimberly Lau, Senior VP of Digital and Head of Business Development at The Atlantic explains that digital transformation in midsize firms means "we have to choose carefully, because we've got limited resources.… work fast and you move on quickly, because there's always somewhere else to put those resources." (Kane et al.,

2018, p. 12). Digital competencies must be updated annually according to 90% of respondents and 44% report that they must continually update digital competencies to stay effective (Kane et al., 2018)

The Deloitte researchers also suggest that relying on off-site training programs and book or online learning, without practice, may be a problem for young digital companies (Kane et al., 2018). Digitally maturing companies were more likely to prefer on-the-job training as a way to expand employees' digital skills (Kane et al., 2018). The report also cites Colin Schiller, President of San Francisco-based Everwise Corp., who believes that digital training should be delegated to those who find the best tools or apps and want to use them in their teams (Kane et al., 2018). Deloitte's researchers add that identifying their own strengths and developing working partnerships with other organizations and institutions will help businesses create a continuously better-equipped workforce (Kane et al., 2018). George Westerman, head scientist for the MIT Sloan Initiative on the Digital Economy, told Deloitte researchers that the fatal error is mistaking digital transformation for a technical challenge rather than "a strategy or leadership challenge" (Kane et al., 2018, p. 13; Westerman, 2017). In short, leaders of digitally savvy, medium to large hospitals and other corporations report that digital transformations slow or fail because their leaders have lacked flexibility in their beliefs, assumptions, and knowledge about effective leadership, erroneously relying on their pre-existing control hierarchies, rather than encouraging their organizations to operate as collaborative and proactive problem-solvers (Heifetz et al., 2009). More recent advisers, however, warn that digitally proficient healthcare leadership must continually set and reset objectives, create innovative policies, reorient and motivate colleagues toward new goals, and model the multiple leadership styles and competencies needed to improve care (Heifetz et al., 2009; Heifetz & Laurie, 1997; Kane et al., 2018; Wachter, 2015).

The increasing frequency of digital disruption in contemporary business models and increasing automation of the workplace has put a premium on leaders who can envision change and frame it positively (Buescher & Viguerie, 2014). Kotter (2014) argues for a *dual operating system* as the solution that will comfort traditionalist leaders with the notion that embracing the new economy need not mean abandoning old methods entirely. Introducing digital systems and new leadership tactics can add agility and speed while old methods provide reliability and efficiency. He asserts that automation now means rapid disruption, reconfiguration, and transformation of services and industries (Kotter, 2014). But how can healthcare organizations continuously reconfigure to embrace and encourage change opportunities within static organizational models and methods for continuous? The digital information age demands fast-paced invention and reinvention, continual change, including daily emendation of strategies, structures, procedures, processes, and authority—ignorance of which can exact, even in a very short time by 20th century industrialist standards, enormous costs (Kane et al., 2018; Kotter, 2014; Wachter, 2015). In general, well-established organizations are optimized for efficiency, not strategic agility, but short-term cost-saving management hierarchies do not quickly or skillfully identify imminent hazards or opportunities, nor can they formulate new strategic initiatives before damage has been done (Heifetz & Laurie, 2001). Young non-hierarchical networks, however, can quickly find and implement creative ways to capitalize on unpredictable windows of opportunity because they lead not by control, but with vision, agility, innovation, inspired action, passion, and recognition—not only for managing projects on budget, but exceeding quarterly expectations (Heifetz & Laurie, 2001; Kane et al., 2018; Wachter, 2015).

Practicing medical professionals have long worked on clinical and research teams, focused on best practices, continuing education, and how to best improve patient outcomes,

whereas hospital chairs, executives, and administrators have evaluated their work mostly in terms of the litigation and fiscal consequences to their organizations (Heifetz & Laurie, 2001). "Traditional management works great until the work becomes complex, agile, and unpredictable, and you can't get data up [to management] quickly enough," says John Kenagy, M.D., an innovation researcher who has applied Toyota's Theory of Adaptive Design to medical care in ways that have since achieved significant cost savings in healthcare (Dunn, 2014, p. 1).

In healthcare, continuous decisions arise during systemic introduction of digital innovations, and often they must be dealt with immediately by medical teams while administrators and executives are occupied elsewhere (Wachter, 2015). This is exemplified by the 2014 crisis in the Veterans' Administration (VA) in which patients missed out on critical, time-sensitive care, a systemic failure which resulted in deaths and lawsuits, ultimately resulting in the Veterans Access, Choice, and Accountability Act of 2014 ("Veterans Choice Act"). In 2014, Rand Corporation's brief of the VA's internal organization reported systemic failures far beyond irresponsible actions by specific individuals (Farmer, Hosek, & Adamson, 2016). The controversy demonstrated that healthcare requires not only the best research but also responsive organizational and fiscal structures with leadership strategies that ensure responsibility is taken for patients' needs and outcomes (Farmer et al., 2016; Hussey et al., 2016).

Many researchers have demonstrated that the character and effectiveness of a healthcare organization is greatly influenced by the intellectual resources and personal relationships formed among the administration, personnel, and patients (Kilpatrick, 2009). Hospitals, clinics, and physicians' practices must learn and adapt quickly because the rate at which a knowledge-based industry can learn should be greater than the change rate in its business sector and leadership should hold the central role in developing methods for learning, including digital innovations

(Franko & Almeida, 2011; Johnson, 1998; Prewitt, 2003; Rijal, 2010; Sandler, 2003; Stata, 1989).

Franko and Almeida (2011) have pointed out that healthcare leaders have influential roles in providing flexible organizational cultures, favorable to innovation, change, and individual action in line with the corporate mission and policies. Organizational learning requires flexible leaders who motivate and bring out the best in others (Rijal, 2010; as cited in Franko & Almeida, 2011). Larger companies are learning that consolidating market share, saving money, and siloing specialties and powers cannot meet the challenges of the organizational transformation and creative leadership that digitalization demands—especially not in healthcare (Heifetz et al., 2009; Heifetz & Laurie, 1997; Kane et al., 2018; Wachter, 2015). Stanford University digital leaders assert that the digital world now requires people to collaborate with "co-bots," collaborative robots (Kane et al., 2018, p. 13). Thus, executive and administrative integration (de-siloing), grassroots collaboration, and improved communications have all been deemed central to ongoing digital transformation that improved patient care, the exact opposite of cost-cutting micromanagement that investors have believed keeps companies "lean and mean" (Heifetz et al., 2009; Kane et al., 2018; Wachter, 2015).

Several executive standards for healthcare leaders were first developed by the National Center for Healthcare Leadership (NCHL) as advice for future leader selection by independent healthcare organizations. They offer 26 major standards and a wide array of secondary categories of competencies for healthcare leaders, ranging from developing a transformative vision to good grammar (National Center for Healthcare Leadership, 2006; see Appendix E). Its *Competency Model* included a new focus on the importance of social media (Booth, Strudwick, & Fraser, 2017) and participation in online communication and learning, recruitment, and e-

professionalism as a core organizational competency for all staff, leadership, and clinicians. Goals include, using social media to meaningfully engaging patients and stakeholders, develop a proactive organizational social media strategy with emerging leaders, and promote organizational and leadership transformation. Since then, healthcare leadership scholars like Wachter (2015) and Heifetz (e.g., Heifetz et al., 2009; Heifetz & Laurie, 1997) have explored those leadership needs and the value of collaborative teamwork and other healthcare leadership competencies in more detail.

In addition to the remaining reluctance of some caregivers to adopt digital information technology, the healthcare industry is still grappling with long-standing challenges in customizing its software to a) meet the needs of patient and practitioner privacy and security and b) meet the digital learning needs of medical end-users, including providers and patients (Wachter, 2015). Computer hardware and software vendors' failures must be overcome by medical professional team innovations seeking to provide effective equity solutions (Wachter, 2015). Professor Leonard H. Friedman of George Washington University summarizes six skills he believes are required for effective healthcare leadership in the modern era (Friedman, 2018).

1) Leadership must build emotional intelligence, systems thinking, and teamwork that prevent *sub optimization* caused by specialization siloing.

2) Leadership must develop effective communication skills, including careful listening, clear and responsive communication, and follow through on commitments.

3) Leadership must initiate *change management*, which motivates workers to change, recognizes that everyone must compromise, and views change as a continuous process.

4) Leadership must embrace challenges and complexity.

5) Leadership must avoid micromanaging the system.

6) Leadership must introduce a few, simple, consistently reinforced organizational norms.

Westerman (2017) concurs and offers a series of things to avoid in order to ensure success in digital transformation, and learning to do business differently.

1) Avoid silo thinking. Mobile strategy, big data strategy, and virtual reality strategy all involve incremental thinking that misses the big opportunities. Valuable transformations, he says, come from new policy approaches, like increasing customer intimacy through a mobile phone app.

2) Do not push too fast, change takes time and requires human adaptation.

3) Do not ask anyone to manage alone, even IT-CEOs can't do digital by themselves.

4) Do not approach it as a project but as building everyone's leadership capabilities.

Overall, Westerman (2017) emphasizes that focusing on transformation shows how leadership and organizational skills create value through innovation. He argues that technology helps business get done, but it's a means to an end.

In recent years, practices in team building, communication, and collaboration to establish consensus and ongoing engagement in nurturing the corporate vision and the strategies and process to achieve it have been proving successful (Kane et al., 2018; Wachter, 2015). It might seem inefficient and time-consuming, but organizational transformation as a full adaptation, applied as needed to the current industry landscape, seems to promise a high degree of success (Heifetz et al., 2009). Adaptive leaders can motivate and harness substantial and often surprising personnel knowledge, expertise, and commitment that generates the internal systemic changes necessary for leadership and corporate transformation, and hence necessary for an organization to renew itself and its market (Heifetz et al., 2009; Wachter, 2015). Medicine has long used one important innovation in team engagement: the *Subjective, Objective, Assessment, and Plan* (SOAP) designed by Larry Weed in 1971 to manage the *problem-oriented medical record* of

severely ill patients. Still often used by practitioners, SOAP requires lead doctors to involve all medical team personnel on the patient's case to determine how severe the patient's condition is, and offer possible solutions, until they have tailored the most elegant plan possible for achieving desired patient outcomes (Wachter, 2015).

After inspecting medical leadership literature and available evidence, Kane's research team came up with a similar approach for improving learning and leadership in healthcare. Kane's approach involves trying out different approaches and improving based on those experiences, continued learning and development of leadership, and group decision-making involving staff at multiple levels (Kane et al., 2018). The leadership recommendations provided by Kane and colleagues (2018) include the following.

1) Keep up with the horizon of healthcare digitalization and manage advancing disruptions through teamwork.

2) Plan in advance with an open mind and willingness to imagine multiple outcomes and failsafe options.

3) Inspect clinical, digital, and organizational systems by engaging the knowledge, interests, and skills of all teams in order to formulate a consensus vision, set achievable goals, and adjust both digital technologies and human behaviors for optimum results.

Finally, most recent leadership scholars agree that open-minded team facilitation (i.e., encouraging and guiding productive team discourse and problem-solving) is an important, if not the most important digital leadership competency. The more often leaders engage in open dialogue with coworkers, the more opportunities they have to learn how change will benefit everyone, and the more engaged staff will become (Heifetz et al., 2009; Kane et al., 2018; Wachter, 2015). Monahan, Chmiola, and Roos (2017), reported that creating a risk-taking culture

gives employees opportunities to learn from failure and success. In fact, their research indicates that if openly testing ideas is unapproved, leaders are unlikely to lead followers through digital transformation successfully (Monahan et al., 2017). Deloitte Consulting's year-long study of leadership behaviors in implementing large-scale technology in a 450-person financial services division indicated that researchers found several, effective executive behaviors quite similar to those listed by Monahan and colleagues in 2017(Kane et al., 2018). Behaviors include a) clarifying priorities and success measures and giving permission to mid-managers to shift priorities as needed, b) creating psychological safety during check-ins to insure employees feel free to offer effective two-way feedback whether or not things are not going right, and c) recognizing staff and support risk-taking.

Behavioral science has proven that intrinsic motivators inspire long-term behavioral change and strong long-lasting engagement in digital transformation (Kane et al., 2018; Monahan et al., 2017). Team facilitation skills are catalysts for defining and achieving specific constructive change—technological, behavioral, or both—whether it be sequencing of clinical or business processes, augmenting or streamlining available system tools, or changing their modes or purposes. Many researchers and healthcare leaders also seem to agree that one critical competency is reiterative engagement and facilitation of collaborative teams, in which colleagues and staff communicate efficiently toward ongoing collaborative organizational transformation, and skills acquisition and refinement (Friedman, 2018; Heifetz et al., 2009; Heifetz & Laurie, 1997; Kane et al., 2018; Wachter, 2015).

In sum, in turbulent environments, healthcare leaders need to develop and nurture a unique set of resources. The changing nature of healthcare suggests that skills cannot remain static (Krawczyk-Sołtys , 2017). Skills must be continually evolving; therefore, healthcare

leaders have to continue to invest in and upgrade their skills and competencies. Furthermore, much of the innovation comes from new entrants drawing on skills distinct from those that we typically associate with healthcare executives and using disruptive business models (Rubin, 2016).

Affinity for Technology

The tendency to adopt technology involves a mindset, an established set of attitudes that includes flexible thinking and a genuine desire to improve efficiency and effectiveness. According to Christopher Bader, a professor of sociology at Chapman University, people tend to express the highest level of fear for things they are dependent on, but that they do not have any control over, which is a defining characteristic of technology. Technology can improve efficiency with limited staffing, but only if those staff are willing to take the time to learn and use the technology (Appleton, 2016). According to Appleton (2016), leaders play a pivotal role in this regard. If the leader has no interest in technology, the organization will fall behind, because staff members usually follow the lead of the executive director (Appleton, 2016). Digital technology transformation starts at the top of an organization's hierarchy and pervades through it; thus, leadership support, interest, and encouragement are essential to drive the initiative to achieve the desired outcome in digital technology implementation (Kane et al., 2018).

A quantitative study done by Hao and Padman (2018) showed that leader effects are statistically significant during the technology implementation process. If leaders increase their technology usage by 10 percent, the physicians who work closely with those leaders increased their technology usage by approximately 3.5 percent, after controlling for physician individual differences, time, working environment, and workload (Hao & Padman, 2018). Hao and Padman's (2018) study indicates that if a healthcare system plans to promote new technology,

they should leverage this leader effect. According to Hao and Padman (2018), without any financial incentives, if leaders continue increasing usage of technology, the physicians under their influence will likely adopt the new technology. Consequently, leaders do not only differ in their technology usage but also in their success at transitioning their organization to new technology (Attig, Wessel, & Franke, 2017). Leadership attitudes and the organizational culture are critical to technology success and they are among a company's most fundamental assets or liabilities (Bradley & McDonald, 2017). As digital health technology becomes more prevalent in healthcare, identifying the leadership styles that are associated with affinity for technology will help with recruitment of leaders who will drive innovation and champion change in ways that engage patients, inform and inspire employees, and ultimately transform the organization to thrive in the digital era.

Measures Relevant to Current Surveys

Edison and Geissler (2003) developed and tested a scale for assessing attitudes toward technology and the factors that lead to resistance (versus acceptance) of technological innovations. Their results form a sample of 605 respondents indicated that younger participants, who demonstrated complex cognitive processes and optimism, exhibited the most positive attitudes toward new technologies. The researchers suggest that more research on attitudes toward technology will be helpful, especially for marketing research. The results from this source have been helpful in providing a baseline perspective on how the general population responds to new technologies in the workplace and what personal factors are or are not related to those responses.

Avolio and Bass (2004) initially established their Multifactor Leadership Questionnaire (MLQ) in 1995, then revised it in 2000, and again in 2004. Raters throughout the business world

now use the MLQ 5X (the most recent version of the questionnaire) to evaluate how often and to what extent they have seen a specific leader or colleague in the workplace engage in 32 specific leadership behaviors and rate attributes of transformational, transactional, or passive avoidant leadership styles. The theoretical basis is that strong leadership motivates associates to be intrinsically motivated to perform to their full potential. Moreover, those strong forces encourage higher order changes, that increase individual and group performance, especially in regard to generating a rapid, high quality response to client needs (Avolio & Bass, 2004). An underlying premise is that such transformational change requires a change in perspective, so that downturns are viewed as opportunities and advances come from *fortuitous failures* (Avolio & Bass, 2004). Moreover, such leadership can shift self-preservation into preservation and promotion of the group and enhance the short and long term development of both.

The MLQ-5X's central strength is that it can either anonymously or individually compare the respondent's understanding, attitudes, and use of all three leadership approaches developed since the mid-20th century— passive avoidant, transactional, and transformational. Overall results of research studies using the MLQ have indicated that active, hands-on leadership styles consistently reap greater rewards and specifically indicates the inefficacy of the passive avoidant and management by exception approaches, most common among senior managers (Avolio & Bass, 2004). Group results of MLQ surveys and follow-up training sessions indicate significant success in nurturing more transactional and transformational leadership styles among senior managers of a variety of organizations (e.g., banks, educational organizations, hospitals, military units, and government agencies) who were previously employing more passive avoidant or exceptional management approaches (Avolio & Bass, 2004). Division managers with high ratings in transformational leadership were viewed as more innovative and less bureaucratic than

other leaders (Avolio & Bass, 2004). According to the researchers, the MLQ has been the primary means they have used to differentiate ineffective leaders from highly effective leaders. Overall, result indicate that women tend to score higher than men in transformational leadership, whereas men tend to score higher than women in transactional leadership. The scale has shown no systematic differences based on ethnicity/race of the rater group or target leader.

Meta-analytic evidence supports the notion that transformational leadership is most effective, followed by transactional leadership, with passive avoidant leadership seeming to be least effective (Lowe, Kroeck, & Sivasubramaniam, 1996). Leaders are typified by their style and MLQ feedback can be used to coach leaders through organizational transition-transformations (Avolio & Bass, 2004). The MLQ provides individualized and group feedback and has demonstrated that brief 6-month interventions can significantly shift leaders' effectiveness. It also encourages collaborative efforts and mentoring, and provides data and information needed to write new leadership plans. It has been used by many Fortune 500 companies. For instance, consultants that use the MLQ take stock of the specific contexts in which respondents are currently leading and use academic methods to educate leaders in all three leadership methods, so that they have the ability to use of them as appropriate to mediate circumstances. By self-identifying differences in leader-follower attitudes and perceptions, and subsequent self-reflection, leaders can learn to use data as the basis for leadership decisions. Leaders can also use this information to a) approach new and existing situations from multiple perspectives, b) plan and support their own and others' leadership development, and c) develop an awareness of the short-range and long-range importance of employing active leadership, to build employees' leadership interest and abilities alongside setting and reaching goals in a collaborative manner. A shorter version of the MLQ—known as the MLQ 5X Short (MLQ-

5XS)—is often used for research purposes. It is comprised of 45 items that identify and measure the key leadership behaviors that are linked with personal and corporate success. The 45 items make up nine components that are measured by 4 highly intercorrelated items. MLQ 5X Long is designed for training and coaching purposes, rather than research.

To address questions regarding attitudes toward technology, Attig and colleagues (2017) developed an assessment scale. Attig and colleagues sought to identify reliable individual differences in tech users' attitudes toward microchip-based technology and how they relate to experience with that new technology (Franke et al., 2018). Franke and colleagues (2018) provide a thorough report on the affinity for technology construct, including convergent and discriminant validity in relation to other personality constructs. They point out that technology must increasingly be tailored to individual users and should become a research focus in engineering psychology. Interest in comprehensive integration of personality studies into *human factors research* has been growing and recent models for technology acceptance and interaction (and new diversity in user experience and preference) can serve as a resource for improving the fit between technology and its users (Franke et al., 2018).

In order to compare the ATI with other well-established scales, Franke and colleagues (2018) identified technology-related personality scales in nine journals and two conference proceedings from the field of human factors/ergonomics. They then selected all scales that were a) developed within the prior 10 years and cited over 10 times or b) published within the prior 5 years (regardless of number of citations). They found that prior work had examined user-openness, conscientiousness, extraversion, agreeableness, and neuroticism, in relation to technology use and acceptance (Franke et al., 2018). Yet, Franke and colleagues concluded that those conceptual categories may not be precise enough to accurately define or predict differences

in user interactions with specific technologies. They also noted overlapping categorical concepts in most surveys that assess psychological traits related to tech-user behaviors. Their findings reveal that the most often used concept categories in scaled assessments of tech users have been *computer attitude*, *computer anxiety*, and *computer self-efficacy* and that most items are weighted toward negative responses (Franke et al., 2018). They also noted that the most recently developed scales (from the previous 5 years), also exhibited a trend toward decreasing the importance of user attitude, although several assessed situation-specific computer anxiety. Franke and colleagues (2018) note that early computer attitude scales are now rarely cited and that users are rapidly shifting from anxiety (technophobia) to attachment (nomophobia).

Preliminary Findings

Leadership theory has been filled with generalized discussions of great leaders, their traits, and leadership roles and objectives. Many contemporary researchers and authors have already identified a real need for high-competency leadership in healthcare administration, and some have worked out well considered theories and axioms regarding how best to facilitate transformation and adaptation to the new digital healthcare era. Yet a number of experienced digital information era leaders and leadership educators, who have best practices to share, have not yet been asked about how to most productively and seamlessly lead digital transformation and manage disruptors in daily practice. Healthcare executive management leadership methods do not yet rest on any empirically determined set of competencies, which could provide much needed information to small and mid-sized hospitals, clinics, and individual practitioners seeking to make the digital shift. Identification of such competencies could also benefit those in other industries who take a significant interest in the choices of our most intelligent, hardworking, and

able healthcare service providers. The current study was designed to identify and systematize that knowledge and experience.

Theoretical Paradigm

The objective of this research is to identify the necessary leadership competencies that may facilitate responsible and successful transformation and adaptation of healthcare and similar service organizations before, during, and after systemic digital technology implementation. Healthcare leadership will be asked to report on their leadership styles, affinity for technology, and demographic factors. This research will examine associations between various leadership styles and competencies (transformational, transactional, passive avoidant leadership) that have been highlighted as important for digital transition in previous work, and examine how these factors relate to affinity for technology.

Conceptual Framework

The conceptual framework of this research is based on the assumption that naturally successful human organizations will demonstrate the properties of living organisms: growth, self-similarity, and scaling, that is, they will develop rapidly in size but naturally tend to maintain their original size and shape when sufficient environmental resources and the competencies needed to access them are both available.

Chapter 3: Research Design and Methods

This chapter explains the methods of empirical investigation and analysis that will be used by this study to investigate affinity for technology among healthcare organizational leaders. The nature of the research conducted will be discussed, including the research problem and scope, research questions, the methods used for participant selection, data collection, and analyses, the study population, sample, and sampling methods, the instruments and their measures, validity and reliability, and the methods employed for data analyses.

Research Design

This study employed a quantitative, empirical, cross-sectional research design to explore the relation between leadership styles and competencies and measures of affinity of technology among healthcare leaders in the U.S. Cooper and Schindler (2008), state that the research design is the most crucial part of a study, as it guides the researcher to accomplishing the goal of the study. The goal of this study is to explore healthcare leadership styles as they relate to individuals' affinity for (or lack thereof) technology. This study will utilize quantitative research methods, which will allow me to empirically test the extent to which affinity for technology differs across healthcare leaders based on their use of the three leadership styles. Relative to qualitative designs, quantitative research designs offer more objective answers and afford researchers greater potential to draw inferences about the larger population they are sampling from. This study will use a cross-sectional design to examine these factors among a range of different healthcare leaders (e.g., of different ages, with different types of practices).

Problem Statement

Digital information technology in the form of EHRs, integrated telecommunications, automatic email patient notifications, and online patient portals has become a pervasive disruptor

in the healthcare industry. EHRs provide a vast toolkit for contact, record keeping, and patient care, as well as accelerating scientific and sociological education and research in all aspects of the medical field. For medium to small hospitals, clinics, physicians' practices, and pharmacies, however, the opportunities of digitalized healthcare present real logistical, fiscal, and organizational leadership challenges.

Because healthcare leaders play such fundamental roles in their industry's organizational goals, culture, strategies, and approach to technology, identifying which behaviors, competencies, and styles are predictive of their affinity for technology is critical to maximizing investments in technology, hiring, training, and leadership development. Because the current empirical literature has not yet addressed this issue, this study will be the first to directly examine the relation between leadership style and affinity for technology in the medical field. Specifically, this study of the leadership styles, behaviors, and competencies of healthcare leaders will use the BASS MLQ5X to assess leadership styles and the ATI scale to examine participant's attitudes toward technology.

Questions for Quantitative Research

The current study is motivated by the following research questions:

1. What sociodemographic characteristics among healthcare leaders are predictive of an increased affinity for technology?
2. Which leadership styles are predictive of increased affinity for technology?

Population and Study Sample

Respondents for the current study will be drawn from the population of healthcare leaders in the United States who have a minimum of 2 years leadership experience in the healthcare industry as owner-operators, chief executives, operating or medical officers, administrators,

academic faculty members, lead physicians, or head nurses. The participants in this study must have at least two years of leadership experience, to ensure that all participants have at least a couple years of experience as healthcare leader, and have presumably had to consider the uptake and maintenance of technological advances to medical records and service provision. The general population of healthcare leaders nationwide is estimated at well over four million, based on the estimated one million registered physicians and over three million registered nurses in 5,546 registered U.S. hospitals as of 2017 (iVantage Analytics as cited in Murphy, 2017). To ensure that I was able to recruit the minimum target sample size ($N = 120$), my goal was to invite 300 individuals to participate in this study.

Institutional Review Board Application

The researcher received approval from the Institutional Review Board (IRB) to conduct this research. The MLQ5X instrument was purchased from Mind Garden, Inc. and approval was secured from the authors of the ATI to use it for research purposes.

Data Collection and Sampling

I recruited participants from among my connections in the healthcare industry on LinkedIn. All connections who were identified as healthcare leaders were sent a direct invitation to take part in this research. All healthcare leaders who identified as chief officers, administrators, physicians, physician-extenders (e.g., a physician assistants), nurse practitioners, registered nurses, or ancillary providers (e.g., a laboratorian, radiologist, physical therapist) were eligible to participate. The rationale for this sampling approach was to strive for a high response rate among the sample of interest. Because I was directly connected to potential participants (healthcare leaders) on LinkedIn, I anticipated that response rates will be measurably higher (and show less bias in who responds) than would be observed if invitations were distributed to

unknown healthcare leaders, randomly sampled from the general population. In addition, this convenience sample was supplemented with snowball sampling, such that all participating healthcare leaders were be encouraged to invite other healthcare leaders in their network to also participate. Each participant was encouraged to enlist other healthcare leaders in their network, further increasing the sample size. Prospective participants who are contacted electronically were provided with a web link, which directed them to a secure website (Qualtrics) to complete the survey battery. In the initial invitation, participants were informed that they had two weeks to complete the survey, after which a reminder email was sent with the goal of increasing the response rate and recruiting a larger sample of participants. Prior to completing the survey, participants provided informed consent, confirming that they were legal adults and healthcare leaders, with at least 2 years of experience and English proficiency. Immediately afterward, the survey scales (MLQ5X and ATI) were presented, followed by the demographic survey items (See Appendix I). Data collection took place between March 5th, 2019 and March 10th, 2019. Once data collection was complete, responses were downloaded and stored on the researcher's local computer.

Instrumentation

The *survey instrument consists of two validated questionnaires and a demographic section.* (see Appendices, G, H, and I for questionnaires and demographic items). The three leadership styles as indicated by the MLQ5X are transformational leadership, transactional leadership, and passive avoidant leadership (Aviolo & Bass, 2004). The MLQ5X measures the full spectrum of leadership styles and competencies using a Likert scale ranging from *Not at all* (0) to *Frequently, if not always* (4). There are 42 survey questions that are evenly distributed across nine distinct leadership subscales (idealized influence attributes, idealized influence

behaviors, inspirational motivation, intellectual stimulation, individual consideration, contingent reward, active management-by-exception, passive management-by-exception, and Laissez-faire leadership) and nine additional items that make up three leadership outcome subscales (extra effort, effectiveness, and satisfaction). The broader concept of transformational leadership is covered in five subscales (idealized influence attributes, idealized influence behaviors, inspirational motivation, intellectual stimulation and individual consideration). The broader concept of transactional leadership is captured by two subscales (contingent reward and active management-by-exception). Sample items include "I provide others with assistance in exchange for their efforts" (Contingent Reward) and "I talk optimistically about the future" (Inspirational Motivation). The concept of passive avoidance is captured by two subscales (passive management-by-exception and Laissez-faire leadership). Subscale scores are calculated by averaging the scores for each item that makes up the subscale, with higher scores being reflective of more leadership readiness and effectiveness (Aviolo & Bass, 2004).

The MLQ5X has undergone extensive validation in diverse samples from over 30 countries (Aviolo & Bass, 2004). A number of studies have found support for the factorial validity of the measure (Felfe & Schyns, 2006; Rowold, 2005). According to Avolio and Bass (2004), the MLQ5X was revised multiple times to improve its reliability. The reliability of the MLQ5X has been measured in many independent studies by scholars examining leadership behaviors (Muenjohn & Armstrong, 2008). Associations with existing measures of leadership styles support the convergent validity of the measures. For example, Rowold (2005) has found that scores on the transformational

leadership subscales of the MLQ5X are positively correlated with those on the transformational leadership inventory (TLI). Relations with personality traits (e.g.,

conscientiousness) and psychological characteristics (e.g., self-efficacy) and behavior provide additional evidence of the construct validity of the instrument. For instance, in one study, military personnel who reported higher levels of transformational leadership (inspirational, intellectually stimulating, visionary leaders) tended to more effective in their roles during near-combat readiness missions (Avolio & Bass, 2004). Strong intraclass correlation coefficients support the reliability of the nine leadership style subscales and test-retest reliability estimates indicate consistency in measurement over durations up to three months (Rowold, 2005). Internal consistency estimates have also been found to be within appropriate limits. Cronbach's alpha is the most common measure of internal consistency (often referred to as reliability), assessing whether participants' responses to individual items on the scale are consistent with one another. Avolio and Bass (2004) report Cronbach's alpha values ranging from 0.74 to 0.94.

The *Affinity for Technology Interaction* (ATI) scale was developed to measure individual differences in the tendency to engage with technology (Franke et al., 2018). Sample items include, "I like testing the functions of technical systems" and "I try to understand how a technical system exactly works." ATI survey instructions contain a definition of technical systems—digital devices and software applications—to orient participants to the survey items that follow. Items are rated on six-point response scale anchored at *Completely Disagree* (1) and *Completely Agree* (6). Six of the items are positively-worded and three are negatively-worded (requiring reverse scoring). Mean scores ranging between 1 and 6 are created based on the average of the nine items. The ATI scale has been shown to have excellent reliability (Cronbach's alpha .83-.94) and demonstrates expected levels of convergent (e.g., moderate correlations with Technology Enthusiasm and Technical Problem Solving) and discriminant validity (e.g., no correlation with the Big Five personality traits) in relation to other constructs

(Franke et al., 2018). In multiple studies ($N > 1500$), the ATI Scale demonstrated satisfying results with regard to dimensionality, reliability, validity, and distribution of ATI score values (Franke et al., 2018). Factor analyses indicated unidimensionality, and reliability analyses demonstrated good-to-excellent internal consistency.

Lastly, respondents also answered five demographic questions, with regard to age, gender, occupation, field, and ethnicity.

Quantitative Data Analytic Strategy

First I conducted descriptive analyses, examining means, standard deviations, and frequencies for the independent, dependent, and demographic variables included in this study. Specifically I report the means, standard deviations, and ranges for each of the MLQ5X subscales (transformational leadership, transactional leadership, and passive avoidant leadership) and the ATI scale. In addition I calculate and report the mean, standard deviation, and range for participant age. For all of the other demographic factors (gender, occupation, field, and ethnicity) I examine and report frequencies.

Next, for the inferential portion of the analyses, I use multiple linear regression. To address RQ1, a multiple regression model is used to examine whether age, gender, occupation, field, and ethnicity significantly predict participants' mean scores on the ATI scale. To address RQ2 I conduct a multiple regression model to explore whether variability in each of the leadership styles (transformational leadership, transactional leadership, and passive avoidant leadership) explains a significant amount of the variance in ATI scores. This is followed up by a second model which statistically controls for demographic factors. This allows me to examine whether variability in leadership styles predicts ATI above and beyond variation accounted for by demographic factors.

Model assumptions. Before conducting inferential analyses I confirm that my data does not violate any of the statistical assumptions of multiple regression. I test for multicollinearity by first examining the correlation between the leadership style subscales (transformational leadership, transactional leadership, and passive avoidant leadership). For correlations between the subscales that are extremely high (above .9), one of the highly correlated scales will be removed from the model. I test for outliers on all predictor variables and the dependent measure of technology affinity. Any variables that have an observation more than 3 standard deviations from the mean are considered possible outliers, and analyses are conducted with and without these values. If inferential conclusions remain the same results will be reported including outliers.

I will check the assumptions of normality, linearity, and homoscedasticity via the residuals scatterplots that are generated through the multiple regression procedure in SPSS statistical analysis software. Specifically, I will examine the residual scatterplot for normality by visually inspecting whether the residuals are normally distributed around the predicted ATI scores. I will assess linearity by examining whether the residuals have a straight-line relationship with ATI scores on the residuals scatterplots. Finally, I will assess homoscedasticity to determine whether the variance of the residuals about predicted ATI scores is the same for all predicted scores. If any of these assumptions appears to be violated based on my visual inspection I will consider alternative approaches such as rescaling my variables or using an alternate distribution or analysis approach.

Ethical Consideration

All human subjects were aware of their participation in this study, and nothing in this study posed any risk to participants.

Chapter 4: Results

Over the past thirty-five years, the fundamental nature of healthcare leadership has not changed, but rapid introduction of digital health technology has changed many of the expectations and challenges for healthcare leaders. There is a plethora of literature on leadership but none has addressed the relationship between leadership styles and affinity for technology among healthcare leaders. Hence, the purpose of this study was to begin to examine how healthcare leaders' transformational, transactional, and passive avoidant leadership styles may relate to their affinity for technology, and to what extent it may be influenced by a leader's demographics.

Participants

The target participants for the study were healthcare leaders with a minimum of 2 years of experience, who reside in the US. Initial invitations to complete the study were sent to 303 potential participants who met the inclusion criteria through LinkedIn. Invitations also encouraged recipients to pass the study on to others who meet the inclusion criteria for the study. While a total of 133 respondents participated in this study, not all respondents answered all questions. More specifically, there were missing values for the ATI scale and leadership style scores. Table 1 displays the breakdown of completed surveys and missing data.

Table 1

Frequency Counts for Completed Surveys and Missing Data

Scale	Missing Responses	Valid Responses	Total Surveyed	Percentage Completed
Transformational Leadership Subscale	14	119	133	89.5%
Transactional Leadership Subscale	14	119	133	89.5%
Passive avoidant Leadership Subscale	14	119	133	89.5%
Affinity for Technology (ATI)	16	117	133	88.0%

The data were transferred from Qualtrics to SPSS software for analysis and the scores for MLQ5x and ATI scales were then calculated. The MLQ5x has 45 questions that measures 9 leadership outcomes and 3 leadership styles. The MLQ5x uses a five-point frequency rating scales where 0 = not at all, 1= once in a while, 2= sometimes, 3= fairly often, 4= frequently, if not always. The scores of corresponding questions for each factor were averaged as summarized in Table 2.

Table 2

Scoring Method for Leadership Style Subscales

Subscale	Questions from the MLQ5x measuring the subscales	Scoring Method
Transformational		
1.Idealized influence (Attributes) (IIA)	10, 18, 21, 25	Sum of items divided by 4
2.Idealized influence (Behavior) (IIB)	6, 14, 23, 34	Sum of items divided by 4
3.Inspirational motivation (IM)	9, 13, 26, 36	Sum of items divided by 4
4.Intellectual Simulation (IS)	2, 8, 30, 32	Sum of items divided by 4
5.Individualized Consideration (IC)	15, 19, 29, 31	Sum of items divided by 4
Transactional		
6.Contingent Reward (CR)	1, 11, 16, 35	Sum of items divided by 4
7.Management by Exception: Active (MBEA)	4, 22, 24, 27	Sum of items divided by 4
Passive avoidant		
8.Management by Exception: Passive (MBEP)	3, 12, 17, 20	Sum of items divided by 4
9.Laisez-faire (LF)	5, 7, 28, 33	Sum of items divided by 4

To determine transformational leadership scores, I calculated the arithmetic mean of all items that make up the IIA, IIB, IM, IS and IC subscales. Transactional leadership scores were based on the arithmetic mean of all items that make up the CR and MBEP subscales, and passive avoidant leadership scores were based on the arithmetic mean of all items that make up the MBEP and LF subscales. The scale for ATI was as follows: completely disagree = 1, largely disagree = 2, slightly disagree = 3, slightly agree = 4, largely agree = 5, completely agree = 6.

Responses to the three negatively worded items (items 3, 6, 8) were reversed (6 = 1, 5 = 2, 4 = 3, 3 = 4, 2 = 5, 1 = 6) and finally, a mean score was computed over all 9 items (as indicated by Franke et al., 2018).

Next, descriptive statistics were analyzed to better understand the sample data. Table 3 displays the descriptive statistics for the leadership styles and sociodemographic variables. Means, standard deviations, and ranges for each of the MLQ5X subscales (transformational leadership, transactional leadership, and passive avoidant leadership) and the ATI scale are provided below. In addition, the mean, standard deviation, and range for participant age were also calculated. For all of the other demographic factors (gender, occupation, field, and ethnicity), frequencies are provided.

Table 3

Descriptive Statistics for Sample Data

Scale	*n*	*M*	*SD*	*Range*	
Transformational Leadership Subscale	119	3.08	0.45	Low: 1.85	High: 4.00
Transactional Leadership Subscale	119	2.61	0.59	Low: 1.13	High: 4.00
Passive Avoidant Leadership Subscale	119	0.70	0.48	Low: 0.00	High: 2.25
Affinity for Technology (ATI)	117	3.92	0.92	Low: 1.67	High: 6.00

Demographic Factors	*n*	*%*
Gender (% Male)	116	34.0
Occupation		
Physician	115	41.7
Non-Physician Provider	115	30.4
C-Level Executive	115	7.8
Administrator	115	17.4
Other	115	2.6
Race		
Black	115	1.7
White	115	66.1
Asian	115	14.8
Native Hawaiian or Pacific Islander	115	0.9
Multiple Races or Other	115	16.5
Employment		
Independent Physician Practice	116	31.9
Academic Institution	116	39.7
Non-Academic Hospital	116	19.8
HMO or IPA Group	116	5.2
Other	116	3.4

There were almost twice as many as females (66%) as males (34%) in the sample, and two-thirds of respondents self-identified as White. Asian respondents made up almost 15% of the

sample, whereas Black respondents made up only 2%. Almost half of the sample (41.7%) were physicians, with the remaining part of the sample consisting of non-physician providers, C-level executives, and administrators. About a third of the sample (31.9%) had their own independent physician practice; another third worked in academic institutions (39.7%); the remaining third worked in either a non-academic hospital, an HMO or IPA group, or in another setting.

In terms of the leadership subscales, respondents averaged the highest on the transformational leadership subscale and the lowest on the passive avoidant leadership subscale. The transformational leadership subscale also had the smallest standard deviation indicating less dispersion in the data. As for the affinity for technology scale, respondents, on average, generally fell in the "slightly agree" category with some variation.

Results of Multiple Regression Analysis

The purpose of this study is to identify which factors, namely sociodemographic and leadership styles, are most predictive of increased affinity for technology among healthcare leadership. To answer this question, a series of regression models were specified and later analyzed. However, prior to running any models, model assumptions were first evaluated. Multicollinearity was assessed among the leadership subscale factors by a correlation matrix. None of the correlations were extremely high (> 0.9), therefore indicating a lack of multicollinearity and meeting the assumption. The correlation matrix can be seen in Table 4 below.

Table 4

Correlation Matrix for Leadership Subscales

	Transformational Leadership Subscale	Transactional Leadership Subscale	Passive Avoidant Leadership Subscale
Transformational Leadership Subscale	1		
Transactional Leadership Subscale	0.477	1	
Passive Avoidant Leadership Subscale	-0.334	0.168	1

After meeting the assumption of multicollinearity, the data were inspected for outliers. These were evaluated by calculating the z-scores for each continuous, predictor variable as well as the dependent variable. One variable, the passive avoidant leadership subscale, indicated a few outlying observations. Analyses were conducted with and without excluding these outlier values. Inferential conclusions were identical, thus results reported here including all data points (no outliers excluded). Typically, the assumption of normality is evaluated through a normal distribution of the residual plots after running the regression, but can also be previewed by reviewing histograms of the independent and dependent variables. Figures 1-4 provide the histograms for each continuous predictor variable in addition to the dependent variable. Figure 1 displays the distribution of the passive avoidant leadership subscale after the deletion of the outlying observations. The data appear to be slightly positively skewed; however, the z-scores for this distribution fall within the acceptable range of three standard deviations of the mean.

Figure 2 provides the histogram of the transactional leadership subscale, and while there are a few bars on the left side of the graph that do not precisely meet the curve, the data otherwise appear as normally distributed. Figure 3 shows the transformational leadership subscale. Similar to the transactional leadership subscale histogram, some spikes are also seen

here; however, the overall pattern of the distribution can be considered as normal. Lastly, Figure 4 displays the histogram for the dependent variable, and these data also appear as normally distributed.

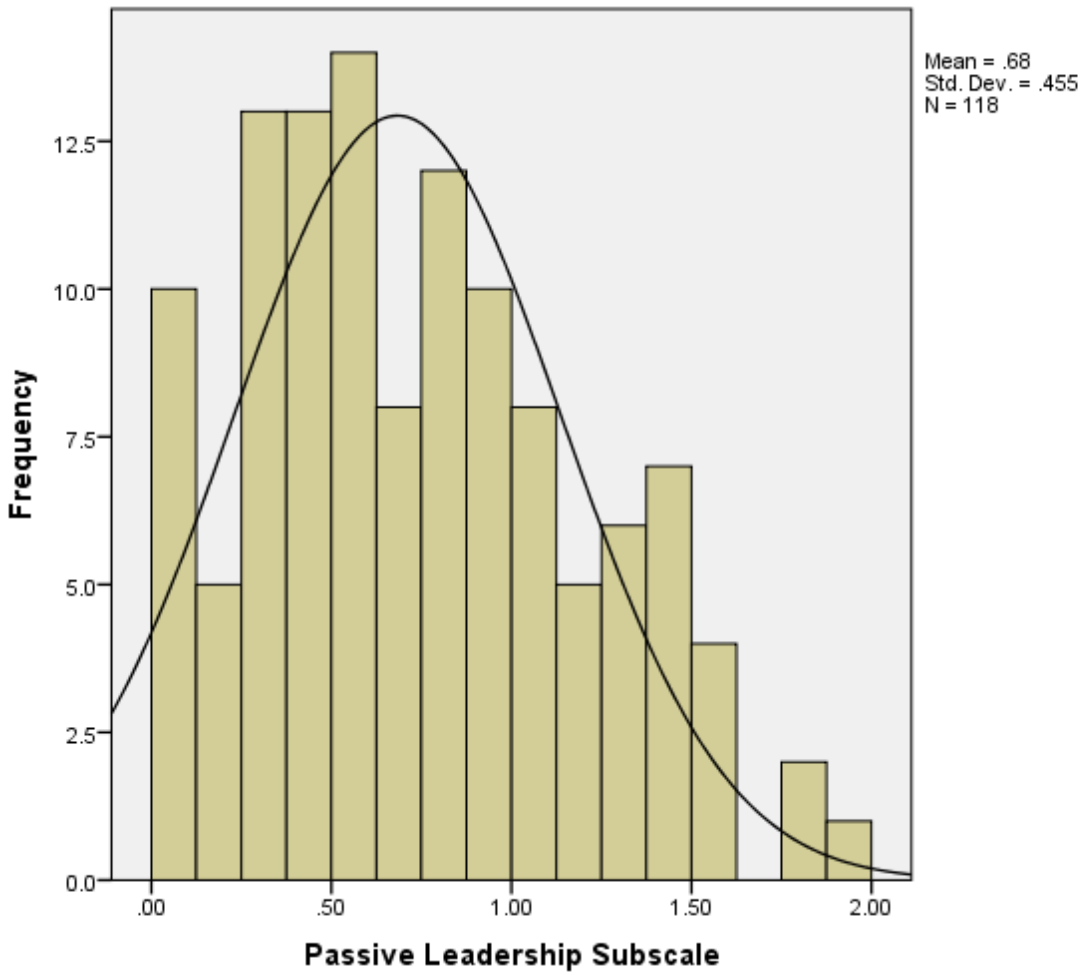

Figure 1. Histogram for the passive avoidant leadership subscale.

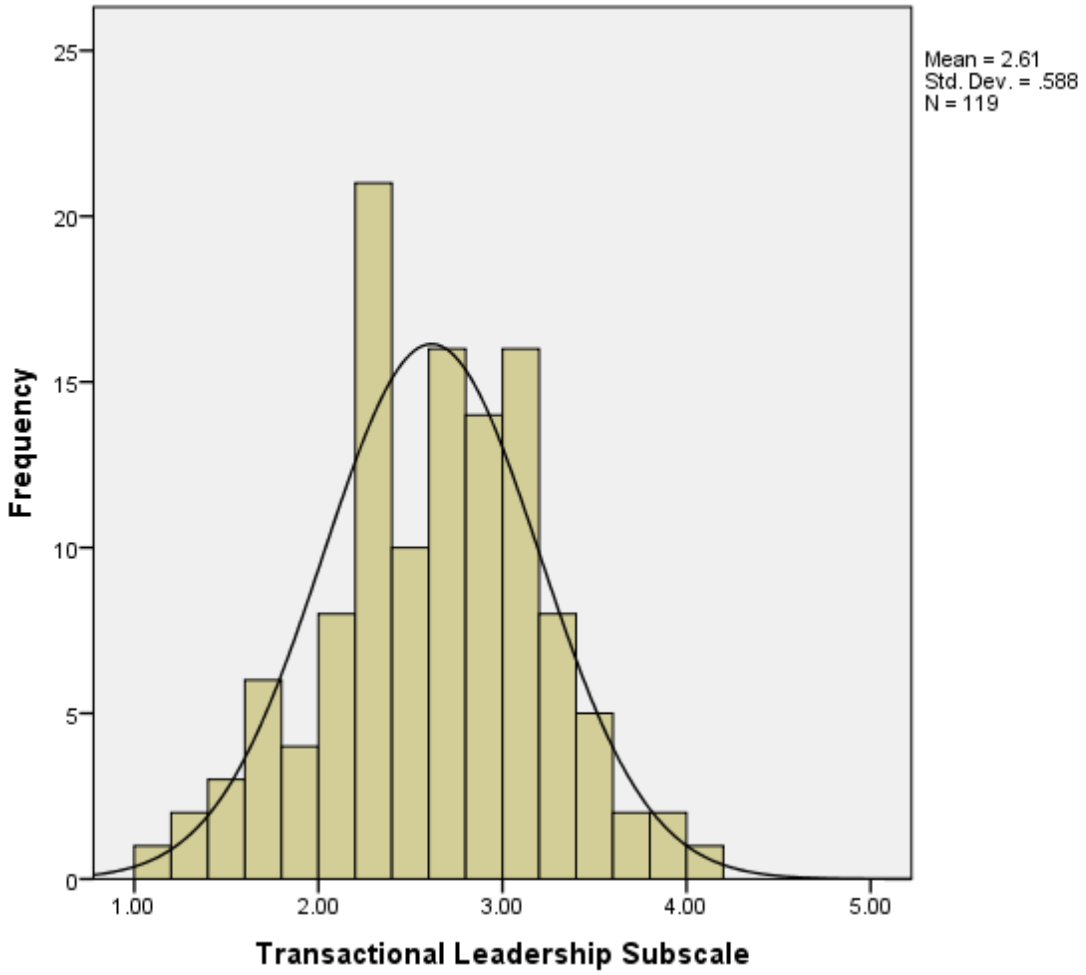

Figure 2. Histogram for the transactional leadership subscale.

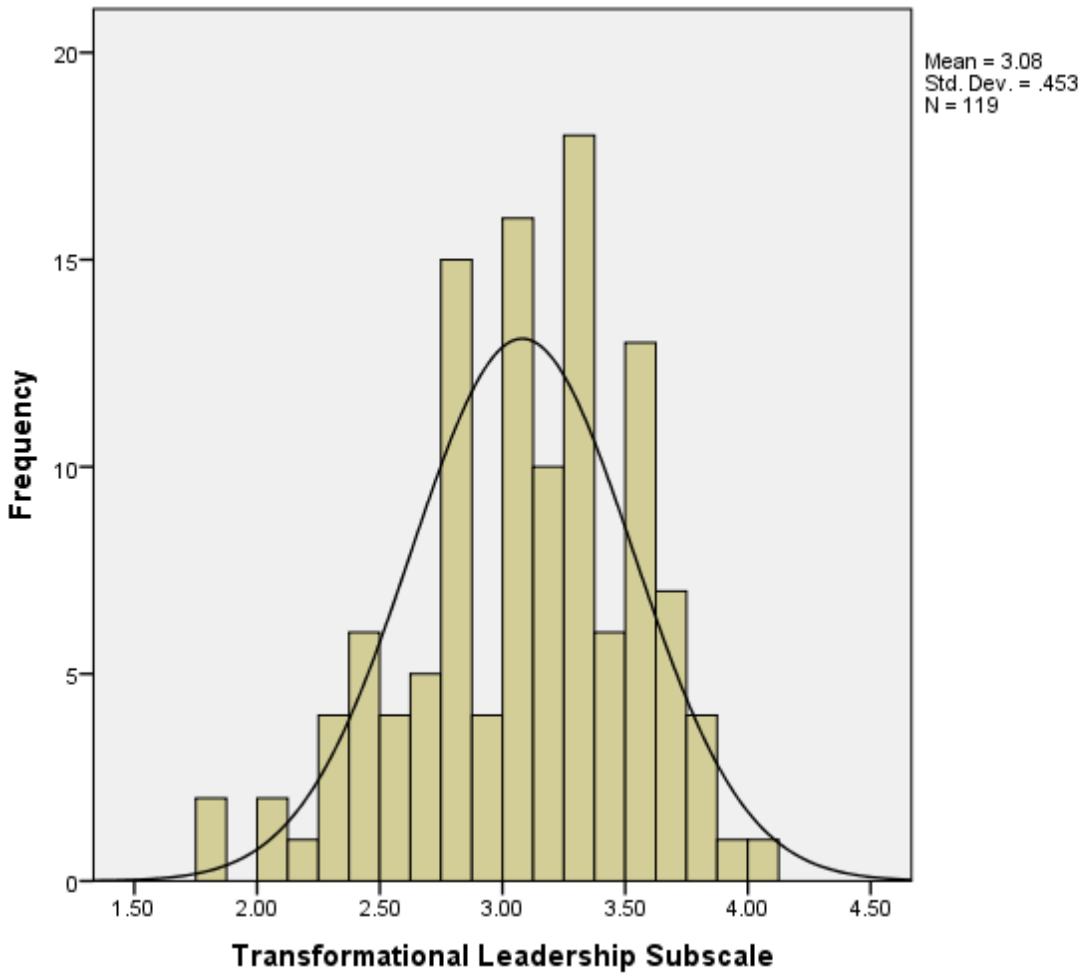

Figure 3. Histogram for the transformational leadership subscale.

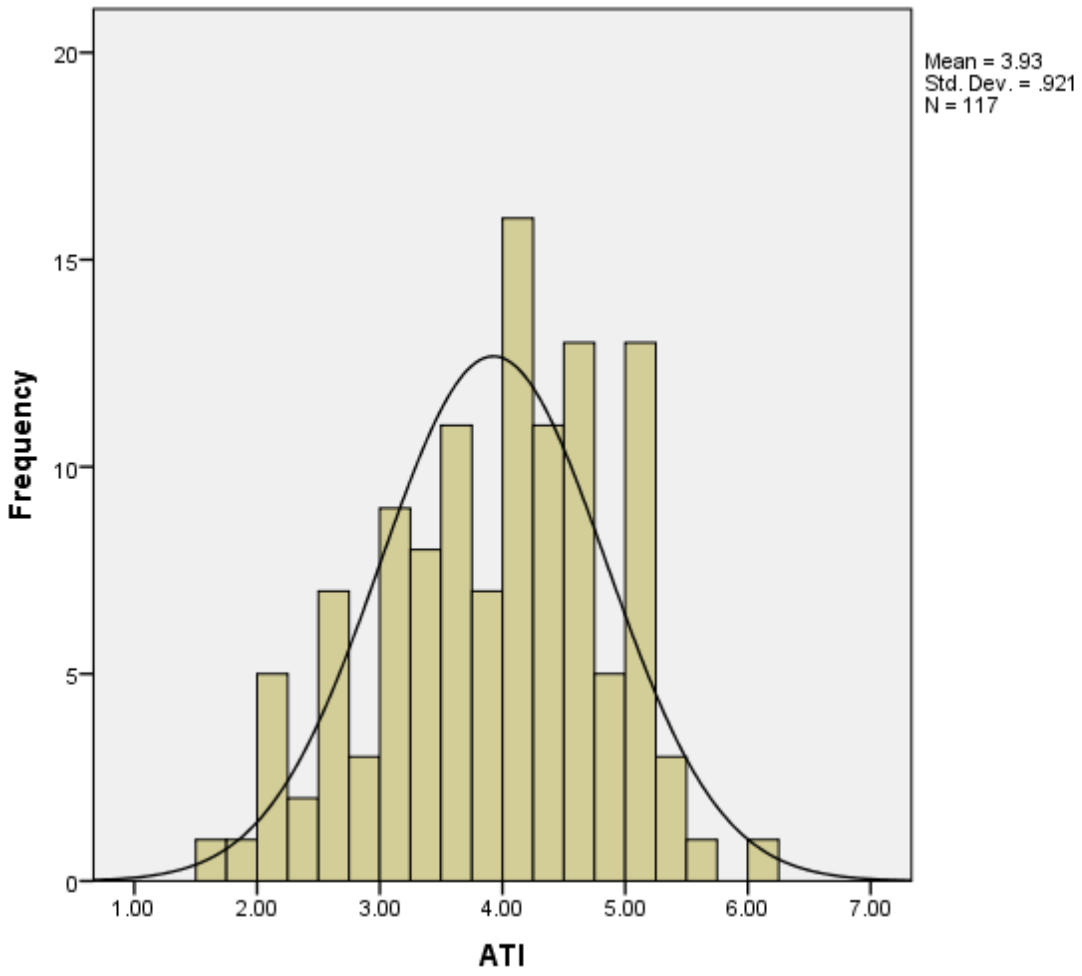

Figure 4. Histogram for the affinity for technology scale.

The assumption of normality, as well as linearity and homoscedasticity, will also be reviewed after running the regression and reviewing the residual plot.

Regression model for demographic factors. To address the first research question, a model examining whether age, gender, occupation, field, and ethnicity significantly predict participants' mean scores on the ATI was analyzed. First, a histogram of the residuals was inspected for normality to verify the assumption. The assumption was evaluated and met. Next, a plot of the predicted values against the residuals was inspected; no pattern was found for this plot, indicating homogeneity of variance. Lastly, the normal P-P plot was inspected to confirm

normality which also validates the linearity of the model. The observations did not stray far from the line, indicating that the assumptions were met. These figures follow below in Figures 5, 6, and 7, respectively.

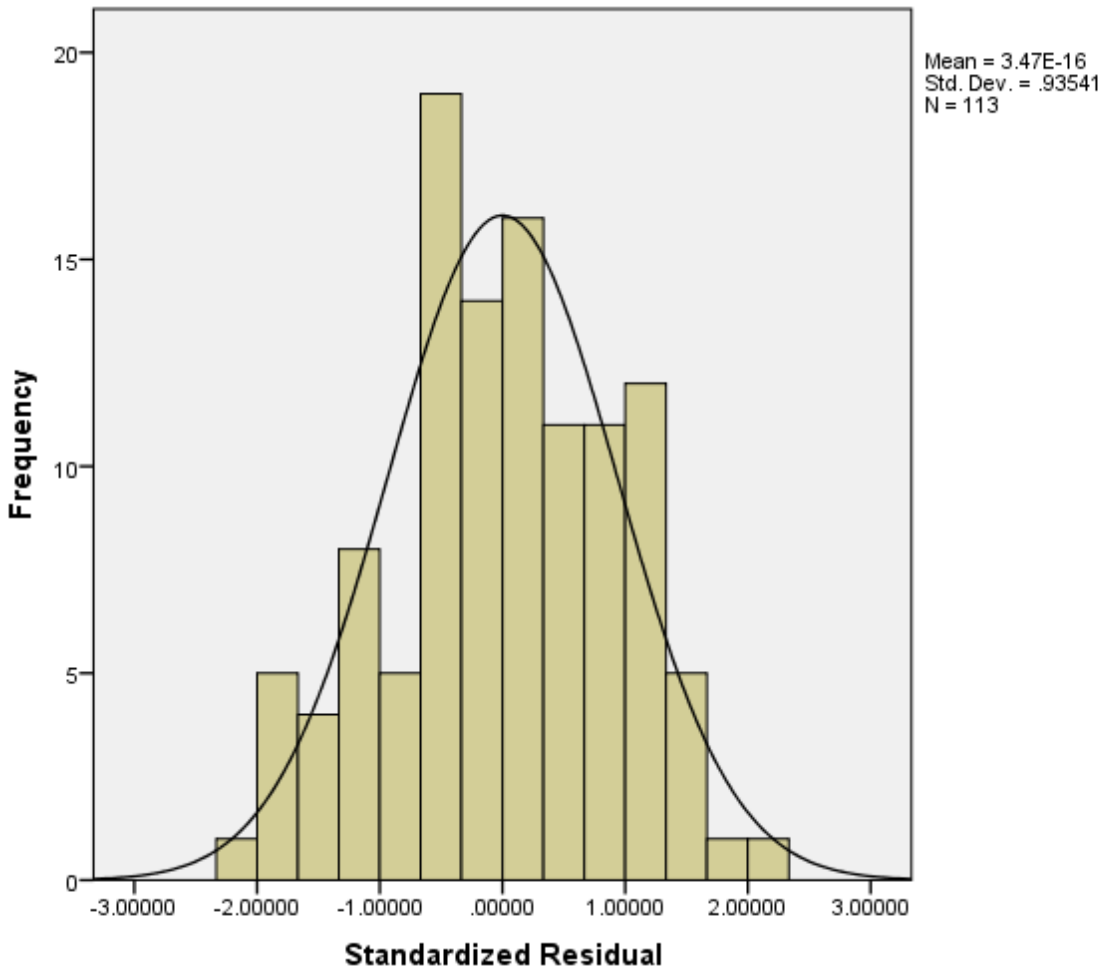

Figure 5. Histogram of residuals demonstrating normality.

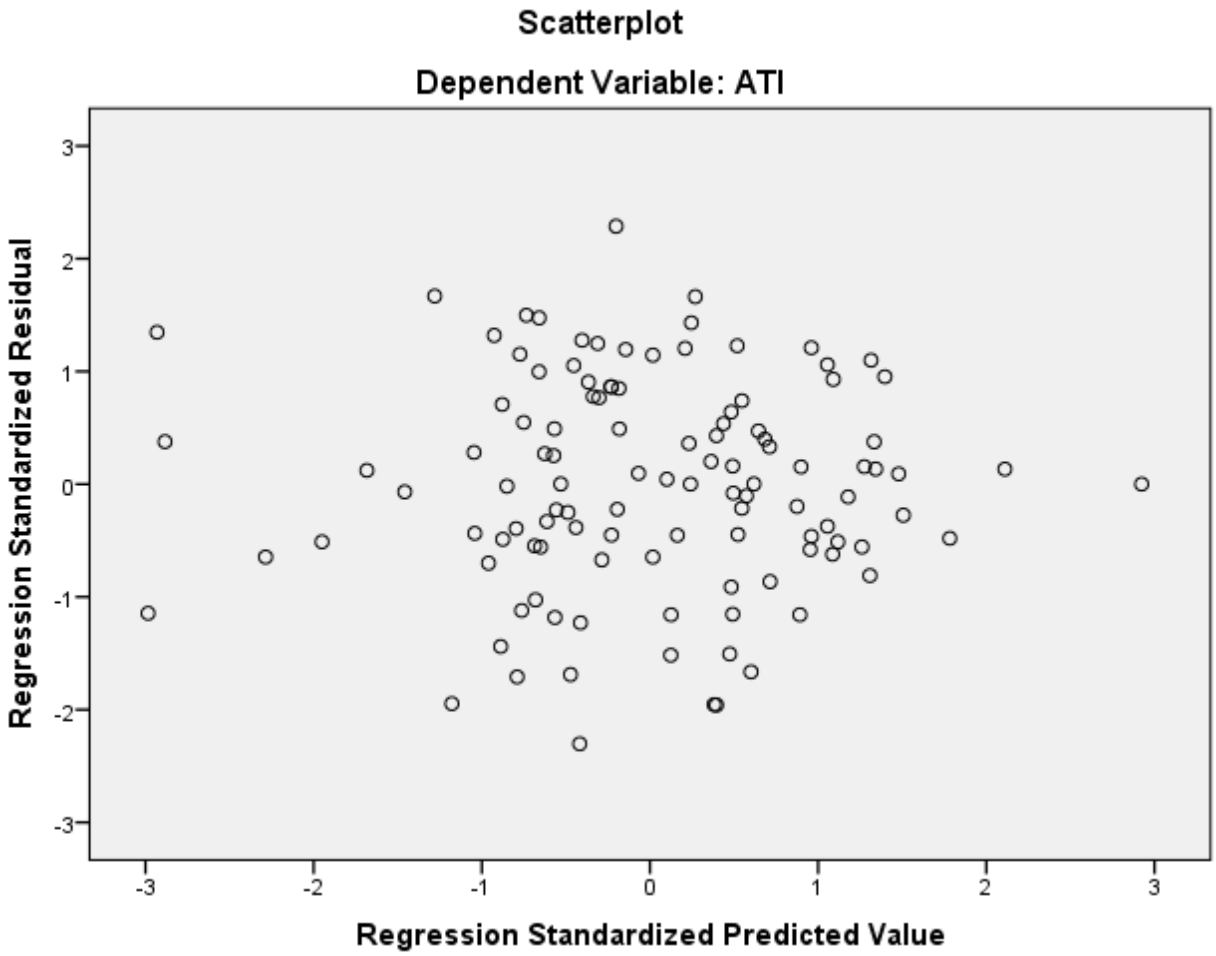

Figure 6. Scatterplot of residuals against predicted values illustrating homogeneity of variance.

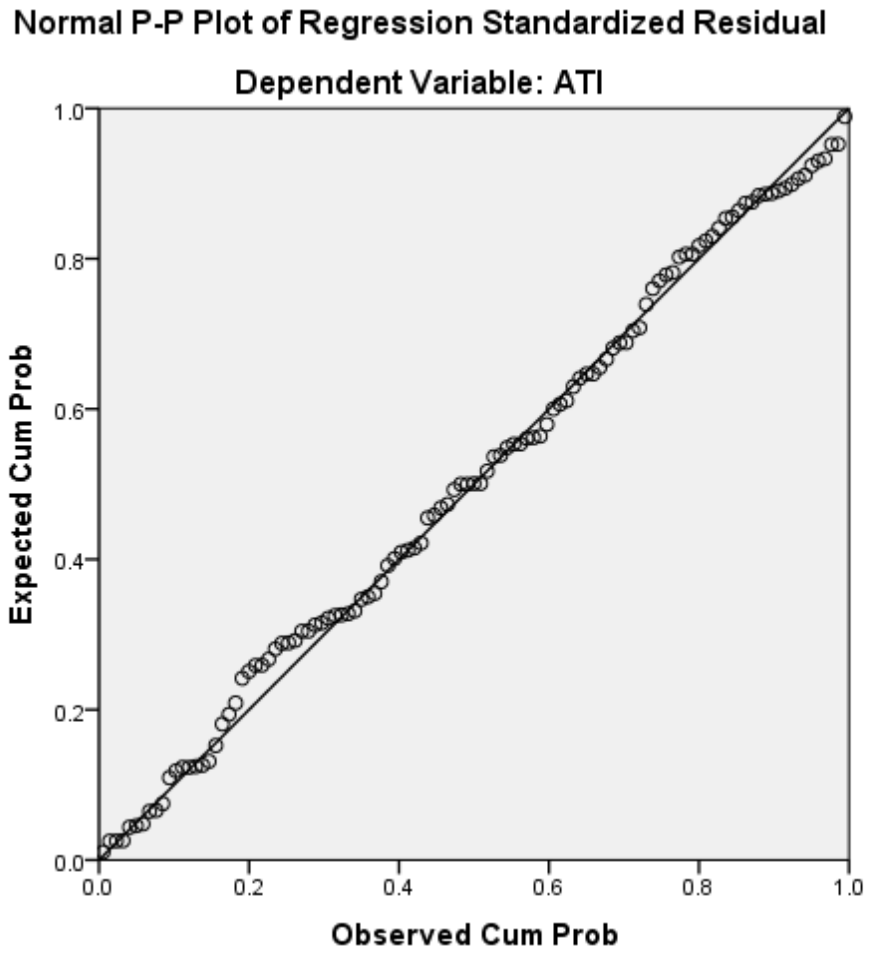

Figure 7. Normal P-P plot illustrating linearity of relationship.

Now that the assumptions have been evaluated and met, results are able to be interpreted. Multiple regression analysis was used to test if the sociodemographic factors significantly predicted participants' scores on the affinity for technology scale. The results of the regression indicated that the set of predictors (gender, age, occupation, ethnicity, and employment) explained 10.0% of the variance (R^2=.10, F (14, 98) = 0.78, p = .691) and returned a non-statistically significant model. The "Other" category served as the reference category for occupation, as well as for ethnicity and employment. The coefficients, t-statistics and p-values for each predictor are presented in Table 5. None of the sociodemographic factors significantly

predicted ATI. Thus, in the current sample, affinity for technology did not significantly vary as a function of age, gender, occupation, ethnicity, or employment sector.

Table 5

Regression Results for Sociodemographic Model

Variable	*B*	*SE B*	*b*	*t-Value*	*p-Value*
Age	0.01	0.01	0.09	0.88	0.383
Gender	-0.16	0.22	-0.08	-0.73	0.468
Occupation					
Physician	-0.24	0.28	-0.13	-0.87	0.388
Non-Physician Provider	-0.37	0.29	-0.15	-1.28	0.203
C-Level Executive	-0.73	0.54	-0.15	-1.35	0.179
Administrator	0.04	0.32	0.02	0.14	0.892
Ethnicity					
Black	0.81	0.99	0.08	0.82	0.413
White	-0.03	0.26	-0.02	-0.11	0.911
Asian	0.30	0.32	0.12	0.92	0.361
Native Hawaiian	0.27	0.97	0.03	0.28	0.781
Employment					
Independent Physician Practice	0.06	0.29	0.03	0.19	0.850
Academic Institution	0.12	0.25	0.06	0.86	0.644
Non Academic Hospital	0.09	0.36	0.03	0.25	0.805
HMO or IPA	-0.65	0.49	-0.15	-1.31	0.192
Intercept	3.68	0.51			

Notes. $R^2 = .10$, $p = .691$

Regression model for leadership subscale factors. To address the second research question, a model examining whether the leadership subscales significantly predicted participants' mean scores on the ATI was run. First, a histogram of the residuals was inspected for normality to verify the assumption. The assumption was evaluated and met. Next, a plot of

the predicted values against the residuals was inspected; no pattern was found for this plot, indicating homogeneity of variance. Lastly, the normal P-P plot was inspected to confirm normality, and thus also linearity of the model. The observations strayed further from the line than in the first model, but not far enough to be of concern. This indicates that the assumption of linearity was also met. These figures follow below in Figures 8, 9, and 10, respectively.

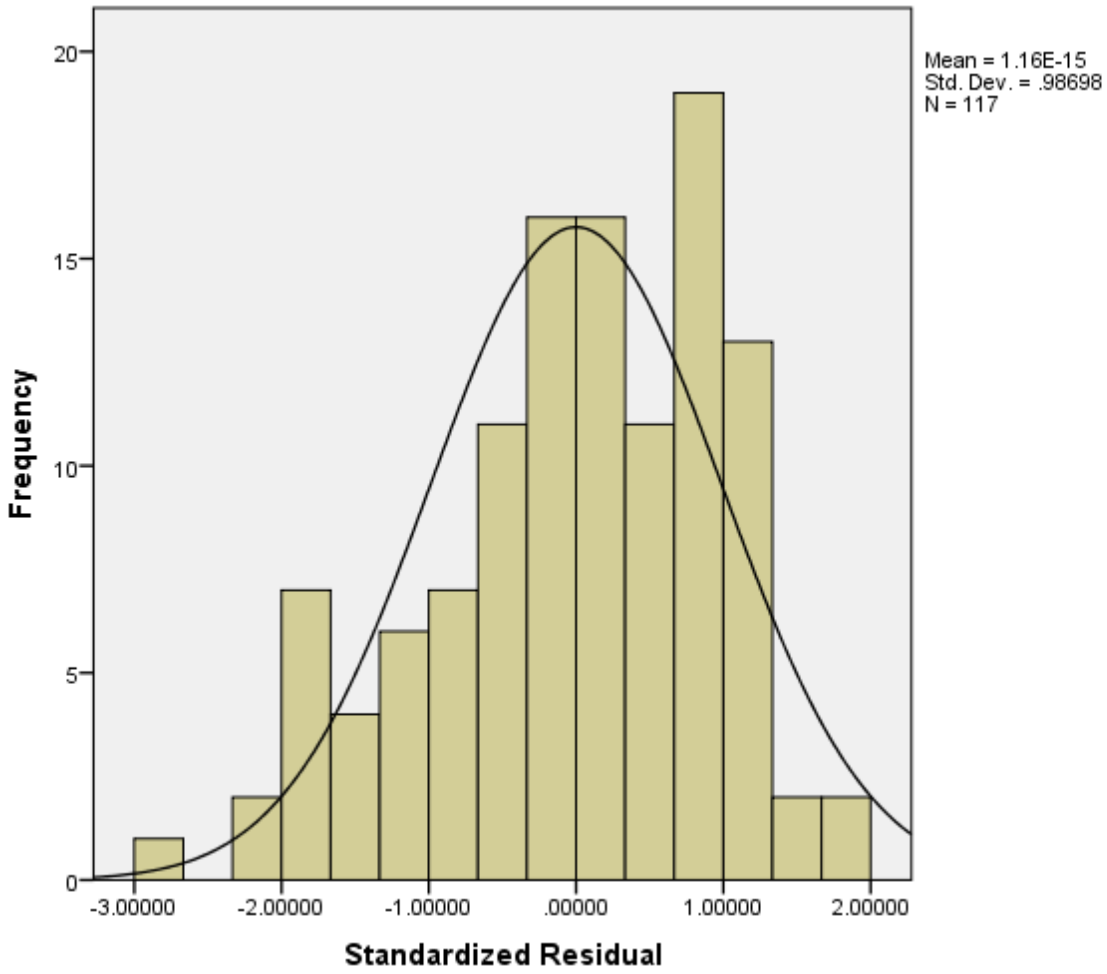

Figure 8. Histogram of residuals illustrating the assumption of normality.

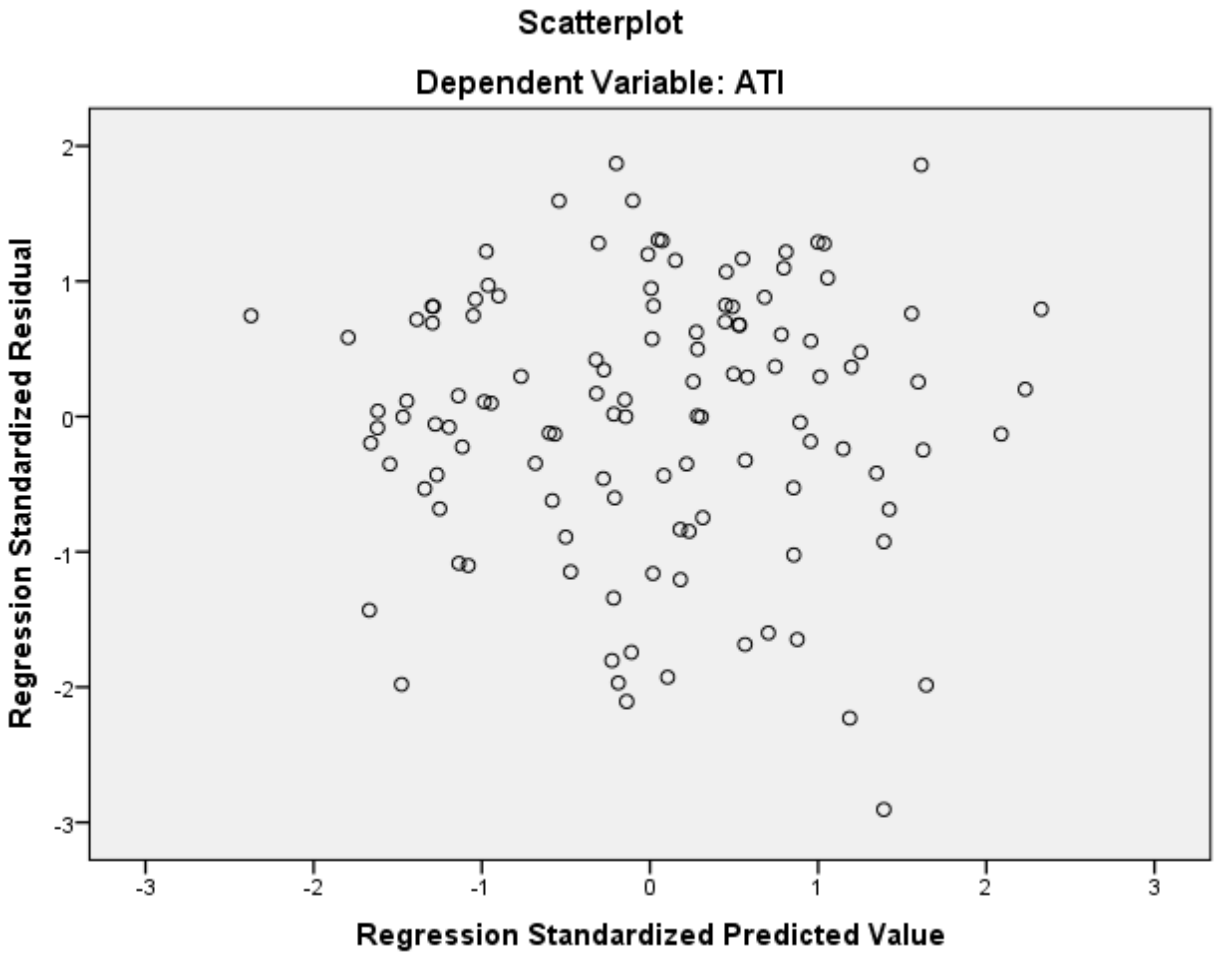

Figure 9. Scatterplot of predicted values against residual values, indicating homogeneity of variance.

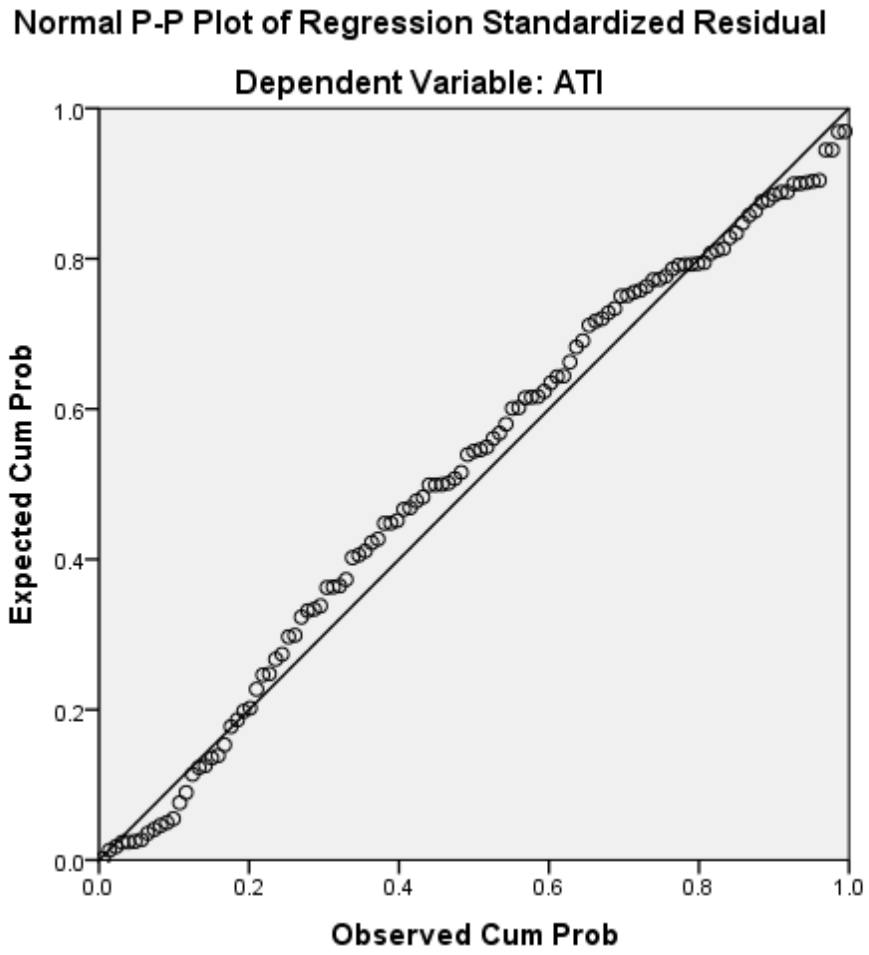

Figure 10. Normal P-P plot illustrating linearity of relationship.

Results of this model were statistically significant, F (3,113) = 3.02, p = .033. Results demonstrated that the transactional leadership subscale was not a statistically significant predictor of affinity for technology (β = 0.33, p = .063). Transformational leadership (β = 0.18, p = .446) and passive avoidant leadership (β = –0.13, p = .522) were also not significant predictors of affinity for technology. Because passive avoidant leadership is largely theoretically irrelevant (since it has to do with non-leadership rather than an active research style, I chose to drop it from the model. The overall model remained significant (F (2, 114) = 4.34, p = .015), but transactional leadership still was not a statistically significant predictor of affinity for technology

(β = .28, p = .079). Assumptions were also verified using the residuals plots prior to coefficient interpretation, and those figures can be seen in Figures 11, 12, and 13. Coefficients for the final model are shown in Table 6.

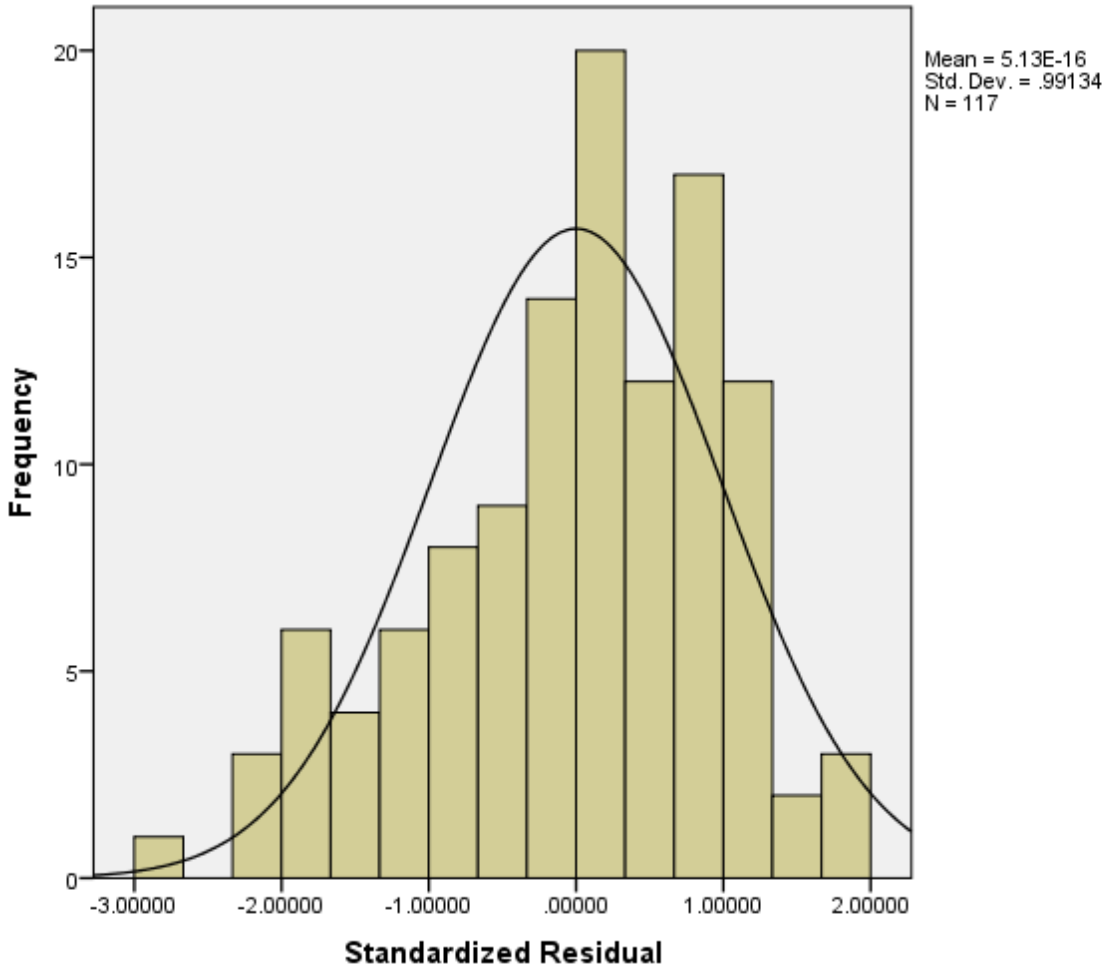

Figure 11. Histogram of residuals illustrating normality.

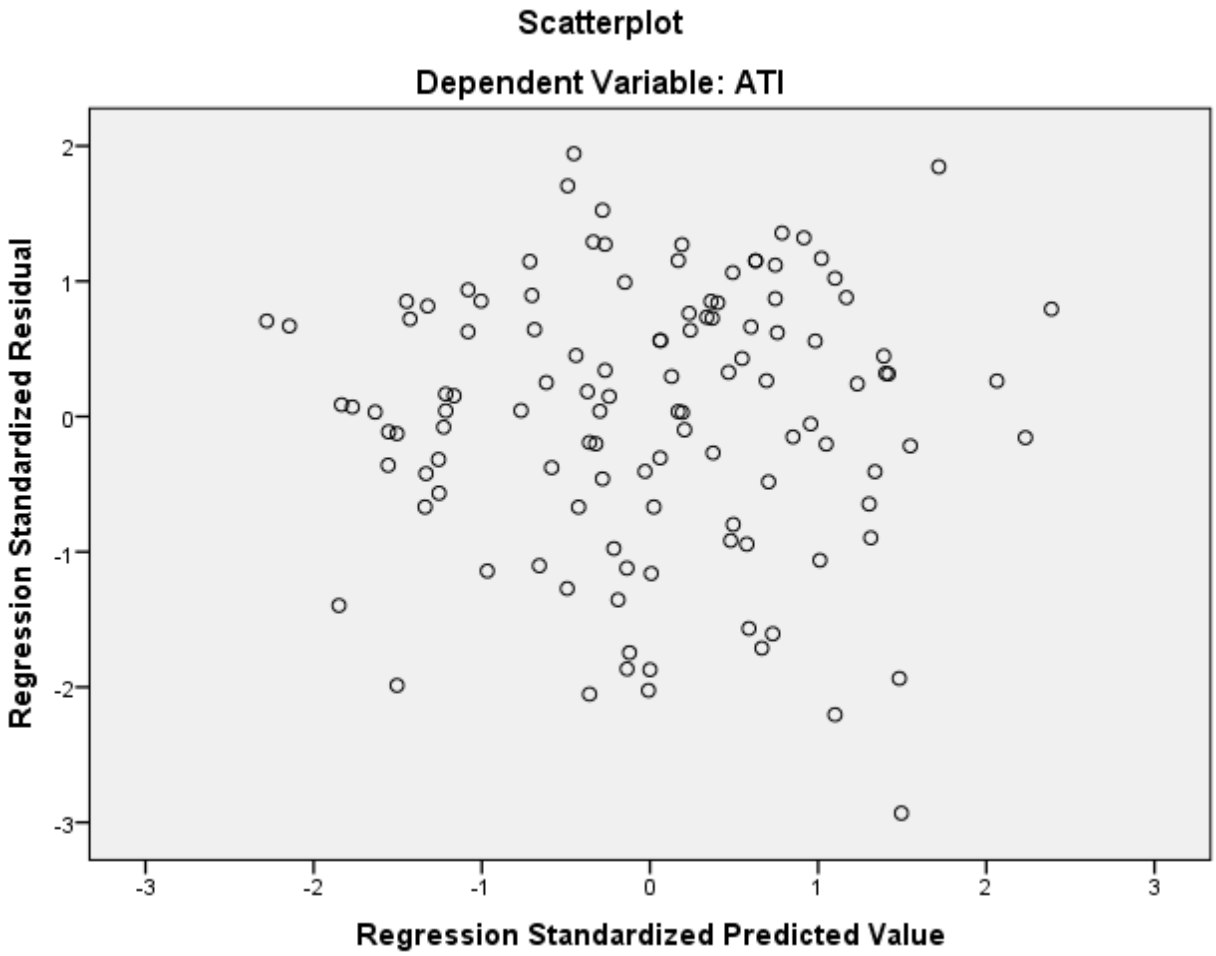

Figure 12. Scatterplot of predicted values against residual values.

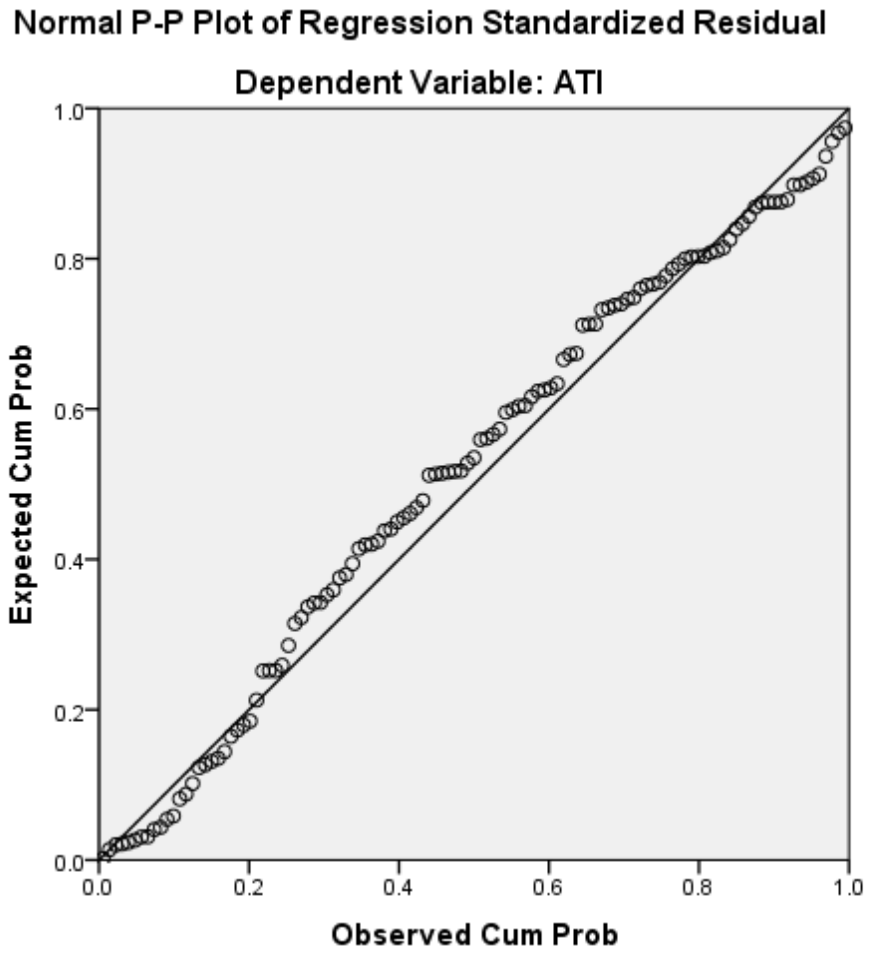

Figure 13. Normal P-P plot illustrating normality and linearity.

Table 6

Regression Results for Final Leadership Subscale Model

Variable	*B*	*SE B*	*β*	*t-Value*	*p-Value*
Transformational Leadership Sub-scale	0.26	0.21	0.13	1.24	0.217
Transactional Leadership Subscale	0.28	0.16	0.18	1.77	0.079
Intercept	2.40	0.58			

Notes. $R^2 = .07$, $p = .015$

The second part of the second research question pertained to the investigation of whether these results held when controlling for specific demographic factors. Consequently, a second

linear regression model was run, where certain demographic factors were entered into the model along with the leadership subscales. The demographic factors that were entered into the model were: a binary variable indicating whether the respondent was White, a binary variable indicating whether the respondent was a physician, and gender. The results of the regression indicated that the overall model was no longer statistically significant with the addition of the sociodemographic factors, F (5, 108) = 2.05, p = .077). This set of predictors explained 8.7% of the variance in affinity of technology scores (R^2 = .087), and the transactional leadership subscale was found to be statistically significant predictor of affinity for technology (β = .34, p = .045). This means that for each additional point gained on the transactional leadership subscale, one's score on the affinity for technology scale increases by 0.34 points. Similar to the other models, assumptions were verified and met prior to interpreting coefficients. Those figures can be seen in Figures 14, 15, and 16, and results of the final model with the included demographic factors is presented in Table 7.

Table 7

Regression Results for Final Leadership Subscale Model Including Demographic Factors

Variable	*B*	*SE B*	*β*	*t-Value*	*p-Value*
Transformational Leadership Subscale	0.20	0.23	0.10	0.89	0.378
Transactional Leadership Subscale	0.34	0.17	0.22	2.03	0.045
White	-0.12	0.18	-0.06	-0.67	0.502
Physician	-0.13	0.19	-0.07	-0.72	0.475
Gender	-0.06	0.21	-0.03	-0.28	0.780
Intercept	2.56	0.63			

Notes. R^2 = .087, p = .077

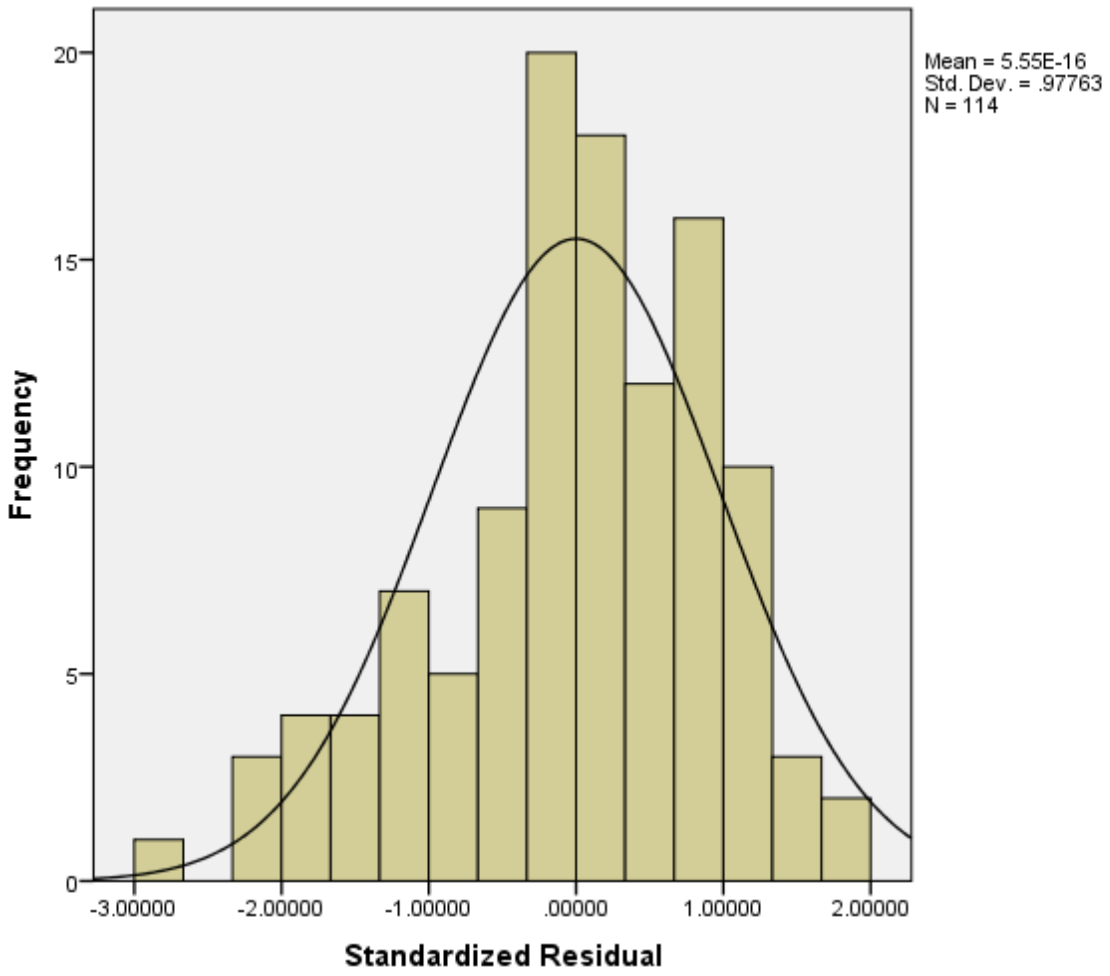

Figure 14. Histogram of residuals for final model, including demographic factors.

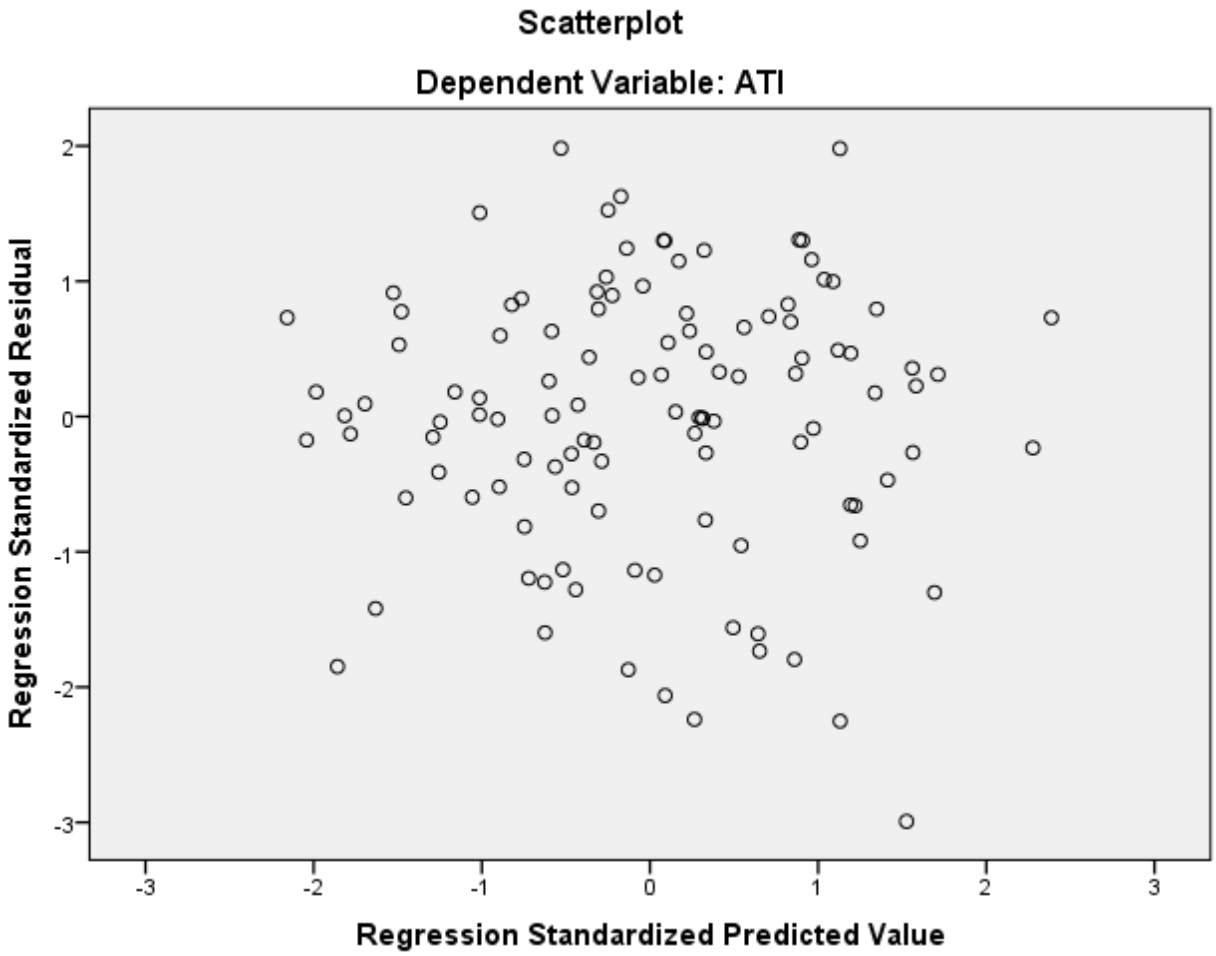

Figure 15. Scatterplot of predicted values against residual values for the final model including demographic factors.

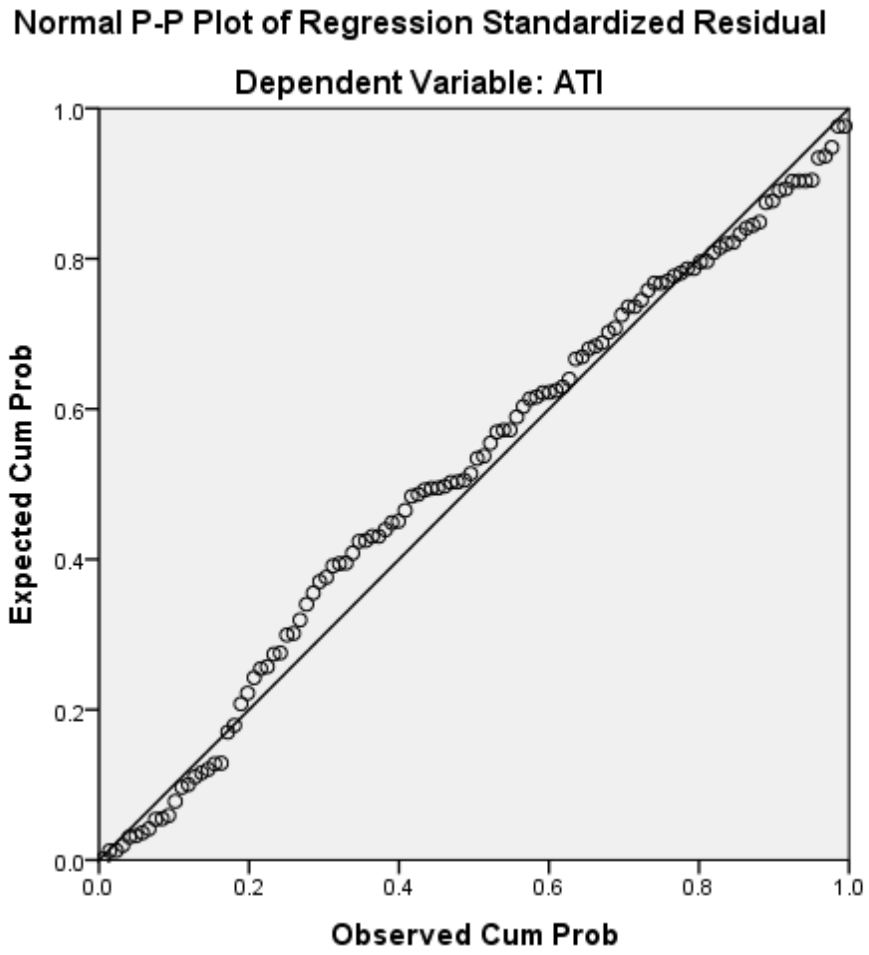

Figure 16. Normal P-P plot for the final model including demographic factors.

Finally, because transactional and translational leadership styles were moderately (positively) correlated, two additional regression models were conducted. One model included just transactional and passive avoidant leadership and the other included just transformational and passive avoidant leadership. Results indicated that in the model without transformational leadership, transactional leadership significantly predicted affinity for technology (B = .41, SE = 0.14), $t(113) = 2.86$, p = .005, $\eta^2_{partial}$ = .067. Results indicated that in the model without transactional leadership, transformational leadership also significantly predicted affinity for technology (B = .44, SE = 0.20), $t(113) = 2.23$, p = .028, $\eta^2_{partial}$ = .042.

The purpose of Chapter 4 was to present an analysis of the findings of the research survey on two research questions designed to determine correlations between self-reported leadership styles of healthcare leaders and affinity for technology. In summary, the final model illustrates a few main conclusions. Firstly, such demographic factors as whether the respondent is a physician, male, or white are not significant predictors of scores on the affinity for technology subscale. Secondly, in spite of the inclusion of those demographic factors, scores on the transactional leadership subscale are not only statistically significant predictors of scores on the ATI scale, but also imply that a higher score on the transactional leadership subscale is associated with a higher score on the ATI scale. The full implications of those results are discussed in the next chapter.

Chapter 5: Discussion, Conclusions, and Recommendations

Digital healthcare technology is not just about using technologies (e.g., electronic devices, electronic healthcare records), but also about reinventing the entire healthcare experience. Digital healthcare technologies are tools to drive this shift toward constant adaptation and innovation. Leaders who are able to transform their organization, adapting to digital healthcare technology's needs, requires strong psychological, social, and organizational knowledge and skills (Heifetz et al., 2009). Many providers and C-level executives that once adhered to a command style of management are finding the digital healthcare era demands a more collaborative approach to leadership.

The healthcare industry has a very complex organizational structure that makes healthcare leadership a challenging subject to investigate empirically. Increasing digitalization has heightened the necessity for healthcare leaders to learn which styles and competencies they need in order to marry healthcare technology with patient care. This research attempts to fill an existing knowledge gap regarding how specific, healthcare leadership styles may be linked to individual healthcare leaders' affinity for technology. The rationale for the study is grounded on the assumption that exploring and understanding the relation between style of leadership and affinity for technology will be useful to current and future healthcare leaders. The conclusions drawn from this research are founded in the results of a survey that quantitatively explores correlations between leaders' affinity for technology and three distinct, leadership dimensions—transformational, transactional, and passive avoidant leadership. The study examined: (a) which sociodemographic characteristics and (b) which contemporary leadership style dimensions are associated with affinity for technology.

A total of 303 invitations were sent to prospective survey participants, and 133 participants accessed the survey online via Qualtrics. Thus, this study had a response rate of 44%, which is a reasonably good rate given that Baruch and Holtom (2008) report an average response rate in the healthcare industry of 53.8%. Participating respondents were between age 27 and 73 and were mostly female (64%), mostly white (66%), and mostly physician/providers (55.7%). The survey instruments used include the Multifactor Leadership Questionnaire, known as the MLQ5x (Avolio & Bass, 2004), the Affinity for Technology Interaction (ATI) Scale, and an original researcher-developed Demographic self-assessment.

Discussion of Results

The two core research questions that frame this study are:

RQ1. What sociodemographic characteristics among healthcare leaders are predictive of an increased affinity for technology?

RQ2. Which leadership styles are predictive of increased affinity for technology?

These research questions were examined in a series of multiple regression analyses. Effects of leadership style dimensions were examined with and without statistically controlling for demographic variables (e.g., gender, race, and occupation). Results indicated that none of sociodemographic variables (race, gender, occupation, and employment sector) were significant predictors of affinity for technology. However, given the relatively small sample in this study I are hesitant to draw firm conclusions about the relations between demographic factors and affinity for technology among healthcare leaders. For instance, there was limited racial diversity in this sample, with most participants racially identifying as White. Thus in a sample of this size there was likely too little racial variability to detect racial differences (if there are any). Relatedly some groups were severely underrepresented in this sample, for example, only a few of the

participants worked for HMOs. This issue is discussed in more detail in the Limitations section below. This study does not provide significant evidence of any relations between demographic factors and affinity for technology, but this could be a result of the limited statistical power this study had to detect significant effects. Taking this into consideration, I consider the results for Research Question #1 to be inconclusive.

Moving on to Research Question #2, results indicated that none of the leadership style dimensions (transformational, transactional, and passive avoidant) significantly predicted affinity for technology. Although this model was much better powered to detect significant effects—given that predictors all were continuous—the sample was still somewhat small. Because transactional and transformational leadership were moderately correlated, I also examined whether effects changed when just one of these variables was included in the regression model. Results indicated that indeed, results did look quite different when only one of the factors is included in the regression model. Moreover, both transformational and transactional leadership predict affinity for technology when they are examined independently. As transformational leadership increases affinity for technology goes up and as transactional leadership goes up affinity for technology increases. Thus, both leadership styles seem to be predictive of openness to and interest in utilizing new technology. In all models passive avoidant leadership was unrelated to affinity for technology, suggesting that levels of passive avoidant leadership are not relevant to healthcare leaders' interest in digital transformation.

Bass (1990) defined transformational leaders as those who lead with compassion and persuasion, challenging outdated norms. Transformational leaders may also use transactional methods to adapt to the individual values and needs of followers. This might help explain why both transforaminal and transactional leadership styles associated with increased interest in

technology. All in all, healthcare leaders need to be tech savvy in order to handle the many digital changes taking place in healthcare—those who lack this technical interest may fail to properly coordinate and adapt their systems (Kane et al., 2018; Kanter, 1997; Wachter, 2015). Thus, the current findings suggest that both transactional and transformational leadership styles may be associated with successful technological adaptation. Moreover, my findings suggest that even if a leader is low on one of these leadership styles (transactional or transformational) they may still show higher levels of interest and engagement with new technology if they are higher in the other leadership style. In other words, as long as leaders score relatively high on transactional or transformational leadership, they can be expected to show higher levels of interest in new technology.

In terms of how participants scored on the leadership subscales, the highest means were on the transformational leadership subscale, and the lowest were on the passive avoidant leadership subscale. The transformational leadership subscale also had the smallest standard deviation, indicating relatively little dispersion in the data, whereas transactional leadership had the highest standard deviation. It is possible that this increased variability in responding on the transactional leadership scale may have contributed to the predictive power of transactional leadership scale in the current study. Based on prior norming data for leaders in the U.S. (Avolio & Bass, 2004), participants in this sample scored in the 50th percentile for passive avoidant leadership, 60th percentile for transformational leadership, and 70th percentile for transactional leadership. This reflects the fact that most participants' corporate roles were largely management-supervisory, rather than vision-decision making. As for the affinity for technology scale, respondents, on average, scored slightly above the midpoint on affinity for technology—which is in the range of mean responses in previous samples (Franke et al., 2018).

Based on prior literature, those who identify stumbling blocks, challenge norms, and expose conflicts are the best leaders for transitioning organizations to digital technology (e.g., Heifetz et al., 2009). This description is consistent with that of transformational leaders, thus it could be anticipated that individuals who score high in transformational leadership would be critical for transitioning organizations to digital technology. The current findings suggest that although transformational leadership does seem to be related to openness to and interest in new technology, it is not the only relevant leadership dimension. In fact, these findings suggest that transactional leadership may be more strongly associated with affinity for technology than transformational leadership. In a practical sense one can imagine that both leadership styles might aid in organizations digital transitions. Highly transactional leaders may be effective in the short term for establishing new norms and expectations surrounding digital tools and technology, establishing and enforcing firm guidelines regarding their usage. Given that a transactional leader values direct orders and clear corporate structures, she or he is more likely to use command operation methods and engage in direct task-oriented projects that use rules and regulations to reach objectives on time. Transactional healthcare leaders who have long focused on rewarding measurable results based on pre-determined top-down corporate goals, may tend to seek or affirm methods and results that conform to preexisting organizational models and structures. Thus highly transactional leaders will measure employee and organizational success or failure in accord with preexisting objectives, goals, awards, and penalties. Because of this, more transactional leadership may be particularly compatible with the data driven, rational decision-making supported by digital technologies that automate and reduce errors in previously human systems.

Although transactional leadership was found to be predictive of affinity for technology in the current study, prior literature on highly transactional leaders suggests that they may not fully recognize the limitations of that leadership style when it comes to motivating corporate creativity and adaptation through problem identification, designing creative solutions, promoting new paths of cooperation, and accepting systemic change. Highly transactional leaders may be inclined to view successful digitalization as a structural process, highly interruptive, unduly demanding of time or preparation, or even as requiring no further human resource development if properly executed. Thus transactional leaders could potentially hinder human adaptation to digitalization and prolong or amplify, rather than remediate, digital disruptions. Those leaders who spend the most time incorporating digital input and throughput into the process of patient management and daily operations may find transactional leadership's data-driven decisions to be unreasonably demanding. As a result of those beliefs and preferences, the solely transactional leader (who scores low on passive avoidant and transformational leadership) may not be an especially good fit for a workplace where creativity, innovative ideas, or transitional leadership is most valued or where progress depends on motivating otherwise self-directed people.

Because healthcare settings tend to be highly structured, hierarchical, rule-based, task-driven environments, they require a high degree of human flexibility within otherwise strict guidelines and regulations, and no doubt as a result, transactional leadership, when expertly applied, has long worked well. However, for maintaining technological literacy and keeping up with new digital technology over the long-term, more flexible transformational leaders may be important. That is, leadership in a healthcare setting must adjust as humans interface with digital technologies, as technology is constantly changing and roles are continually being redefined. This means that those who tend to take a highly transactional leadership style must find ways to

motivate continuous professional education among staff, ongoing adjustment to developing digital and organizational systems, and incorporating and applying new learning gained from digital data collection and analyses as well as from the leadership experiences of those on the ground. In healthcare, a transactional leader is most likely to implement the new digital technology soundly, efficiently, and on-time because of the leadership's preference for direct orders and clear corporate structures. However, the literature suggests that for long term success of any healthcare digital technology, coaching, affiliative and democratic styles—characteristics of transformational leadership—show more success (Goleman, 2000).

Better understanding the relation between leadership styles and affinity for technology could be highly advantageous, helping to inform future recruitment efforts of leaders who will adopt and support digital healthcare technology. The early work of Katz (1974) categorized the skills of effective leaders as technical, human, and conceptual. He viewed lower management as employing mostly technical skills, middle management, mostly human skills, and upper management mostly conceptual skills, although his model allowed for considerable overlap, as well as learning and mentoring (Katz, 1974). Participants in the current study were mostly physicians/providers and C-level comprised only 7.8% of the sample. To better understand the relationship between technology implementation and leadership style it may be helpful to organize healthcare leaders into sub groups of lower, middle ,and upper management. Lower management leaders might be more transactional and less innovative and visionary therefore exhibiting less transformational characteristics.

Nearly half of all participants were physicians/healthcare providers. According to Chapman and colleagues (2014), physicians in individual practice or those who supervise clinical teams are unique among leaders with regard to their leadership style, noting that among

this group there is no typical leadership style. Chapman's team found that surgeons were most often found to use pace-setting and authoritative styles, perhaps due to their roles in leading teams to achieve precise results. This suggests that physicians are aware of and consciously choose their leadership and communication styles.

Leaders play a pivotal role in organizational adoption of new technology (Appleton, 2016; Franko & Almeida, 2011). If the leader has no interest in technology, the organization will fall behind, because staff members usually follow the lead of the executive director (Appleton, 2016). Digital technology transformation starts at the top of an organization's hierarchy and pervade through it, the leadership support, interest, and encouragement are essential to drive the initiative to achieve the desired outcome in digital technology implementation (Kane et al., 2018). Most recent leadership scholars agree that open-minded team facilitation (i.e., encouraging and guiding productive team discourse and problem-solving) is an important, if not most important digital leadership competency (Watcher, 2015). Leaders of digitally savvy, medium to large hospitals and corporations report that digital transformations slow or fail because their leaders have lacked flexibility in their beliefs, assumptions, and knowledge about effective leadership—erroneously relying on their pre-existing control hierarchies, rather than encouraging their organizations to operate as collaborative and proactive problem-solvers (Heifetz et al., 2009). Creating a risk-taking culture gives employees opportunities to learn from failure and success. In fact, their research indicates that if openly testing ideas is unapproved, leaders are unlikely to lead followers through digital transformation successfully (Kane et al., 2018; Monahan et al., 2017).

A quantitative study done by Hao and Padman (2018) showed that leader effects are statistically significant during the technology implementation process. If leaders increase their

technology usage by 10 percent, the physicians who work closely with those leaders increased their technology usage by approximately 3.5 percent, after controlling for physician individual-level fixed effects, time effects, working environment and workload (Hao & Padman, 2018). Hao and Padman's (2018) study indicates that if a healthcare system plans to promote new technology, they should leverage this leader effect. According to Hao and Padman (2018), without any financial incentives, if leaders continue increasing usage of technology, the physicians under their influence will likely adopt the new technology.

Limitations of the Study

The healthcare industry is a very complex setting with a variety of components and systems, each having its own structure, procedures, and training. This complex structure makes it difficult to capture with any one sample or study. Thus, there are a number of limitations to the current work that must be acknowledged.

First and foremost, this study was relatively underpowered, particularly with regard to the sociodemographic factors. As an example, power analysis (using G*Power) indicates that in order to reliably detect moderate size effects of race, a sample of at least 216 participants would be needed. Moreover, given that participants are not equally distributed across the 6 racial categories used in this study, a substantially larger sample would be needed to ensure a minimum of 36 participants per racial category. This study utilized a convenience sample that was not stratified to oversample minority groups, but also was not representative of all healthcare leadership in the United States. Reaching all healthcare sectors, to have a diverse and representative sample is a monumental job for any research team and was not possible given the resources available for this particular project. Moreover, the sample that I was able to recruit for this study was rather small, which limited statistical power and the ability to detect demographic

differences. For instance, the vast majority of participants were physicians or non-physician providers (72%), and only about 8% of the sample were C-Level executives. This imbalance in occupations among participants in this sample limits the ability to draw conclusions about how occupation relates to affinity for technology. Similarly, most participants were in private practice or employed by an academic institution, therefore this study can say little about those employed by HMOs or IPA groups or how they might differ from those employed in other settings. Future research should examine the question of how leadership styles and demographic factors relate to technological affinity in larger and more representative samples.

Although this web-based survey was relatively short (requiring just 15 minutes to complete), it may have been too long for some busy healthcare professionals to complete particularly when there was no incentive for participation. It is also possible that in some cases the invitation to participate was overlooked or not received (e.g., flagged as SPAM), given that the survey was distributed via an email link sent through a professional networking website (i.e., LinkedIn). The response rate was acceptable at approximately 44%, but a portion of those respondents (~10%) provided insufficient data for analysis. In order to increase the response rate and incentivize full participation it may be necessary to present healthcare leaders with some more tangible benefit for participating in this kind of research.

In the current study a higher response rate was observed among female healthcare leaders. The study invitation was sent out to a pool of potential participants that was 57% women, but 64% of those who completed the study were women. Thus female healthcare leaders responded at a higher rate than male healthcare leaders. Although it is unknown why this is the case it is possible that female healthcare leaders were behaving more communally by volunteering to participate in research, consistent with prior work indicating that women tend to

behave more communally than men (e.g., McCarty, Monteith, & Kaiser, 2014; Moskowitz, Jung Suh, & Desaulniers, 1994). It is also possible that female healthcare leaders felt a particular sense of comradery with the researcher who conducted this study, who is also a woman. Given that only 16% of leadership positions in healthcare administration or department levels in the U.S. are held by women (Cox, 2019), results may look different if the participant sample more closely represented the demographics of healthcare leadership in the U.S.

Another limitation of the current study is that the scale used to assess attitudes toward technology and the proclivity leaders might have to adopt and integrate new technology was not specifically designed for this purpose. The affinity for technology scale assesses general interest in new technology, but may overlook important aspects of technology that are specific to the healthcare field. It is also possible that healthcare leaders may have affinity for technology in their personal lives (e.g., always getting the newest smartphones and gadgets as soon as they are released) that does not translate into interest in transitioning to electronic health records and other digital technologies used in the workplace. Future research should follow-up on this work with questionnaires that are specifically tailored to examine technological use and integration in healthcare.

Recommendations for Future Study

One important future direction for this line of inquiry will be to examine how dimensions of leadership styles predict the behavior of healthcare leaders. For instance, does greater transactional leadership actually predict increased use and implementation of digital technology in the workplace? Larger and more representative studies that examine actual outcomes in terms of successful digital transitions will be important for developing a full understanding of the link between leadership styles and healthcare technology transitions. It could also be worthwhile to

take a cross-sectional approach to this question, assessing the leadership styles of healthcare leaders who have been the most successful with digital transitions and comparing them to leaders who have had much more limited progress in their digital transition.

Examining the various aspects of leadership in tandem may also be fruitful. In other words, although transactional leadership seems to be predictive of affinity for technology, that relation may to some extent be dependent upon the levels of transformational and passive avoidant leadership. Thus future work should examine how the various leadership dimensions interact with one another to predict affinity for technology. The rather small sample in the current study limits the potential to examine such relations, but if future studies are able to recruit larger samples this would be a valuable next step.

Finally, it may also be important to consider others' ratings of healthcare leaders leadership styles. The MLQ5x was designed to be completed by leaders themselves and by coworkers (supervisors and those that they supervise). Although most evidence suggests that these ratings tend to converge (Avolio & Bass, 2004), it may be informative to assess whether relations look any different when others are rating the leadership style of the healthcare leader.

Summary

According to the leadership literature, healthcare leaders need to be tech savvy in order to handle the many digital changes taking place in healthcare—those who lack this technical background and interest may fail to properly coordinate and adapt their systems (Kane et al., 2018; Kanter, 1997; Wachter, 2015). Individual differences (e.g., personality characteristics) play an important role in interactions with technology, yet little is known about how healthcare leadership styles relate to affinity for digital technology (Franke et al., 2018). None of the demographic factors examined here (e.g., employment sector, gender, race) were associated with

affinity for technology, although they may be attributable to the rather small sample size. In this study respondents averaged highest on the transformational leadership subscale, although according to norming data they were in the 60th percentile, whereas participants scored in the 70th percentile for transactional leadership. Results revealed that both transactional and transformational leadership styles among healthcare leaders seem to be associated with affinity for technology, which could have important implications for facilitating digital transitions in healthcare.

Leaders' interest in technology has been shown to be a critical predictor of successful digital transitions among organizations. Leaders do not only differ in their technology usage but also in their success at transitioning their organization to new technology (Attig et al., 2017). Leadership attitudes and the organizational culture are critical to technology success and they are among a company's most fundamental assets or liabilities (Bradley & McDonald, 2017). As digital health technology becomes more prevalent in healthcare, identifying the leadership styles that have affinity for technology, will help with recruitment of leaders who will drive innovation and will champion change in ways that engage patients, inform and inspire employees, and ultimately transform the organization to thrive in the digital era.

REFERENCES

Angood, P., & Birk, S. (2014). The value of physician leadership. *Physician Executive, 40*(3), 6–22. Retrieved from https://csms.org/wp-content/uploads/2015/04/The-Value-of-Physician-Leadership.pdf

Appleton, C. (2016, May). Technology adoption in the workplace: A view from the trenches. *NTEN*. Retrieved from https://www.nten.org/article/technology-adoption-workplace-view-trenches/

Attig, C., Wessel, D., & Franke, T. (2017). Assessing personality differences in human–technology interaction: An overview of key self-report scales to predict successful interaction. In C. Stephanidis (Ed.), *HCI International 2017 – posters' extended abstracts* (pp. 19–29). Cham, Switzerland: Springer International Publishing

Avolio, B., & Bass, B. (2004). Multifactor leadership questionnaire [Trademarked assessment instrument]. *Mind Garden*. Retrieved from https://www.mindgarden.com/16-multifactor-leadership-questionnaire

Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human Relations*, *61*(8), 1139–1160. https://doi.org/10.1177/0018726708094863

Bass, B. M. (1990). From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics, 18*, 19–31. https://doi.org/10.1016/0090-2616(90)90061-S

Bauer, J. C. (2002). Rural America and the digital transformation of health care: New perspectives on the future. *Journal of Legal Medicine, 23*, 73–83. https://doi.org/10.1080/019476402317276678

Benjamin, K., & Potts, H. W. W. (2018). Digital transformation in government: Lessons for digital health. *Digital Health, 3*, 1–5. https://doi.org/10.1177/2055207618759168

Beyer, M. A., & Laney, D. (2012). *The importance of 'big data': A definition*. Stamford, CT: Gartner.

Bradley, A. J., & McDonald, M. P. (2011, October). The six attitudes leaders take toward social media. *Harvard Business Review*. Retrieved from https://hbr.org/2011/10/the-six-attitudes-leaders-take

Bolden, R., Gosling, J., Marturano, A., & Dennison, P. (2003). *A review of leadership theory and competency frameworks*. Centre for leadership studies, University of Exeter. Retrieved from https://ore.exeter.ac.uk/repository/bitstream/handle/10036/17494/mgmt_standards.pdf?sequence=1

Booth, R. G., Strudwick, G., & Fraser, R. (2017). The transformative power of social media: Considerations for practice and emerging leaders. In *Healthcare management forum* (pp. 138-141). Los Angeles, CA: SAGE Publications.

Buescher, B., & Viguerie, P. (2014, June). How U.S. healthcare companies can thrive amid disruption. *McKinsey & Company Healthcare Systems & Services*. Retrieved from https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/how-us-healthcare-companies-can-thrive-amid-disruption

Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.

Cameron, E., & Green, M. (2004). *Making sense of change management: A complete guide to the models, tools, and techniques of organizational change*. London, UK: Kogan Page.

Chapman, A. L., Johnson, D., & Kilner, K. (2014). Leadership styles used by senior medical leaders: Patterns, influences and implications for leadership development. *Leadership in Health Services*, *27*(4), 283–298. https://doi.org/10.1108/LHS-03-2014-0022

Charles, D., Gabriel, M., & Searcy, T. (2015). Adoption of Electronic Health Record systems among U.S. non-federal acute care hospitals: 2008–2014. *Office of the National Coordinator for Health Information Technology* (ONC Data Brief No. 23). Retrieved from https://www.healthit.gov/sites/default/files/data-brief/2014HospitalAdoptionDataBrief.pdf

Cohen, R., Martinez, M., & Zammitti, E., (2016). Health insurance coverage: Early release of estimates from the national health interview survey, January–March 2016. *National Center for Health Statistics*. Retrieved from https://www.cdc.gov/nchs/data/nhis/earlyrelease/insur201609.pdf

Commonwealth Fund (2014). *US health system ranks last among eleven countries on measures of access, equity, quality, efficiency, and healthy lives*. Retrieved from https://www.commonwealthfund.org/press-release/2014/us-health-system-ranks-last-among-eleven-countries-measures-access-equity

Cooper, S. J. (2003). An evaluation of the leading an empowered organisation programme. *Nursing Standard, 17*(24), 33–39. https://doi.org/ 10.7748/ns2003.02.17.24.33.c3350

Cooper, D. R., & Schindler, P. S. (2008). *Business research methods* (12th ed.). New York, NY: McGraw Hill Irwin.

Cox, E. (2019, January 10). Why aren't more women in healthcare leadership? *U.S. News & World Report*. Retrieved from https://health.usnews.com/health-care/for-better/articles/2019-01-10/why-arent-more-women-in-health-care-leadership-roles

Davis, K., Schoenbaum, S., & Audet, A. (2005). A 2020 vision of patient-centered primary care. *Journal of General Internal Medicine, 20*, 953–957. https://doi.org/10.1111/j.1525-1497.2005.0178.x

Dizon, D. S., Sedrak, M. S., Lewis, M. A., Cook, E., Fisch, M. J., Klemp, J. R., … Nichols, C. (2018). Incorporating digital tools to improve clinical trial infrastructure. *JCO Clinical Cancer Informatics, 2*, 1–8. https://doi.org/10.1200/CCI.17.00122

Drucker, P. (2006). *Classic Drucker: Essential wisdom of Peter Drucker from the pages of Harvard Business Review*. Boston, MA: Harvard Business School Publishing.

Dunn, L. (2014, September 17). Peter Drucker's brilliant 47-year-old idea could transform healthcare. *Beckler's Hospital Review.* Retrieved from https://www.beckershospitalreview.com/healthcare-blog/peter-drucker-s-brilliant-47-year-old-idea-could-transform-healthcare.html

Dye, C. F. (2017). *Leadership in healthcare: Essential values and skills*. Chicago, IL: Health Administration Press.

Edison, S., & Geissler, G. (2003). Measuring attitudes toward general technology: Antecedents, hypotheses and scale development. *Journal of Targeting, Measurement, and Analysis for Marketing, 12*(2), 137–156. https://doi.org/10.1057/palgrave.jt.5740104

eLearning (2018). Healthy people 2020. *Office of Disease Prevention and Health Promotion*. Retrieved from https://www.healthypeople.gov/2020 /tools-and-resources/Healthy-People-eLearning

Eshet, Y. (2005). Thinking skills in the digital era. In C. Haward, J. V. Bottcher, L. Justice, K. Schenk, P. L. Rogers, & G. A. Berg (Eds.), *Encyclopedia of Distance Learning, I*, 1840–1845, London, UK: Idea Group Inc.

Ewens, A. (2002). The nature and purpose of leadership. In E. Howkins & C. Thornton (Eds.) *Managing and leading innovation in health care*, (pp. 69–90). London, UK: Baillière Tindall.

Farmer, C., Hosek, S., & Adamson, D. (2016). Balancing demand and supply for veterans' health care: A summary of three RAND assessments conducted under the veterans choice act. *Rand Health Quarterly, 6*(1), 12. Retrieved from https://www.rand.org/pubs/research_reports/RR1165z4.html

Felfe, J., & Schyns, B. (2006). Personality and the perception of transformational leadership: The impact of extraversion, neuroticism, personal need for structure, and occupational self-efficacy. *Journal of Applied Social Psychology, 36*, 708–739. https://doi.org/10.1111/j.0021-9029.2006.00026.x

Frampton, S. B., Guastello, S., Hoy, L., Naylor, M., Sheridan, S., & Johnston-Fleece, M. (2017). Harnessing evidence and experience to change culture: A guiding framework for patient and family engaged care. *National Academy of Medicine Perspectives*. Discussion Paper, National Academy of Medicine, Washington, DC. https://doi.org/10.31478/201701f

Franke, T., Attig, C., & Wessel, D. (2019). A personal resource for technology interaction: Development and validation of the Affinity for Technology Interaction (ATI) scale. *International Journal of Human-Computer Interaction, 35*(6), 456–467. https://doi.org/10.1080/10447318.2018.1456150

Franko, M., & Almeida, J. (2011). Organisational learning and leadership styles in healthcare organisations: An exploratory case study. *Leadership & Organization Development Journal, 32*, 782–806, https://doi.org/10.1108/01437731111183739

Franko, O., & Tirrell, T. (2012). Smartphone app use among medical providers in ACGME training programs. *Journal of Medical Systems, 36*, 3135–3139. https://doi.org/10.1007/s10916-011-9798-7

Frey, W. (2011). The uneven aging and 'younging' of America: State and metropolitan trends in the 2010 Census. *Brookings*. Retrieved from https://www.brookings.edu/research/the-uneven-aging-and-younging-of-america-state-and-metropolitan-trends-in-the-2010-census/

Friedberg, M., Chen, P., Van Busum, K., Aunon, F., Pham, C., Caloyeras, J. … Tutty, M. (2013). *Factors affecting physician professional satisfaction and their implications for patient care, health systems, and health policy*. *RAND Corporation*. Retrieved from https://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR439/RAND_RR439.pdf

Friedman, L. (2018, February 13). Transformational healthcare leadership competencies. *Association for Talent Development*. Retrieved from https://www.td.org/insights/transformational-healthcare-leadership-competencies

Gardner, W. L., Cogliser, C. C., Davis, K. M., & Dickens, M. P. (2011). Authentic leadership: A review of the literature and research agenda. *The Leadership Quarterly, 22*, 1120–1145. https://doi.org/10.1016/j.leaqua.2011.09.007

Gardner, W. L., Avolio, B. J., Luthans, F., May, D. R., & Walumbwa, F. (2005). "Can you see the real me?" A self-based model of authentic leader and follower development. *The Leadership Quarterly, 16*(3), 343–372. https://doi.org/10.1016/j.leaqua.2005.03.003

George, B. (2003). *Authentic Leadership: Rediscovering the secrets to creating lasting value*. San Francisco, CA: Jossey-Bass/Wiley.

George, B. (2007). *True north: Discover your authentic leadership*. San Francisco, CA: Jossey-Bass/Wiley.

Goleman, D. (2000). Leadership that gets results. *Harvard Business Review*, *78*(2), 4–17. Retrieved from https://hbr.org/2000/03/leadership-that-gets-results

Gross, A. (2018). 'Internet of Things' poses new cybersecurity challenges to medical practices. *Medical Economics, 96*(10). Retrieved from https://www.medicaleconomics.com/business/internet-things-poses-new-cybersecurity-challenges-medical-practices

Gunderman, R. B. (2009). *Leadership in healthcare*. New York, NY: Springer Science & Business Media.

Hao, H., & Padman, R. (2018). An empirical study of opinion leader effects on mobile technology implementation by physicians in an American community health system. *Health Informatics Journal, 24*, 323–333. https://doi.org/10.1177/1460458216675499

Harder, B. (2013). Are MOOCs the future of medical education? *BMJ, 346*, f2666. https://doi.org/10.1136/bmj.f2666

Healthcare Leadership Council (2017, January 25). *Healthcare leaders to congress and administration: Improve the value-based care movement*. Retrieved from https://www.hlc.org/news/healthcare- leaders-to-congress-and-administration-improve-the-value-based-care-movement/

Heifetz, M. L. (1993). *Leading change, overcoming chaos: A seven stage process for making change succeed in your organization*. Berkeley, CA: Ten Speed Press.

Heifetz, R., Grashow, A., & Linsky, M. (2009). The theory behind the practice: A brief introduction to the adaptive leadership framework. In R. Heifetz, A. Grashow, & M.

Linsky (Eds.) *Practice of adaptive leadership: Tools and tactics for changing your organization and the world* (pp. 1–34). Boston, MA: Harvard Business Press.

Heifetz, R. A., & Laurie, D. L. (2001). The work of leadership. *Harvard Business Review, 79*(11), 37–48. Retrieved from http://www.kwli.org/wp-content/uploads/2015/01/Heifetz-Laurie-2001.pdf

Heifetz, R. A., & Laurie, D. L. (1997). The work of leadership. *Harvard Business Review, January–February*, 124–134. Retrieved from http://www.nhcue.edu.tw/~aca/fte/95-2/4.pdf

Hersey, P., Blanchard, K. H., & Natemeyer, W. E. (1979). Situational leadership, perception, and the impact of power. *Group & Organization Studies*, *4*, 418–428. https://doi.org/10.1177/105960117900400404

Hersey, P., & Blanchard, K. H. (1969). Life cycle theory of leadership. *Training and Development Journal, 23,* 26–34. Retrieved from https://psycnet.apa.org/record/1970-19661-001

Highmore, B. (2003). Machinic magic: IBM at the 1964–1965 New York World's Fair. *New Formations, 51*(51), 128–148. Retrieved from https://s3.amazonaws.com/academia.edu.documents/31737795/Machinic_Magic.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1557888314&Signature=Gv4pw6uo5Ysv9mvs%2Bm55Un3mOcw%3D&response-content-disposition=inline%3B%20filename%3DMachinic_Magic.pdf

Hussey, P. S., Ringel, J. S., Ahluwalia, S., Price, R. A., Buttorff, C., Concannon, T. W.... & Sloss, E. M. (2016). Resources and capabilities of the Department of Veterans Affairs to provide

timely and accessible care to veterans. *Rand Health Quarterly, 5*(4), 14. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5158229/

Johnson, J. R. (1998). Embracing change: A leadership model for the learning organization. *International Journal of Training and Development, 2*(2), 141–150. https://doi.org/10.1111/1468-2419.00042

Kalargyrou, V., Pescosolido, A. T., & Kalargiros, E. A. (2012). Leadership skills in management education. *Academy of Educational Leadership Journal*, *16*(4), 39–63. Retrieved from http://werken.ubiobio.cl/html/documentos/valores_bcm/leadership_skills.pdf

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2018, June 5). Coming of age digitally: Learning, leadership, and legacy. *MIT Sloan Management Review and Deloitte Insights*. Retrieved from https://www2.deloitte.com/insights/us/en/focus/digital-maturity/coming-of-age-digitally-learning-leadership-legacy.html

Kanter, R. M. (1997). *On the frontiers of management*. Boston, MA: Harvard Business School Press.

Katz, R. L. (1974). Skills of an effective administrator. *Harvard Business Review, 33*, 33–42. https://hbr.org/1974/09/skills-of-an-effective-administrator

Kerr, W. T., Lau, E. P., Owens, G. E., & Trefler, A. (2012) . The future of medical diagnostics: Large digitized databases. *The Yale Journal of Biology and Medicine, 85*, 363–377. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3447200/

Khan S, I., & Latiful Hoque, A. S. M. (2016). Digital health data: A comprehensive review of privacy and security risks and some recommendations. *Computer Science Journal of Moldova, 24*, 273–292. Retrieved from http://www.math.md/files/csjm/v24-n2/v24-n2-(pp273-292).pdf

Kilpatrick, A. O. (2009). The health care leader as humanist. *Journal of Health and Human Services Administration, 31*, 551–565. Retrieved from https://www.jstor.org/stable/25790742

Koop, C. E., Mosher, R., Kun, L., Geiling, J., Grigg, E., Long, S.... Rosen, J. M. (2008). Future delivery of health care: Cybercare. *IEEE Engineering in Medicine and Biology Magazine, 27*, 29–38. https://doi.org/10.1109/MEMB.2008.929888.

Kotter, J. (2014). *Accelerate: Building strategic agility for a faster moving world*. Boston, MA: Harvard Business Review Press.

Krawczyk-Sołtys, A. (2017). From healthcare manager's competencies to healthcare organization's competences. *Vadyba Journal of Management*, *31*(2), 9–15. Retrieved from https://www.ltvk.lt/file/zurnalai/01.pdf

Ladkin, D., & Taylor, S. S. (2010). Enacting the 'true self': Towards a theory of embodied authentic leadership. *The Leadership Quarterly*, *21*(1), 64–74. https://doi.org/10.1016/j.leaqua.2009.10.005

Landis, E. A., Hill, D., & Harvey, M. R. (2014). A synthesis of leadership theories and styles. *Journal of Management Policy and Practice*, *15*(2), 97–100. Retrieved from http://www.m.www.na-businesspress.com/JMPP/LandisEA_Web15_2_.pdf

LaVito, A., & Cox, J. (2018, January 30). Amazon, Berkshire Hathaway, and JPMorgan Chase to partner on US employee health care. *CNBC*. Retrieved from https://www.cnbc.com/2018/01/30/amazon-berkshire-hathaway-and-jpmorgan-chase-to-partner-on-us-employee-health-care.html

Lobas, J. G. (2006). Leadership in academic medicine: Capabilities and conditions for organizational success. *The American Journal of Medicine, 119*(7), 617–621. https://doi.org/10.1016/j.amjmed.2006.04.005

Lowe, K. B., Kroeck, K. G., & Sivasubramaniam, N. (1996). Effectiveness correlates of transformational and transactional leadership: A meta-analytic review of the MLQ literature. *The Leadership Quarterly, 7*(3), 385–425. https://doi.org/10.1016/S1048-9843(96)90027-2

Majumdar, A., & Bansal, R. (2010). Healthcare in the era of digital convergence. *SETLabs Briefings, 8*, 27–32. Retrieved from https://pdfs.semanticscholar.org/9a59/1669a3ef9b7a0a291dfe434572f3a22811c7.pdf

McCarty, M. K., Monteith, M. J., & Kaiser, C. R. (2014). Communally constrained decisions in workplace contexts. *Journal of Experimental Social Psychology, 55*, 175–187. https://doi.org/10.1016/j.jesp.2014.07.007

Menachemi, N., & Collum, T. H. (2011). Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy, 4*, 47–55. https://doi.org/10.2147/RMHP.S12985

Miller, H. D. (2009). From volume to value: Better ways to pay for health care. *Project HOPE–The People-to-People Health Foundation.* https://doi.org/ 10.1377/hlthaff.28.5.1418

Mold, J. (2017). Goal-directed health care: Redefining health and health care in the era of value-based care. *Cureus, 9*(2), e1043. https://doi.org/10.7759/cureus.1043

Monahan, K., Chmiola, A., & Roos, L. (2017, December 6). How effective leaders drive digital change. *MIT Sloan Management Review*. Retrieved July 15, 2018 from https://sloanreview.mit.edu/article/how-effective-leaders-drive-digital-change/

Moskowitz, D. S., Jung Suh, E., & Desaulniers, J. (1994). Situational influences on gender differences in agency and communion. *Journal of Personality and Social Psychology, 66*, 753–761. https://doi.org/10.1037/0022-3514.66.4.753

Muenjohn, N., & Armstrong, A. (2008). Evaluating the structural validity of the multifactor leadership questionnaire (MLQ), capturing the leadership factors of transformational-transactional leadership. *Contemporary Management Research, 4*(1), 3–14. https://doi.org/10.7903/cmr.704

Mumford, M. D., Zaccaro, S. J., Harding, F. D., Jacobs, T. O., & Fleishman, E. A. (2000). Leadership skills for a changing world: Solving complex social problems. *The Leadership Quarterly, 11*(1), 11–35. https://doi.org/10.1016/S1048-9843(99)00041-7

Murphy, B. (2017, January 25). 50 things to know about the hospital industry | 2017. *Becker's Hospital Review*. Retrieved from https://www.beckershospitalreview.com/hospital-management-administration/50-things-to-know-about-the-hospital-industry-2017.html

Natt och Dag, K. (2017). A scholar-practitioner perspective on a leadership development program in health care: Integrating connectivism theory. *Advances in Developing Human Resources*, *19*(3), 295–313. https://doi.org/10.1177/1523422317712671

National Center for Healthcare Leadership. (2006). *Healthcare leadership competency model (v. 2.1)*. Retrieved from http://www.nchl.org/Documents/NavLink/NCHL_Competency_Model-full_uid892012226572.pdf

Northouse, P. G. (2016). *Leadership theory and practice* (7th ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Oliver, S. (2006). Leadership in health care. *Musculoskeletal Care, 4*(1), 38–47. https://doi.org/10.1002/msc.17

Organization for Economic Cooperation and Development. (2017). *Health at a glance*. https://doi.org/10.1787/health_glance-2017-en

Ovretveit, J., Wu, A., Street, R., Thimbleby, H., Thilo, F., & Hannawa, A. (2017). Using and choosing digital health technologies: A communications science perspective. *Journal of Health Organization and Management, 31*(1), 28–37. https://doi.org/10.1108/JHOM-07-2016-0128.

Patil H. K., & Seshadri, R. (2014). Big data security and privacy issues in healthcare. *IEEE International Congress on Big Data*, 762–765. https://doi.org/10.1109/BigData.Congress.2014.112

Payne, T. H. (2016). Snapshot at mid-stride: Current state of EHRs and their use by clinicians from a CMIO's perspective. In C. A. Weaver, M. J. Ball, G. R. Kim, & J. M. Kiel (Eds.) *Healthcare information management systems: Cases, strategies, and solutions* (pp. 59–72). New York, NY: Springer Cham Heidelberg.

Porter, M. E., & Teisberg, E. O. (2007). How physicians can change the future of health care. *The Journal of the American Medical Association*, *297*(10), 1103–1111. https://doi.org/10.1001/jama.297.10.1103

Powell, A. (2016, February 22). The cost of inequality: Money = quality healthcare = longer life. *The Harvard Gazette*. Retrieved from https://news.harvard.edu/gazette/story/2016/02/money-quality-health-care-longer-life/

Prewitt, V. (2003). Leadership development for learning organizations. *Leadership and Organization Development Journal, 24*(2), 58–61. https://doi.org/10.1108/01437730310463242

Rao, A., & Scaruffi, P. (2013). *A history of Silicon Valley: The largest creation of wealth in the history of the planet* (2nd ed.). Palo Alto, CA: Omniware group.

Rijal, S. (2010). Leadership style and organizational culture in learning organization: A comparative study. *International Journal of Management and Information Systems, 14*(5), 119–127. https://www.doi.org/10.19030/ijmis.v14i5.19

Rowold, J. (2005). Multifactor leadership questionnaire. *Psychometric properties of the German translation by Jens Rowold.* Redwood City: Mind Garden. Retrieved from https://www.mindgarden.com/documents/MLQGermanPsychometric.pdf

Rubin, J. (2016, April 27). Healthcare leadership skills in an era of disruptive innovation. *HFMA*. Retrieved from https://www.hfma.org/Leadership/Archives/2016/Spring/Healthcare_Leadership_Skills_in_an_Era_of_Disruptive_Innovation/

Sajjadim, A., Karimkhani, M., & Mehrpour, M. (2014). New emerging leadership theories and styles. *Technical Journal of Engineering and Applied Sciences, 4*, 180–188. Retrieved from https://pdfs.semanticscholar.org/85f9/c9c72354feff08611e19f3acb6594ab6270f.pdf

Sandler, P. (2003). *Leadership.* London, UK: Kogan-Page.

Schiano, S., Sherman, C., & McClean, C. (2018, March 28). Engaging employees in healthcare data security. *Harvard Business Review*. Retrieved from https://hbr.org

Schneider, E. C., Sarnak, D., Squires, D. O., Shah, A., & Doty, M. M. (2017). Mirror, mirror 2017: International comparison reflects flaws and opportunities for better U.S. health care. *The Commonwealth Fund*. https://doi.org/10.15868/socialsector.27698

Schyve, P. M. (2009). Leadership in healthcare organizations: A guide to joint commission leadership standards. *The Governance Institute*. Retrieved from https://www.jointcommission.org/assets/1/18/WP_Leadership_Standards.pdf

Stata, R. (1989). Organizational learning–the key to management innovation. *Sloan Management Review, 30*(3), 63–74. Retrieved from https://sloanreview.mit.edu/article/organizational-learning-the-key-to-management-innovation/

Stoller J. K. (2009). Developing physician-leaders: A call to action. *Journal of General Internal Medicine, 24*(7), 876–878. https://doi.org/10.1007/s11606-009-1007-8

UCSF. (2012). FAQs. *Preparing the 21st Century Physician*. Retrieved from http://meded.ucsf.edu/bridges/faqs on 3/09/2016.

UCSF. (2016). Success Stories. *Medical Education Green Initiatives*. Retrieved from http://meded.ucsf.edu/green/success-stories on 03/09/2016.

Verghese, A., & Horwitz, R. I. (2009). In praise of the physical examination. *British Medical Journal, 339*, 1385–1386. https://doi.org/10.1136/bmj.b5448

Wachter, R. (2015). *The digital doctor: Hope, hype, and harm at the dawn of medicine's computer age*. New York, NY: McGraw-Hill Education.

Wallin, J. (2006). *Business orchestration: Strategic leadership in the era of digital convergence*. West Sussex, England: John Wiley & Sons.

Walumbwa, F., Avolio, B., Gardner, W., Wernsing, T., & Peterson, S. (2008). Authentic leadership: Development and validation of a theory-based measure. *Journal of Management, 34*(1), 89–126. https://doi.org/10.1177/0149206307308913

Weinman, J. (2015). *Digital disciplines: Attaining market leadership via the cloud, big data, social, mobile, and the Internet of things*. Hoboken, NJ: Wiley CIO.

Westerman, G. (2017, October 25). Your company doesn't need a digital strategy. *MIT Sloan Management Review*. https://sloanreview.mit.edu

APPENDIX A

IRB Approval Notice

Pepperdine University
24255 Pacific Coast Highway
Malibu, CA 90263
TEL: 310-506-4000

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Date: March 04, 2019

Protocol Investigator Name: Zahra Ghafari

Protocol #: 18-10-898

Project Title: HEALTHCARE LEADERSHIP STYLES AND AFFINITY FOR DIGITAL HEALTH

School: Graduate School of Education and Psychology

Dear Zahra Ghafari:

Thank you for submitting your application for exempt review to Pepperdine University's Institutional Review Board (IRB). We appreciate the work you have done on your proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations 45 CFR 46.101 that govern the protections of human subjects.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an amendment to the IRB. Since your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite the best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the IRB as soon as possible. We will ask for a complete written explanation of the event and your written response. Other actions also may be required depending on the nature of the event. Details regarding the timeframe in which adverse events must be reported to the IRB and documenting the adverse event can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* at community.pepperdine.edu/irb.

Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval. Should you have additional questions or require clarification of the contents of this letter, please contact the IRB Office. On behalf of the IRB, I wish you success in this scholarly pursuit.

Sincerely,

Judy Ho, Ph.D., IRB Chair

cc: Mrs. Katy Carr, Assistant Provost for Research

APPENDIX B

Informed Consent for Participation in Research

Informed Consent Form

PEPPERDINE UNIVERSITY
Graduate School of Education and Psychology

Healthcare Leadership Styles and Affinity for Technology in the Digital Era

You are invited to participate in a research study conducted by Sophie (AKA) Zahra Ghafari, under the supervision of Dr. Cameron Sublett Ph.D. at Pepperdine University, because you are in healthcare leadership. Your participation is voluntary. You should read the information below, and ask questions about anything that you do not understand, before deciding whether to participate.

PURPOSE OF THE STUDY

The purpose of the study is to identify leadership practices of healthcare executives and to explore their attitude toward technology. Additionally, this study will examine the relationship between demographic characteristics such as age, gender and practice affinity for technology.

STUDY PROCEDURES

If you volunteer to participate in this study, you will be asked to participate in an on-line survey built on Qualtrics platform. The questionnaire will take approximately 15 to 20 minutes to complete.

The surveys will be stored on a password protected computer at researcher's residence.

All information collected (survey responses) will be destroyed after completion of the dissertation.

POTENTIAL RISKS

There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

While there are no direct benefits to the study participants, there are several anticipated benefits to healthcare society which include: knowledge and information about healthcare leadership styles as it relates to technology implementation. This will add to the body of knowledge about this subject, which presently is extremely limited.

PAYMENT/COMPENSATION FOR PARTICIPATION

There is no payment or compensation for participating in this research.

CONFIDENTIALITY

I will keep your records for this study confidential as far as permitted by law. Pepperdine's University's Human Subjects Protection Program (HSPP) may also access the data collected. The

HSPP occasionally reviews and monitors research studies to protect the rights and welfare of research subjects.
The data will be stored on a password protected computer at the principal investigators place of residence. The data will be stored until the completion of the dissertation. No identifiable information will be obtained in connection with this study.
PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. You may withdraw your consent at any time and discontinue participation.

ALTERNATIVES TO FULL PARTICIPATION
The alternative to participation in the study is not participating.

INVESTIGATOR'S CONTACT INFORMATION

I understand that the researcher is willing to answer any inquiries I may have concerning the research herein described. I understand that I may contact Zahra Ghafari. If you have further questions about the researcher.

RIGHTS OF RESEARCH PARTICIPANT – IRB CONTACT INFORMATION

If you have questions, concerns or complaints about your rights as a research participant or research in general please contact Dr. Judy Ho, Chairperson of the Graduate & Professional Schools Institutional Review Board at Pepperdine University 6100 Center Drive Suite 500 Los Angeles, CA 90045, 310-568-5753 or gpsirb@pepperdine.edu.

ELECTRONIC CONSENT:
By clicking continue you are agreeing to consent to the study. You may print a copy of this consent form for your records. By selecting the "Agree" button below you are indicating that you have read the above information, are a legal adult with two or more years of healthcare leadership experience who is able to speak and read English, and voluntarily agreeing to participate in this research study

☐ Agree

☐ Disagree

APPENDIX C

Recruitment Script

Dear [Name],

My name is Zahra Ghafari, and I am a doctoral candidate in the Graduate School of Education and Psychology's (GSEP) program at Pepperdine University. I am conducting a research study examining the healthcare leadership styles and the affinity for technology. If you agree, you are invited to participate in completing a web-based questionnaire. The questionnaire is anticipated to take no more than 20 minutes.

Participation in this study is voluntary. Your identity as a participant will remain anonymous.

If you have questions or would like to participate, please contact me.

Thank you for your participation,

Zahra Ghafari

Pepperdine University

Graduate School of Education and Psychology

Status: Doctoral Student

APPENDIX D

Challenges of Rapid Implementation of Healthcare Hardware and Software

Inadequate software and hardware design prior to implementation:

The first EHRs were not user-centered, reflected little knowledge of the needs of medical practice, often treated doctors as if already expert users (Wachter, 2015, p. 75).

Checking boxes made patient conditions too similar, provided no "connections between problems," and undermined diagnoses (Wachter, 2015, p. 79).

Lack of standardized language meant patient progress notes combined with inability to revise or delete made records longer and increasingly convoluted (Wachter, 2015, p. 72).

EHRs "offered reminders, alerts, and messaging capability" but consumed non-existent time, distracted attention with "persistent," often "irrelevant" alerts of equal urgency creating a "boy-who-cried-wolf" effect. (Wachter, 2015, p. 74).

Automatic diagnoses increased severity. (Wachter, 2015, p. 86)

Inadequate structural organization and administrative preparation.

The "sacred space" of patient exam rooms and operating rooms were shattered by the demands of computer entry and doctors spent more time focused on computers than patients. (Wachter, 2015, p. 75)

"Electronic siloing" of specialists (Wachter, 2015, p. 77) undermined the collegial relationships previously relied upon for success during emergency and critical care (Wachter, 2015, p. 78).

EHR records were hard to read because they were unwieldy and often very long: a complex patient case could require 1000s of EHR pages including structured and unstructured data, descriptions, and narratives (Wachter, 2015, p. 118).

Physician and hospital invoicing, and therefore patient billing, became so long and complex that paper summaries had to be confirmed and printed after patient discharge, too late to confirm accuracy of treatment for billing (Wachter, 2015, p. 81).

"Hold harmless" clauses freed IT vendors from all legal liability even when EHRs were implicated in adverse patient outcomes, but doctors were held legally liable as "learned intermediaries" and accused of "poor implementation practices" by their own administrators and EHR providers (Wachter, 2015, p. 89).

Use of non-dedicated, i.e., user-owned, iPhones, iPads, and computers allowed personal messages to distract during rounds, created potential security risks, and possibly caused risk patient harm. (Wachter, 2015, p. 84).

Front-line users were not on the implementation teams.

Medical professionals found the EHR interfaces convoluted, disruptive, and excessively time consuming.

Dictation errors were many, embarrassing, and time-consuming to correct resulting in a cost for "scribes" or more of the doctor's or nurse's time for typing documentation (Wachter, 2015, p. 74-75).

Medical professionals using the new EHR systems were forbidden by administrators to provide constructive feedback.

Physicians and nurses were being subjected to "shame and self-blame" when they pointed out systemic problems which damaged morale (Wachter, 2015, p. 74.)

Technology companies' non-disclosure clauses prohibited public complaint and interfered with longstanding medical culture. Medical personnel who identified EHRs' imperfections and safety risks were labeled "technophobic, resistant, and uncooperative" so the flawed systems went uncorrected and opened hospitals and doctors to greater liability because medical "causes of harm" involving technology could no longer be openly explored at medical conferences. (Wachter, 2015, p. 86-89)

Unexpected safety, security, compliance, and human resources issues were handled too late.

Entry error rates increased because interrupting complex computer entries for 3 minutes causes error rates to double, for 4.4 seconds, to triple; that meant medical personnel in a busy hospital filled with frequent crises could not be interrupted (Wachter, 2015, p. 82-83)

Hospital workflow bottlenecked because it was had been built entirely on doctor decision-making. When nurses using the EHR, as opposed to traditional paper charts, were legally viewed as violating "meaningful use" standards, hospitals' internal policies and organization had to be transformed after creating risk of patient harm (Wachter, 2015, p. 85).

Failures to bill insurers and patients were initially very difficult to enter, track, monitor, and manage. (Wachter, 2015, p. ??; Maine Memorial article, 2013)

APPENDIX E

NCHL Recommended Leadership Competencies of 2006

Below are NCHL Leadership Competencies that apply directly to this research. For the complete version of all NCHL competencies, visit: http://www.nchl.org/Documents/NavLink/NCHL_Competency_Model-full_uid892012226572.pdf.

4. CHANGE LEADERSHIPATI Leadership Scale

4.1 Identifies Areas for Change. Publicly defines one or more specific areas where change is needed; Identifies what needs to change, but may not completely describe the path to change.

4.2 Expresses Vision for Change. Defines an explicit vision for change (i.e., what should be different and how); Modifies or redefines a previous vision in specific terms; Outlines strategies for change.

4.3 Ensures Change Message is Heard. Deliver the message or vision for change to everyone affected; Repeats message wherever possible; Posts change messages (e.g., banners, plaques, or other physical and public reminders); Provides opportunities for others to engage in change initiatives.

4.4 Challenges Status Quo. Publicly challenges the status quo by comparing it to an ideal or a vision of change; Creates a realistic sense of crisis or a disequilibrium in order to prepare the ground for change; Energizes others for change.

4.5 Reinforces Change Vision Dramatically. Takes a dramatic action (other than giving a speech) to reinforce or enforce the change effort; Personally exemplifies or embodies the desired change through strong, symbolic actions that are consistent with the change.

4.6 Provides Calm During the Storm of Change. Maintains an eye on the strategic goals and values during the chaos of change; Provides focused, unswerving leadership to advance change initiatives; Exemplifies quiet confidence in the progress and benefits of change; Provides direction for overcoming adversity and resistance to change; Defines the vision for the next wave of change.

"5. COLLABORATION: The ability to work cooperatively with others, to be part of a team, to work together, as opposed to working separately or competitively. Collaboration applies when a person is a member of a group of people functioning as a team, but not the leader.

5.1 Conducts work in a cooperative manner. supports team decisions; does his or her share of the work; keeps other team members informed and up-to-date about what is happening in the group; shares all relevant or useful information.

5.2 Expresses Positive Attitudes and Expectations of Team or Team Members: expresses positive attitudes and expectations of others in terms of their abilities, expected contributions, etc.; speaks of team members in positive terms, either to the team member directly or to a third party; develops effective working interactions with teammates.

5.3 Solicits Input: genuinely values others' input and expertise: actively seeks the input of others to increase the quality of solutions developed; displays willingness to learn from others, including subordinates and peers; solicits ideas and opinions to help form specific decisions or plans; works to create common mindset.

5.4 Encourages Others: publicly credits others who have performed well; encourages others; empowers others.

5.5 Builds Team Commitment: acts to promote good working relationships regardless of personal likes or dislikes; breaks down barriers across groups; builds good morale or cooperation within the team, including creating symbols of group identity or other actions to build cohesiveness; encourages or facilitates a beneficial resolution to conflict; creates conditions for high-performance teams.

6. COMMUNICATION SKILLS

The ability to speak and write in a clear, logical, and grammatical manner in formal and informal situations to prepare cogent business presentations and to facilitate a group.

6.4 Facilitates Group Interactions: Uses varied communication management techniques, brainstorming, consensus building, group problem solving, and conflict resolution; Demonstrates good meeting management techniques (e.g., agenda development, time management).

7. COMMUNITY ORIENTATION

The ability to align one's own and the organization's priorities with the needs and values of the community, including its cultural and ethnocentric values and to move health forward in line with population-based wellness needs and national health agenda.

7.1 Responds Appropriately to Community Needs. Follows through, when asked, on inquiries, requests, complaints; Keeps stakeholders up-to-date about progress of projects or other events that impact them.

7.2 Maintains Clear Communication. Maintains clear communication with community leaders and constituents regarding mutual expectations; Monitors community satisfaction and potential health needs; Regularly distributes helpful information to key stakeholders; Gives friendly, cheerful service.

7.3 Takes Personal Responsibility for Initiating Collaborative Planning. Corrects problems promptly and non-defensively; Takes personal responsibility for correcting service problems; Initiates collaborative planning; Mobilizes resources to meet community health needs and challenges.

7.4 Participates with and Understands the Community. Sponsors activities, takes action, and conducts data gathering to understand the health needs of the local and regional communities; Gets involved in the community for the purposes of increasing wellness and presenting a good image of the organization; Is routinely involved in community health programs, interventions, and services.

7.5 Provides Services to the Community. Takes deliberate action to support the local and regional community's health values and needs; Initiates or develops a new service or array of

services to address the specific needs of the population and how it wants to receive health, recognizing ethnic and cultural differences; Works with other regional health organizations and constituencies to create a comprehensive and integrated health system to promote long-term wellness and serve community needs; Advocates for community health needs and priorities.

7.6 Advocates for the Broader Health Environment. Engages in meaningful actions at the national level to move recognized priorities forward; Partners across health constituencies to create a coordinated and dynamic health system on a national basis that meets long-term health and wellness needs; Understands needs of health stakeholders nationally and pushes their agenda forward.

APPENDIX F

Adaptive Leadership Theory

Premises of Adaptive Leadership. Heifetz posits that adaptive leaders use flexibility and experimentation: they "observe events and patterns," "interpret" their observations with "multiple hypotheses," "intervene...to address the adaptive challenge," and "repeatedly refine." They ask questions, consider data about organizational history, alliances, actors, behavior patterns, and corporate culture. They analyze who has what at stake, including underlying "values and loyalties," for example misinterpretations of the challenge as "technical rather than adaptive," use provocative interpretations as experimental interventions, always clarifying how interpretations connect to the objectives or tasks at hand to share their own perspectives. (Heifetz et al., 2009, p. 20-23). Adaptive leaders are necessary to lead "adaptive change" in a new landscape.

1. "The [traditional or existing] organization is the way it is because the people in authority and longtime employees want it that way" (Heifetz et al., 2009, p. 6).

2. Leadership failures are most often produced by "treating adaptive challenges as if they were technical problems…resolved through...authoritative expertise and ...the organization's current structures, procedures, and ways of doing things." (Heifetz et al., 2009, p. 6)

3. Technical problems need technical specialists, not leaders, to provide "the problem definition and solution, protect the organization from external threats, orient people into their current roles, restore order, and maintain norms" (Heifetz et al., 2009, p. 16).

4. Adaptive leaders identify the change challenge, frame key questions, disclose external threats, disorient current roles; resist orienting people into new roles too quickly, expose conflict or let it emerge, challenge norms or let them be challenged" (Heifetz et al., 2009, p. 16).

5. Adaptive challenges can only be addressed through changes in people's priorities, beliefs, habits, and loyalties. (Heifetz et al., 2009, p. 5)

6. Since significant progress requires going "beyond any authoritative expertise, " the adaptive leader "challenges individuals' and organizations' investments in relationships, competence, and identity." (Heifetz et al., 2009, p. 11)

7. Creating a "Productive Zone of Disequilibrium" provides a safer simulation of an impending problem than waiting for the problem to genuinely manifest and provides opportunities for discovery and innovation in solving it.

8. Sponsors, who initially support adaptive leaders through "formal and informal authority" may prove perilous because adaptive leaders may "challenge expectations" too often or too greatly for their comfort; thus, "very often, leadership challenges are about managing conflict inside of the "authorizing environment." (Heifetz et al., 2009, p. 15)

9. "Adaptive failures...can only be diagnosed in the context of the highly distributed, entrenched stakes of so many: from boards of directors, executives, middle managers, union

members, to vendors and their organizations, a wide swath of investors, and millions of consumers..." (Heifetz et al., 2009, p. 6)

Adaptive leadership recognizes the culturally diverse, technological workplace and provides premises and strategic and tactical solutions based on an intertwined set of situations, competencies, and their anticipated and potential outcomes. It offers methods for managing disruptions, especially organizational transformation due to digital implementation or sudden innovation. Below is a series of leadership competencies spread throughout Heifetz and colleagues (2009).

1. Finding the "larger purpose" by choosing "among competing, legitimate purposes, sacrificing many in the service of one or a few….what you are willing to die for...what you are willing to live for (Heifetz et al., 2009, p. 26-27).
2. "Mobilize people to tackle tough challenges and thrive" (Heifetz et al., 2009, p. 2)
3. Connect with the values, beliefs, and anxieties of those you mobilized. (Heifetz et al., 2009, p. 26)
4. Modify the stories your people tell themselves and the world about what they believe in, stand for, and represent (Heifetz et al., 2009, p. 11).
5. "Build on the past" (Heifetz et al., 2009, p. 3).
6. Identify the adaptive challenge; frame key questions & issues. (Heifetz et al., 2009, p. 3-4).
7. Disclose external threats (Heifetz et al., 2009, p. 4).
8. Disorient current roles; resist orienting people to new roles too quickly (Heifetz et al., 2009, p. 4-5).
9. Expose conflict or let it emerge; challenge norms or let them be challenged (Heifetz et al., 2009, p. 3).
10. "Displace, reregulate, and rearrange" existing "DNA," i.e., cultural memes (Heifetz et al., 2009, p. 4).
11. Rely on diversity (Heifetz et al., 2009, p. 3).
12. Experiment and do not "become wedded" to your own interventions. (Heifetz et al., 2009, p. 3, p. 24).
13. Let it take time (Heifetz et al., 2009, p. 4).
14. Motivate to meet immediate adaptive challenges (Heifetz et al., 2009 p. 5).
15. Build the organization's "adaptive capacity" by "fostering processes" that generate new norms to meet ongoing challenges" (Heifetz et al., 2009, p. 5)
16. Design interventions outside everyone's comfort zone and "your own tool kit" (Heifetz et al., 2009, p. 24)
17. Take into account the available resources. (Heifetz et al., 2009, p. 5)
18. Consider where you "sit" in the organization and your chances of success. (Heifetz et al., 2009, p. 23)

APPENDIX G

ATI Scale

Affinity for Technology Interaction (ATI) Scale

Franke, Attig, & Wessel (2018)

In the following questionnaire, we will ask you about your interaction with technical systems. The term "technical systems" refers to apps and other software applications, as well as entire digital devices (e.g., mobile phone, computer, TV, car navigation).

	Please indicate the degree to which you agree/disagree with the following statements.	completely disagree	largely disagree	slightly disagree	slightly agree	largely agree	completely agree
01	I like to occupy myself in greater detail with technical systems.	☐	☐	☐	☐	☐	☐
02	I like testing the functions of new technical systems.	☐	☐	☐	☐	☐	☐
03	I predominantly deal with technical systems because I have to.	☐	☐	☐	☐	☐	☐
04	When I have a new technical system in front of me, I try it out intensively.	☐	☐	☐	☐	☐	☐
05	I enjoy spending time becoming acquainted with a new technical system.	☐	☐	☐	☐	☐	☐
06	It is enough for me that a technical system works; I don't care how or why.	☐	☐	☐	☐	☐	☐
07	I try to understand how a technical system exactly works.	☐	☐	☐	☐	☐	☐
08	It is enough for me to know the basic functions of a technical system.	☐	☐	☐	☐	☐	☐
09	I try to make full use of the capabilities of a technical system.	☐	☐	☐	☐	☐	☐

Analysis

1. When entering the participants' responses into a data file for the analysis, the responses should be coded as follows: completely disagree = 1, largely disagree = 2, slightly disagree = 3, slightly agree = 4, largely agree = 5, completely agree = 6.
2. Responses to the **three negatively worded items** (items 3, 6, 8) **need to be reversed** (6=1, 5=2, 4=3, 3=4, 2=5, 1=6).
3. Finally, a mean score should be computed over all 9 items.

Source: Franke, T., Attig, C., & Wessel, D. (2018). A Personal Resource for Technology Interaction: Development and Validation of the Affinity for Technology Interaction (ATI) Scale. *International Journal of Human–Computer Interaction*. DOI: 10.1080/10447318.2018.1456150

More Information: www.ati-scale.org 26-04-2018

Appendix H

Multifactor Leadership Survey Questionnaire (MLQ5X)

Multifactor Leadership Questionnaire

Leader Form

My Name: _____ Date: _____

Organization ID #: _____ Leader ID #: _____

This questionnaire is to describe your leadership style as you perceive it. Please answer all items on this answer sheet. **If an item is irrelevant, or if you are unsure or do not know the answer, leave the answer blank.**

Forty-five descriptive statements are listed on the following pages. Judge how frequently each statement fits you. The word "others" may mean your peers, clients, direct reports, supervisors, and/or all of these individuals.

Use the following rating scale:

Not at all	Once in a while	Sometimes	Fairly often	Frequently, if not always
0	1	2	3	4

1.	I provide others with assistance in exchange for their efforts	0	1	2	3	4
2.	I re-examine critical assumptions to question whether they are appropriate	0	1	2	3	4
3.	I fail to interfere until problems become serious	0	1	2	3	4
4.	I focus attention on irregularities, mistakes, exceptions, and deviations from standards	0	1	2	3	4
5.	I avoid getting involved when important issues arise	0	1	2	3	4
6.	I talk about my most important values and beliefs	0	1	2	3	4
7.	I am absent when needed	0	1	2	3	4
8.	I seek differing perspectives when solving problems	0	1	2	3	4
9.	I talk optimistically about the future	0	1	2	3	4
10.	I instill pride in others for being associated with me	0	1	2	3	4
11.	I discuss in specific terms who is responsible for achieving performance targets	0	1	2	3	4
12.	I wait for things to go wrong before taking action	0	1	2	3	4
13.	I talk enthusiastically about what needs to be accomplished	0	1	2	3	4
14.	I specify the importance of having a strong sense of purpose	0	1	2	3	4
15.	I spend time teaching and coaching	0	1	2	3	4

Continued ➔

Not at all	Once in a while	Sometimes	Fairly often	Frequently, If not always
0	1	2	3	4

16. I make clear what one can expect to receive when performance goals are achieved	0	1	2	3	4
17. I show that I am a firm believer in "If it ain't broke, don't fix it."	0	1	2	3	4
18. I go beyond self-interest for the good of the group	0	1	2	3	4
19. I treat others as individuals rather than just as a member of a group	0	1	2	3	4
20. I demonstrate that problems must become chronic before I take action	0	1	2	3	4
21. I act in ways that build others' respect for me	0	1	2	3	4
22. I concentrate my full attention on dealing with mistakes, complaints, and failures	0	1	2	3	4
23. I consider the moral and ethical consequences of decisions	0	1	2	3	4
24. I keep track of all mistakes	0	1	2	3	4
25. I display a sense of power and confidence	0	1	2	3	4
26. I articulate a compelling vision of the future	0	1	2	3	4
27. I direct my attention toward failures to meet standards	0	1	2	3	4
28. I avoid making decisions	0	1	2	3	4
29. I consider an individual as having different needs, abilities, and aspirations from others	0	1	2	3	4
30. I get others to look at problems from many different angles	0	1	2	3	4
31. I help others to develop their strengths	0	1	2	3	4
32. I suggest new ways of looking at how to complete assignments	0	1	2	3	4
33. I delay responding to urgent questions	0	1	2	3	4
34. I emphasize the importance of having a collective sense of mission	0	1	2	3	4
35. I express satisfaction when others meet expectations	0	1	2	3	4
36. I express confidence that goals will be achieved	0	1	2	3	4
37. I am effective in meeting others' job-related needs	0	1	2	3	4
38. I use methods of leadership that are satisfying	0	1	2	3	4
39. I get others to do more than they expected to do	0	1	2	3	4
40. I am effective in representing others to higher authority	0	1	2	3	4
41. I work with others in a satisfactory way	0	1	2	3	4
42. I heighten others' desire to succeed	0	1	2	3	4
43. I am effective in meeting organizational requirements	0	1	2	3	4
44. I increase others' willingness to try harder	0	1	2	3	4
45. I lead a group that is effective	0	1	2	3	4

APPENDIX I

Demographic Questions

1. What is your gender?
    - Female
    - Male
    - Other
2. How old are you?
3. What is your occupation?
    - Physician
    - Non -physician provider
    - C- level executive
    - Administrator
    - Other
4. What is your race?
    - Black or African American
    - White
    - Asian
    - Native Hawaiian or other Pacific Islander
    - American Indian or Alaskan Native
    - Multiple races or other
5. Which one of the following categories best describe your employment?
    - Independent physician practice
    - Academic institution
    - Nonacademic hospital
    - HMO or IPA group
    - Other