2019

Towards an artificial intelligence (AI)-driven government in the United Arab Emirates (UAE): a framework for transforming and augmenting leadership capabilities

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TOWARDS AN ARTIFICIAL INTELLIGENCE (AI)-DRIVEN GOVERNMENT IN THE UNITED ARAB EMIRATES (UAE): A FRAMEWORK FOR TRANSFORMING AND AUGMENTING LEADERSHIP CAPABILITIES

A dissertation submitted in partial satisfaction

of the requirements for the degree of

Doctor of Education in Organizational Leadership

by

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June, 2019

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TABLE OF CONTENTS

Page

Page

Page

LIST OF TABLES

Page

Page

LIST OF FIGURES

Page

ACKNOWLEDGMENTS

I dedicate this honorable work of pursuing a doctoral degree to several people in my life.

I am deeply thankful to my beloved family for their love, sacrifices, and support in every critical stage of my life. I am particularly thankful to my precious father and role model, Jasem Almarzooqi, for being a true inspiration. He was the main catalyst behind pursuing a doctoral degree, and I would have never accomplished what I have accomplished today without his continuous encouragement.

Also, I am grateful for my amazing dissertation chairperson and committee members who made this journey so joyful and rewarding. Special thanks to my valued chairperson, Dr. Jack McManus, for being such a great mentor. He helped me turn an idea into a completed dissertation. I would like to thank my valued committee members, Dr. Lani Fraizer and Dr. Paul Sparks for their support and valuable guidance.

I would like to thank my EDOL family at Pepperdine University for such a great experience.

Finally, I would also like to thank the individuals who participated in this study for generously sharing their time and knowledge. I have truly learned a lot from this study, and I wish I can get the opportunity to utilize what I have learned to help make a better tomorrow.

VITA

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ABSTRACT

The UAE Government has recently launched a strategy for Artificial Intelligence (AI) that transitions the government to a new phase of becoming an AI-driven government. This strategy aimed to adopt AI-based technologies to boost the overall performance of the government. AI-based technologies have the capability to perform a wide range of human cognitive functions such as voice recognition, image recognition, and prediction. However, to achieve the vision of becoming an AI-driven government, the UAE has to prepare effectively for the transformation by anticipating the various challenges that accompany the adoption of AI-based technologies. Previous research indicated that infusing AI-based technologies will stimulate major shifts in organizations such as reshaping the nature of work, changing how work was previously done, and, more importantly, redefining the measurements of effective leadership. Hence, to particularly address the major shifts triggered by the adoption of AI-based technologies in terms of organizational leadership, this research study explored aspects of effective leadership in the UAE's future AI-driven government. For this purpose, the study employed an explanatory sequential mixed methods design that incorporated the collection of both quantitative and qualitative data.

The key findings of this study contributed to the development of a framework for transforming and augmenting leadership capabilities that could be implemented in UAE's AI-driven government. This study found that public entities within the UAE government will need to redefine their organizational leadership structure by essentially incorporating roles that foster a culture of innovation and establish a data-driven organization as a major cornerstone for a successful AI-transformation. Equally important, AI-based technologies will enable leaders to become more efficient and productive through the concept of augmented intelligence. The

findings of this study also indicated that agile mindset, AI-technology proficiency, data intelligence, and qualities associated with transformational leadership theory are the 4 main competencies which define an effective leader in UAE's AI-driven government. Finally, this study highly recommends the implementation of more innovative development methods as a key step to build and prepare the leaders needed for the UAE's AI-driven government.

Chapter 1: Introduction

Background

Governments around the globe deploy various technological advancements to enhance the operation and the quality of public services. The United Arab Emirates' (UAE) government, since its formation in 1971, constantly looks for innovative ways to improve people's quality of life in the country. Accordingly, UAE launched its Electronic Government (E-Government) Strategic Plan 2011-2013, the first in the Gulf Region. This plan completely revolutionized the country's governmental system (Al-Khouri, 2012). The objective of the UAE's E-Government was to incorporate Information and Communications Technology (ICT) to different government sectors. As a result, the use of ICT by the UAE government has significantly enhanced the quality of most public services.

In 2010, H. H. Sheikh Mohammed bin Rashid Al-Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, launched UAE Vision 2021. The Vision mainly focuses on improving the quality of work in various public sectors such as healthcare, education and security to sustain a competitive knowledge economy (UAE Vision 2021, 2018). Thus, in 2013, the government announced a strategy for its Smart Government also known as Mobile Government (M-Government) to contribute in achieving the country's vision for 2021. M-Government complements the previous government's initiatives to ultimately make public services accessible to people 24/7 via smart phones. The UAE government strongly believes that a successful government is one that directly reaches its people (Government.ae, 2018).

In 2017, building on UAE's Vision 2021, the government announced UAE Centennial Plan for 2071, which is a new transition point for the UAE government. The UAE Centennial Plan is a long-term plan aiming to guide the country towards future success and prosperity in

different fields. The UAE Centennial Plan involves four different aspects, which are government, education, economy, and community (Government.ae, 2018). The ultimate goal of the country is to acquire the best government, best education, best economy, and the happiest communities (Chand, 2017). In other words, the UAE aspires to become the best country in the world by 2071. However, to achieve the objectives of UAE's long-term vision, the government will focus on adopting the latest advancements in technology to enable and reach success. This indicates that investment in human capital will be an extremely important factor for the UAE government to achieve its vision. Hence, the UAE government will work on various initiatives and strategies to prepare future generations by equipping them with the skills and knowledge needed to thrive in a rapidly changing world characterized by uncertainty and complexity (Government.ae, 2018).

More importantly, in 2017, the UAE government launched its strategy for Artificial Intelligence, which is the first project developed to deliver UAE Centennial plan objectives. The unique strategy transitions UAE government to a completely new phase of becoming an AI-driven government as shown in Figure 1.

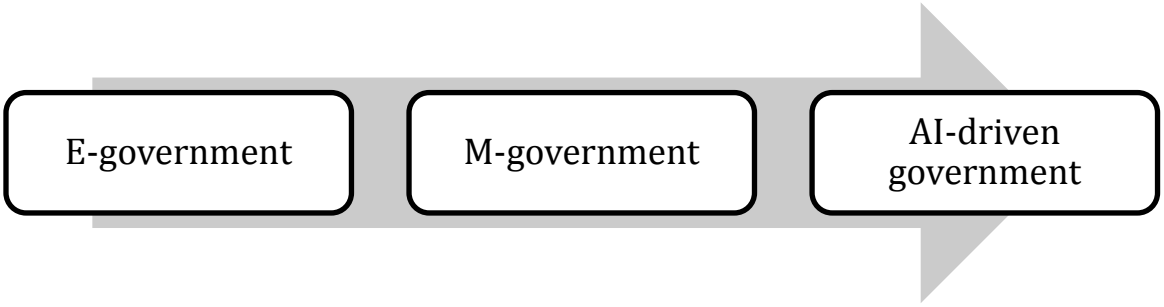

Figure 1. UAE government technological transition phases.

The strategy for Artificial Intelligence (AI) aims to adopt the most advanced AI technologies to boost overall performance and efficacy of the government (Government.ae, 2018). The UAE's goal is by 2031 to have a government that is 100 percent AI-driven. AI will

be deployed to enhance the work in different fields in UAE government such as education, transportation, energy, space, and technology. The UAE AI strategy is expected to save 50 percent annual operating costs (UAE 2031, 2018). Eventually, the UAE aspires to become the hub for Artificial Intelligence in which it invests in AI research and host world-class AI exhibitions (Government.ae, 2017).

More importantly, the Founder and Executive Chairman of the World Economic Forum, Klaus Schwab, considered Artificial Intelligence as one of the main drivers of the fourth industrial revolution. Schwab (2016) emphasized the role of AI technologies in stimulating discontinuous changes in many industries. Discontinuous change occurs through creative destruction, a term popularized by Schumpeter (1942), which involves the development of radical innovations (such as Artificial Intelligence), that tend to revolutionize the entire economic as well as operating system.

Recent advances in Artificial Intelligence (AI) has enabled technologies to perform a wide range of tasks that normally require human intelligence such as voice recognition, image recognition, and prediction. Machine Learning (ML), which is a subset of Artificial Intelligence, involves giving technologies the ability to learn from experience without being explicitly programmed through the use of different types of algorithms. Hence, ML is considered one of the most impactful technologies in today's era that is shaping the future of work in many industries. (Brynjolfsson & McAfee, 2012). Researchers emphasized that AI-based technologies must be viewed as collaborators and partners that are deployed to augment human capabilities rather than automating them (Davenport & Kirby, 2015). In addition, researchers indicated that AI will create new professions that has no precedent. The new professions will be created to

mainly train, explain, and sustain AI-based technologies in organizations (Wilson, Daugherty, & Morini-Bianzino, 2017).

Furthermore, researchers divided the roles of AI-based technologies in organizations into three main categories, process automation, cognitive insight, and cognitive engagement (Davenport & Ronanki, 2018; Schatsky, Muraskin, & Gurumurthy, 2015). Process automation incorporates using AI-based systems to input and transfer big data through multiple Information Technology (IT) systems. Cognitive insight involves integrating AI-based technologies to recognize patterns and interpret huge amounts of data for enhanced decision-making purposes. Cognitive engagement involves utilizing, a subfield of AI, Natural Language Processing (NLP), which gives technologies the capability to interact with humans (Davenport & Ronanki, 2018; Schatsky, Muraskin, & Gurumurthy, 2015).

Problem Statement

Currently, the UAE government is working towards implementing strategies for AI, which will transform the UAE government into an intelligent government 100% reliant on AI technologies by 2031 (UAE 2031, 2018). The strategy involves adopting different types of AI based technologies that will contribute in improving the quality of work in the government (UAE 2031, 2018). Hence, the integration of AI systems will reshape the nature of work by adding an entire virtual workforce that is capable of automating or augmenting human tasks (Purdy & Daugherty, 2017).

Despite the wide variety of benefits AI can provide, human capital development will remain a major priority to the UAE government. The government strongly believes that investment in leadership development is a key factor to success. In fact, effective leadership, over the decades, has played a pivotal role to support organizations' vision and strategy. The

effectiveness of leadership is assessed through the development of different competencies (Van Velsor, Turregano, Adams, & Fleenor, 2016). Hence, organizations address critical leadership competencies that align with their vision. In an era of constant change, however, critical leadership qualities are continuously being redefined to thrive in a complex environment driven by technological development (Ryan & Ali, 2013). Thus, since 2008, the UAE government has established a leadership development program designed specifically to develop leaders that meet the government needs. The program utilizes various leadership tools and methods in order to develop competent leaders in the government in line with the country's vision (UAE Government Leaders Programme, 2018).

The government will need to proactively identify the challenges derived from AI in order to effectively prepare their manpower. One of the major challenges, according to a recent research, is that AI will redefine the role of leadership where organizations will need to rethink their leadership frameworks (Abbatiello, Knight, Philpot, & Roy, 2017). For example, Kolbjørnsrud, Amico, and Thomas (2016a) revealed that AI is capable of performing most administrative tasks that will eventually give leaders more time to spend on innovation and developing others.

In leadership literature, there are several popular theories of leadership that were found to achieve organizational effectiveness such as transactional, situational, authentic, and transformational leadership. Nevertheless, advances in technology, globalization, as well as economic modifications are major forces of change that ultimately alters the role of organizations as well as its leadership (Goleman, Boyatzis, & McKee, 2013). Different set of knowledge, capabilities, behaviors, and skills determine the competence of leaders. Often, leadership competencies are divided into three main categories: intellectual (IQ), managerial

(MQ), emotional (EQ; Higgs & Dulewiez, 2003). Intellectual and managerial competencies encompass the hard elements of leadership, which mostly include technical related skills. On the other hand, emotional competencies are considered among the soft elements of leadership including skills such as social, communication and personality traits.

Recent research predicts that Artificial Intelligence technologies would take over most of the hard elements of leadership (Chamorro-Premuzic, Wade, & Jordan, 2018). According to Schwab (2016), the age of AI requires highly emotionally intelligent leaders who are capable of coaching and developing others. Other current studies indicate that organizations would need agile leaders, who are humble, adaptable, visionary, and engaged to thrive in the second machine age (Wade, Tarling, & Neubauer, 2017). Different leadership development methods are utilized to cultivate certain competencies needed by various entities. However, traditional leadership development training methods would no longer be sufficient in the future (Abbatiello et al., 2017). Traditional leadership development includes methods such as job rotation, action learning, 360-assessment and training courses. Research indicates that organizations will need to foster innovation in leadership development methods to thrive in an era of constant change (Petrie, 2011). Hence, the UAE government will be encouraged to consider innovative ways of leadership development methods for government officials to excel within the adoption of Artificial Intelligence.

More Importantly, a deep understanding of Artificial Intelligence and other advanced technologies is required to help develop leadership models to cope with the new complex environment (Van Velsor et al., 2016). This, as a result, stimulates identifying which leadership concepts are most critical to meet the UAE's government future needs. Therefore, there is a need

to study the future of UAE's AI-driven government leadership by identifying the key leadership concepts that will contribute to its success.

Purpose Statement

The purpose of this research was to study aspects of effective leadership in the UAE's future Artificial Intelligence (AI)-driven government by ascertaining the perceptions of different individuals who are currently associated with UAE government and who have sufficient knowledge in Artificial Intelligence (AI). The study particularly aimed to (a) explore how adopting AI-based technologies could redefine leadership roles in UAE government (b) understand how the adoption of AI-based technologies can make leaders more efficient and productive (c) identify the critical leadership competencies required to achieve the vision of becoming a highly successful technology-oriented government (d) determine the steps required to develop effective leaders that meet the UAE's AI-driven government needs.

Research Questions

According to Kolbjørnsrud et al. (2016a) the adoption of Artificial Intelligence (AI)-based technologies will redefine the requirements of leadership. Thus, the following research questions were formulated as a contribution to help UAE government identify the key factors involved in having effective leaders in UAE's future Artificial Intelligence (AI)-driven government.

The inquiry aimed to address the following main research question:

In the perception of individuals currently associated with UAE government, what key factors could contribute to effective leadership in the UAE's future Artificial Intelligence (AI)-driven government?

The following were the sub-research questions:

a. How will AI redefine leadership roles in the UAE government?
b. How will AI-based technologies help UAE government leaders become more efficient and productive?
c. What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government?
d. What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's future AI-driven government?

Importance of the Study

This study was considered to be an important contribution to the success of UAE's future government. The government is currently in the initial phase of executing the goals of UAE's AI strategy in which the government is expected to face many challenges in the way including its leadership. Hence, identifying leadership gaps originated by AI technologies is key to facilitating the adoption of AI. Furthermore, this study will add valuable insights to existing literature on the integration of AI technologies and its impact on leadership.

Equally important, the researcher intended to increase the level of understanding on the impact of advanced technologies on leadership. Hence, the outcomes of this study can be utilized by various federal as well as local governmental entities to redesign their leadership frameworks to develop competent leaders, who are capable of leading in complex working environments. Ultimately, the research findings will stimulate the development of innovative methods of leadership that could be further implemented to facilitate government effectiveness.

Definitions of Terms

- **Artificial intelligence (AI)**. A field in computer science, which involves the development of technologies that are self-aware and capable of performing tasks requiring human intelligence (Eggers, Schatsky, & Viechnicki, 2017).
- **Deep learning (DL).** A sub-field of Machine Learning (ML) comprising of algorithms that enable smart machines to perform certain tasks such as image and speech recognition, through the exposure of multilayered neural networks to huge amount of data (Parloff, 2016).
- **Discontinuous change.** A disruptive change that has no precedent due to an abrupt event (Pullen, 1993).
- **e-Government.** A government strategy that involves the integration of Information and Communications Technology (ICT) to public services (Al-Khouri, 2012).
- **Leadership competency.** A set of knowledge, skills, and behaviors required by leaders to excel in their leadership roles. Leadership competencies can be developed using different development methods (Ledford, Lockwood, & Williams, 2008).
- **Leadership development method.** A method that is utilized to develop certain leadership competencies. Current traditional methods used by organizations to develop their leaders include training, 360-assessment feedback, and job rotation (Society for Human Resource Management, 2012).
- **Leadership framework.** A framework that incorporates the development of critical competencies needed by workforces in leadership roles to facilitate achieving the vision of an organization (Sydänmaanlakka, 2003).

- **Machine learning (ML).** A subfield of Artificial Intelligence, which includes the development of smart machines that continuously improve their performance without being programmed explicitly by humans (Brynjolfsson & McAfee, 2012).
- **m-Government.** An extended E-government strategy to provide public services that are accessible to people 24/7 via advanced applications on smart and mobile devices (Government.ae, 2018).
- **Natural language processing (NLP).** A computer science field that involves the interaction between smart machines and humans in which algorithms are applied to develop intelligent machines capable of recognizing speech and text. (Reshamwala, Mishra, & Pawar, 2013).
- **The fourth industrial revolution.** An industrial revolution that will disrupt the nature of work in different industries due to technological advancements in various fields such as Artificial Intelligence, 3D Printing, and Internet of Things (Schwab, 2016).
- **UAE centennial 2071.** A plan launched by UAE government that comprises certain objectives in different aspects to guide the UAE to become the best country in the globe by 2071 (UAE Centennial 2071, 2018).
- **UAE strategy for AI 2031.** The first project in UAE Centennial 2071 plan, which includes a strategy to adopt Artificial Intelligence (AI) based technologies in different public sectors to increase overall performance of the government. The goal of the strategy is to have a government that is fully dependent on AI by 2031 (UAE 2031, 2018).

Theoretical Framework

The researcher's ultimate goal was to study the impact of Artificial Intelligence (AI) in redefining leadership in UAE government. Thus, the selected theoretical framework of this study

involved four main theories and concepts, which are leadership, technological development, discontinuous change, and emotional intelligence (EQ).

Over the decades, leadership was seen as one of the most critical factors in achieving organizations visions and strategies (Lieberson & O'Connor, 1972). Correspondingly, technological development, globalization, and economic changes continuously enforce the evolution of new leadership theories and concepts to cope with the changes (Goleman et al., 2013). Hence, technological development is considered a major force in driving organizational discontinuous change, which compels the generation of new operational models across various disciplines to sustain effectiveness (Nadler, Shaw, & Walton, 1995). Artificial Intelligence (AI) systems is one of the most recent technologies that is leading the fourth Industrial Revolution in which it is triggering tremendous changes in the nature of work, including leadership, within various industries (Schwab, 2016). Furthermore, emotional intelligence (EI) is a key concept in leadership, which is expected to have a greater emphasis on the workplace in the age of intelligent machines (Goleman, 2005; Hyacinth, 2017; see Figure 2).

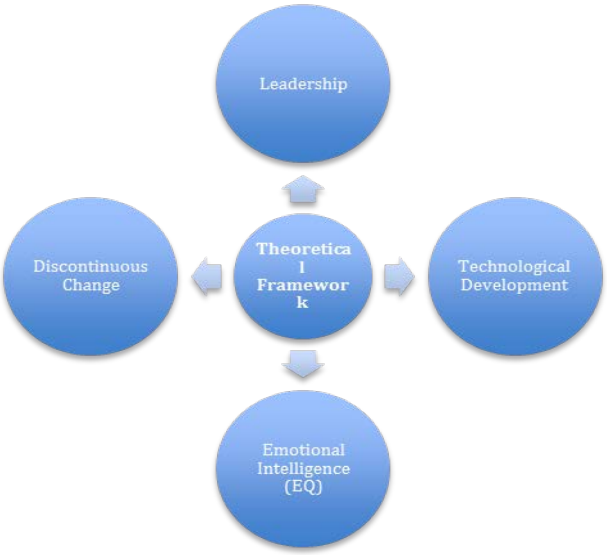

Figure 2. Theoretical framework.

Limitations

This research involved some degree of limitations that could restrict the conclusions of the study. The UAE strategy for AI is currently in its initial stages that is considered unique and first of its kind in the region. Hence, to date, the researcher was unable to locate any literature concerning the key leadership concepts associated with the adoption of AI in the UAE government. Additionally, Artificial Intelligence (AI)-based technologies are continuously advancing, which restricts the conclusions of the study with the current level of knowledge on AI of the sample recruited for the study.

Delimitations

The delimitations included the boundaries that were set by the researcher for the study to maximize the quality of the conclusions. The researcher selected the most appropriate methodology to address the research questions. The methodology selected for the study considered the collection of both quantitative and qualitative data as a key technique to validate the outcomes of the study. In addition, the researcher followed a participant exclusion criterion to achieve the desired outcomes in which individuals who lack knowledge in AI-based technologies will be excluded from the study sample.

Assumptions

Several assumptions were derived from the reviewed literature on the topic that prompted the researcher to conduct the research study. The researcher assumed that the adoption of AI technologies by the UAE government would reshape the nature of leadership. Hence, the critical competencies of higher government leaders in UAE were redefined due to disruptions from AI.

Moreover, in an age of continuous change, the UAE government needs to incorporate innovative leadership development methods to achieve the objectives of the UAE Centennial

Plan. The participants of the study would have moderate understanding in advanced technologies. Thus, the researcher assumed that their current knowledge in the field of AI was sufficient to accomplish the goals of the inquiry. Finally, the researcher assumed that identifying the critical leadership factors would contribute to the effectiveness of UAE Strategy for AI.

Organization of the Study

This research study is divided into five chapters. Chapter 1 is focused on introducing the study's background, problem, purpose, and research questions. Chapter 2 gives a review of the literature in line with the theoretical framework introduced in Chapter 1. Chapter 3 describes the methodology and design of the research study. Chapter 4 presents the key findings of the research study. Finally, Chapter 5 summarizes the conclusions drawn from the study and includes a discussion of the researcher findings and recommendations.

Chapter 2: Literature Review

UAE Government Vision Plans and Leadership

Background of UAE government. The government of United Arab Emirates (UAE) was established in 1971. Since its formation, the government has been constantly seeking different operational models to increase the quality of its work to provide world-class services to its citizens, expatriates, and visitors. The UAE government has been adopting various types of technologies as a superior method to enhance productivity and efficiency. Thus, the government had launched its Electronic Government (E-Government) Strategic Plan 2011-2013 which incorporated the use of Information and Communications Technology (ICT) in the products and services of different governmental sectors (Al-Khouri, 2012).

In 2010, the government's vision for 2021 was announced in which it mainly focused on improving the quality of work in different public sectors (UAE Vision 2021, 2018). Thus, in 2013, the government had announced a strategy for its Smart Government also known as Mobile Government (M-Government) to contribute in achieving the country's vision for 2021. The ultimate goal of the M-Government strategy was to make public services accessible to the people 24/7 through smart devices (Government.ae, 2018).

UAE centennial plan 2071. Following UAE's vision 2021, in 2017, the government had announced the UAE Centennial Plan for 2071, which is a five-decade span vision that guides the country for success and prosperity in different fields. The UAE Centennial plan involves four different aspects, which are government, education, economy, and community (Government.ae, 2018). The ultimate goal of the country is to acquire the best government, best education, best economy, and the happiest communities (Chand, 2017). In other words, the UAE aspires to become the best country in the world by 2071. In light of, to achieve the objectives of UAE's

long-term vision, the government will focus on adopting the latest advancements in technology as main enabler to reach success. Consequently, the UAE government will work on various initiatives and strategies to prepare future generations by equipping them with the necessary skills and knowledge to succeed in a rapidly changing world (Government.ae, 2018).

UAE strategy for AI 2031. In 2017, the UAE government had launched their Artificial Intelligence (AI) Strategy, which transitions the country to a completely new phase. Most importantly, the UAE strategy for Artificial Intelligence will serve as an important contributor in achieving the goals of UAE Centennial Plan for 2071 in becoming the best country in the world. Hence, the strategy aims to adopt a wide variety of AI-powered systems to (a) boost overall government performance (b) become more efficient in handling challenges and provide quick solutions (c) position the UAE to be the first in the field of Artificial Intelligence investments in different sectors (Government.ae, 2018).

The Strategy aims to adopt AI technologies in nine key sectors, which include:

1. Traffic: to reduce accidents, reduce traffic congestions, and develop more effective traffic policies
2. Environment: to increase the rate of afforestation
3. Education: to enhance the educational system
4. Technology: to enhance productivity and efficiency
5. Water: to help with water resources studies and analyses
6. Renewable energy: to manage different renewable energy facilities
7. Space: to conduct more accurate space experiments with minimized percentage of errors
8. Health: to contribute in minimizing dangerous and chronic diseases

9. Transport: to save operational costs and to reduce accidents (Government.ae, 2018).

To effectively achieve the objectives of UAE Strategy for AI, the government has appointed a Minister of State for Artificial Intelligence who is responsible for adopting and allocating the latest AI technologies in various governmental sectors (Government.ae, 2018). In addition, the government has formed an AI Council composed of 10 members from different governmental entities to help in exploring the fundamental supporting infrastructure needed for AI. Furthermore, the Minister of State of AI and the AI Council members are working closely on the process of issuance of government legislations to regulate the safe use of AI technologies in the nation.

Currently, the government is organizing various workshops and training courses for its employees at all levels to equip them with the necessary skills, knowledge, and mindset to facilitate the integration of AI systems. In addition, the UAE recently signed agreements with leading universities such as Oxford University located in the United Kingdom to train students and employees to develop capabilities related with the use of intelligent machines (Arabian Business, 2018).

UAE government leadership. In 2008, the UAE government leadership programme was launched by Sheikh Mohammed bin Rashid Al-Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai (UAE Government Leaders Programme, 2018). The government of UAE strongly believes that investing in leadership development is key to attaining an effective government. Hence, the ultimate goal of UAE government leadership programme is to build leaders of the future that have the capabilities to contribute in directing the vision and strategies of the country (UAE Government Leaders Programme, 2018). The leadership programme

utilizes various methods and tools to develop public leaders that are equipped with 21st century leadership competencies. In addition, the program targets governmental officials at all levels by providing them with the required talent database to become leaders in different fields (UAE Government Leaders Programme, 2018).

An Overview of Leadership

The role of leadership in organizations. What does leadership mean to an organization? Why is it important to have effective leaders in organizations? Why has leadership been a central focus for decades to many researchers? According to Wallace and Weese (1995), leadership is considered the quintessential factor to organizational success. Indeed, according to Uzohue, Yaya, and Akintayo (2016), they stressed that poor leadership may ultimately prompt organizations to decline in productivity. In other words, Senior (1997) indicated that ineffective leadership may result in job dissatisfaction, low subordinate morale, and other critical organizational challenges. While Lieberson and O'Connor (1972) stated that an effective leader plays a huge role in achieving the goals of an organization. In addition, Dvir, Eden, Avolio, and Shamir (2002) declared that leaders influence employees' development and performance. Covey (1991) stated leaders develop coherent vision and goals, which aid in guiding followers to the right direction.

While there is no universal definition of leadership, numerous scholars define leadership in many different ways. One definition of leadership by Maxwell (1993) is the ability to influence others and obtain followers. Jacob and Jaques (1990) defined leadership as the process of directing and influencing people to achieve a common goal. Another interpretation of leadership by Ferris and Rowland (1981) is the influence on subordinates performance and attitudes to impact their perceptions on their jobs. Although there are wide range of perspectives

on leadership, most scholars and researchers link leadership with the words influence, followers, and goal (Bryman, 1992).

In the literature, there are many distinct characteristics mentioned that best represent a successful leader, considering the huge number of publications written on leadership. Hogan, Curphy, and Hogan (1994) indicated that personality factors correlate with effective leaders such as emotional stability and intellect. Bennis (1989) believed that successful leaders are individuals who precisely acknowledge what they want and clearly communicate it to others. Certo (1992) described leaders as visionary, inspiring, and courageous. Lunenburg (2011) believed that an individual that focuses and empowers people, and creates change is considered a true leader.

But, what are the major indicators of effective leadership in organizations? According to Hogan et al. (1994), leadership effectiveness is tough to measure due to its correlation to many aspects in the organization. However, Yukl (2010) offered that leadership effectiveness could be measured through different variables such as productivity, customer satisfaction, profitability, and goal achievement. On the other hand, Szarlan, Singha, and Brown (2010) declared that effective leaders are the ones that anticipate change and act accordingly to ensure their organizations remain operational.

Leadership and management. To date, there is still a misperception of leadership and management. People mostly view managers as leaders; however, according to Zaleznik (1977), not all managers are leaders. In fact, several researchers noted that there are major differences between the two. According to Maxwell (2007), leadership involves inspiring people, whereas management incorporates the administration of processes and systems. Yukl (1981) stressed that managers maintain current functions of an organization while leaders seek new functions for long-term goals. Nayar (2013) declared while leaders attain followers with influence, managers

use power to attract subordinates. Another significant differentiator identified by Kotter (1990) is that leaders are capable of producing effective organizational changes.

Furthermore, to better distinguish the differences between leadership and management, researchers identified their distinct functions in organizations. Kotter (1987) stated that leadership entails functions as (a) creating a vision, (b) effectively communicating a vision, and (c) inspiring and empowering others. On the other hand, Lunenburg (2011) identified some examples of management processes to be (a) organizing, (b) staffing, (c) problem solving, (d) budgeting, and (e) controlling.

Historical leadership theories. Theories on leadership existed since the 19th century in which some of the earliest theories include the Great-Man theory, Trait theory, and Behavioral theory. The Great-Man theory, developed by Thomas Carlyle in 1847, was one of the very first theories on leadership. The theory claimed that leaders are born with inner qualities and not made (Bernard, 1926). In addition, it also argued that leaders are men inherited with those superior qualities, which differentiated them from their followers.

Years later, the Great-Man theory evolved into Trait theory in which declared that leadership is still genetically gifted, yet, with certain traits (Hughes, 2005). According to Trait theory, some of the traits that distinguished leaders from non-leaders included physical as well as personality factors such as attractiveness, height, intelligence, self-confidence, and charisma (Ekvall & Arvonen, 1991). However, during the 20th century, research on leadership has drastically expanded due to many criticisms on the Trait theory which entirely changed people's perception on leadership (Bryman, 1986). Thus, the Behavioral theory emerged and further evolved opposing preceding theories by indicating that leaders are actually made and not born. Several studies were made to support Behavioral theory of leadership in which researchers

concluded that leaders are able to learn and adapt certain behaviors to effectively impact subordinates (Bryman 1986; Daft, 1999).

Recent leadership theories. The world had rapidly changed due to various environmental factors during the middle of the 20th century. Organizations became more complex in which different types of leadership were demanded to sustain organizational effectiveness. Goleman et al. (2013) indicated that advances in technology, globalization, and economic changes are major external environmental factors that altered the effectiveness of leaders. Horner (1997) stated that environmental factors trigger changes in the nature of work, workforce talents, and organizational structures, which compel new concepts of leadership in organizations to remain effective. In other words, what made leaders effective in the past might no longer be impactful in the present.

Over the time, social theorists and philosophers made substantial studies to better understand effective leadership in organizations, which stimulated the emergence of various leadership theories (Stogdill, 1974). The most popular and recent leadership theories include transactional, authentic, situational, and transformational.

Transactional leadership. The theory of transactional leadership was first studied by Max Weber and was then carried on by James MacGregor Burns (Burns, 1978; Weber, 1947). According to Burns (1978), transactional leadership also known as managerial leadership is a contingent exchange process between leaders and followers, which ensures the continual loyalty of followers to leaders. In other words, transactional leadership entails that followers acquire certain rewards such as wages and recognition in return of executing leaders' commands. Avolio (2004) claimed that followers also receive punishments, if the developed agreements between transactional leaders and followers were not satisfied. Bass (1985) indicated that transactional

leadership maintains the current functions and does not seek for new methods of working. Bass (1985) simply described transactional leaders as individuals who use cost-benefit processes as motivators to subordinates to meet their needs in exchange of their efforts. Howell and Avolio (1993) divided transactional leadership into four distinct components:

a. Contingent rewards: includes the process of rewarding subordinates if tasks were completed as commanded by leader
b. Management-by-exception (active): leaders continuously monitor subordinates work and give rewards or punishments based on subordinate's performance.
c. Management-by-exception (passive): leaders do not track subordinates performance and waits until serious issues are generated to react
d. Laissez-faire: leaders do not engage with followers and leave all responsibilities to subordinates

Furthermore, Den Hartog, Van Muijen, and Koopman (1997) mentioned that the relations between transactional leaders and followers are all based on a series of exchange processes to attain organizational and personal objectives. Van Linden and Fertman (1998) outlined three main characteristics of transactional leaders: (a) task-oriented, (b) value problem solving, and (c) focuses on the final product.

Several studies discuss the impact of transactional leadership in organizational effectiveness. Burns (1978) claimed that transactional leaders are ineffective in achieving long-term goals, and could be only effective in short-term goals of an organization. According to Yammarino and Bass (1990), transactional leadership lacks the positive environment in organizations. Moreover, Yukl (1981) revealed that transactional leaders limit the enthusiasm of subordinates to accomplish organizational goals. However, McCleskey (2014) stated that

transactional leadership is superior for organizations that mainly have a sequence of fast and simple transactions to be acquired. In addition, Jansen, Vera, and Crossan (2009) revealed that the reward process of transactional leadership motivates followers to become more creative in achieving organizational goals.

Authentic leadership. For many decades, researchers studied the significant role of authenticity in leadership, yet, referring it to many different terms (Erickson, 1995). In 2003, the former chairman and CEO of Medtronic, Bill George, popularized the theory of authentic leadership in his book *Authentic Leadership: Rediscovering the Secrets to Creating Lasting Value* in which he stressed the need for a new generation of leaders that are genuine, values-centered, and capable of building sustainable organizations (George, 2003). Gardner, Avolio, Luthans, May, and Walumbwa (2005) stated that the most important element that characterizes an authentic leader is achieving authenticity. Harter (2002) defined the term authenticity as "owning one's personal experiences, be they thoughts, emotions, needs, wants, preferences, or beliefs, processes captured by the injunction to know oneself" (p. 382). Also, Bhindi and Duignan (1997) mentioned that authenticity incorporates ethics, integrity, ethics, morals, values, relationships, self, and learning

Thus, Luthans and Avolio (2003) described authentic leadership in organizations as a process that encourages a positive as well as a greatly developed organizational environment, which aids in superior self-regulated and self-awareness positive behaviors of leaders as well as followers. Avolio (2004) declared that authentic leaders inspire their followers by simply being role models, which in turn positively triggers the development of followers into leaders. In addition, many researchers emphasized the influence of authentic leadership in creating a Positive Organizational Behavior (POB; Luthans & Avolio, 2009; Luthans, Norman, & Hughes,

2006; Yammarino, Dionne, Schriesheim, & Dansereau, 2008). George, Sims, McLean, and Mayer (2007) mentioned that authentic leadership is based on trust and ethics, which makes it ideal for accomplishing long-term goals of organizations. For people to better understand authentic leaders and be able to recognize them from other kinds of leaders George (2003) identified five fundamentals of authentic leadership:

- Acknowledging their purpose
- Developing solid values
- Leading deeply with their heart
- Establishing well-connected relationships
- Showing self-discipline

Situational leadership. Expanding on the concept of 3-D leadership model generated by Reddin (1967), Hersey and Blanchard (1969) developed the theory of situational leadership that was originally called the life cycle theory of leadership. Also, some scholars refer situational leadership theory as contingency theory or behavioral theory (Bass & Bass, 2008; Yukl, 2011). Hersey and Blanchard (1969) in their journal article *Life Cycle Theory of Leadership* argued that both task-oriented leaders and people-oriented leader are effective, however, only under certain circumstances (Graeff, 1983). Hence, Graeff (1983) defined situational leadership as the adaption of leaders to different leadership behaviors based on the situation. In other words, Yeakey (2002) indicated that situational leaders adjust their leadership style to match the type of subordinates being led or influenced.

In 1977, Hersey and Blanchard (1977) in their book *Management of Organizational Behavior* incepted the first situational leadership model. According to Northouse (1997), the

situational leadership model consists of four leadership styles that were divided upon task-behavior as well as relationship-behavior:

- Directing (S1): leaders are high directive and low supportive
- Coaching (S2): leaders are high directive as well as supportive
- Supporting (S3): leaders are low directive and high supportive
- Delegating (S4): leaders are low directive as well as supportive

Hersey and Blanchard's (1977) model offered that leaders adapt one of the four distinctive leadership styles to situate the level of maturity of followers. The levels of maturity of subordinates were also divided into four categories, which are (M1) unable and unwilling to do the tasks, (M2) unable but willing to do the task, (M3) able but unwilling, and (M4) able and willing to do the tasks.

However, in 1985, the situational leadership model was revised in the book *Leadership and the One Minute Manager* in which Blanchard, Zigarmi, and Zigarmi (1985) presented the second generation of the model with several modifications. The situational leadership model, however, was then updated a couple of times by Ken Blanchard and his collaborators. According to Blanchard, Zigarmi, and Nelson (1993), one of the major changes in the updated version is that the term development was used to substitute the old model terms, readiness and maturity, to measure the level of subordinates. Blanchard et al. (1993) claimed that the words readiness and maturity can be misleading indicators. Hence, the development level was utilized as a more accurate indicator that measures the competence as well as commitment of subordinates. Northouse (1997) outlined the four development levels of employees: (D1) incompetent but highly committed, (D2) some competence but uncommitted, (D3) high competence but uncommitted, and (D4) very competent and highly committed.

Transformational leadership. The concept of transformational leadership was first introduced by the American politician James MacGregor Burns (1978) in his book *Leadership* that was published in 1978 (Kuhnert & Lewis, 1987). Burns (1978) contrasted transformational with transactional leadership by indicating that transformational leadership involves the engagement of leaders with followers to achieve a greater level of morality and motivation. Thereafter, researchers such as Bass (1985) built on the theory, which led transformational leadership to become one of the most popular theories in organizational psychology today.

Bass (1985) believed that transformational leadership occurs when leaders are deeply concerned and aware of their subordinates needs to achieve superior performance. Northouse (1997) declared that transformational leadership involves emotions, values, ethics, standards, and accomplishing long-term goals. Thus, Bass and Riggio (2006) described transformational leaders as individuals who inspire followers to attain exceptional outcomes as well as to develop them to become future leaders.

According to Bass and Avolio (1993) and Northouse (1997), transformational leadership is achieved by developing at least one of the four main components of transformational leadership, which are known as the 4Is. The four components are:

- Idealized influence: leaders act as effective role models for followers by using attributable or charismatic factors in which it strongly aids in subordinates following the vision the leader creates.
- Inspirational motivation: leaders articulate the vision by inspiring followers through motivation to be a critical part of the shared organization vision.
- Individualized consideration: leaders support followers by listening and being mindful of their specific needs.

- Intellectual stimulation: leaders stimulate followers to become innovative and think of new ways to solve problems in the organizations.

Antonakis (2012) indicated that research on transformational leadership has drastically increased, not only in organizational psychology, but also in other fields such as healthcare, education, and engineering. Similarly, Judge and Bono (2000) mentioned that transformational leadership is among the most supported theories in leadership.

A research by Chou (2014) concluded that transformational leadership is a powerful and significant approach to successfully implement organizational change. Another study by Garcia-Morales, Liorens-Montes, and Verdu-Jover (2008) revealed that transformational leadership plays a huge role in developing a foundation of organizational knowledge for better problem solving. Garcia-Morales et al. (2008) also found that transformational leadership inspires organizational learning that stimulates continuous improvements in organizations. Transformational leadership and organizational learning are critical in fostering innovation that improves an organization's outcomes. In innovative organizations, leaders are encouraged to continuously evolve by learning, which significantly assists in the adaption and initiation of organizational change. Hence, Jung, Chow, and Wu (2003) concluded that transformational leadership highly supports innovative organizational climates, particularly, by the empowerment of employees.

Leadership competency models. Most recently, various organizations worldwide have been utilizing leadership competency models as a key tool to meeting organizational goals (Turner & Müller, 2005). Bolden, Gosling, Marturano, and Dennison (2003) stated that leadership competency models are frameworks that contains a competency profile required for organizational leaders to excel in their role. Ledford et al. (2008) mentioned that identifying

essential leadership competencies helps organization develop their next generation leaders. The competency concept was popularized by a work done by McClelland (1973) in the 1970s. UNIDO (2002) defined competency as a set of skills, knowledge, and behaviors required to excel in a specific role. The leadership competency model encompasses similar concepts studied in previous leadership theories such as transformational, transactional, and situational (Turner & Müller, 2005).

According to Higgs and Dulewicz (2003), leadership competency models are divided into three categories, which include intellectual or cognitive competencies, managerial or functional competencies, and emotional competencies. Intellectual competencies include intelligence and problem solving skills as noted by Higgs and Dulewicz (2003). Managerial competencies involve the skills and knowledge required to manage functions (Higgs & Dulewicz, 2003). Emotional competencies include the four fundamentals of Goleman's (1998) emotional intelligence concept, which are self-awareness, self-regulation, empathy, and social skills. Higgs and Dulewicz (2003) study indicated that emotional competence of leaders accounts for 37%, whereas intellectual accounts for 27% and managerial 16%. Therefore, emotional competencies play a pivotal role in the effectiveness of leadership. However, Turner and Müller (2005) declared that intellectual and managerial are as important for leaders to reach superior performance. Similarly, Higgs (2003) indicated that most leadership theories neglected the importance of cognitive abilities in which researchers primarily focused on measuring behavioral and emotional elements of leadership. Thus, De Vries, Manfred, and Florent-Treacy (2002) stressed that effective leadership requires a combination of cognitive, managerial, and emotional competencies.

Historical Technological Development and Industrial Revolutions

The history of technological change. Technological development over the centuries has stimulated the revolution of many industries that in return produced significant social and economic impacts. As technology transformed, many aspects of industries also modified such as products, services, capabilities, and other key success factors (Afuah & Utterback, 1997). Innovation, however, is the major catalyst of the continuous advancements in technology which mainly enhance productivity and overcome industrial challenges (Johnston, 1966). Correspondingly, technological innovation is a critical contributor to the Total Factor Productivity (TFP), which is a key indication to trace economic progress (Hulten, Dean, & Harper, 2001). Therefore, Solow (1956) declared that technological change plays a huge role in long-term economic growth.

In fact, technological change has historically stimulated the occurrence of three tremendous industrial revolutions that had huge impact on the world economy and society:

- The First Industrial Revolution: an industrial revolution that was led by Britain, occurring between 1750-1850. The introduction of railroad constructions as well as steam engines facilitated mechanical production (Deane, 1979).
- The Second Industrial Revolution: one of the critical industrial revolutions that spanned between 1870-1914. The second industrial revolution witnessed the invention of electricity as its major event that stimulated mass production in manufacturing (Mokyr, 1998).
- The Third Industrial Revolution: an industrial revolution that is best known as the digital revolution having started in the 1960s. It ushered the development of computer machines, semiconductors, and the Internet (Schwab, 2016).

More importantly, industrial revolutions and technological innovations heavily contributed to shaping the employment market, which is a critical economic factor. Autor (2015) indicated that automation over the years has aided in complementing, eliminating, and creating jobs. For instance, Autor (2014) mentioned that the introduction of automated machinery and other technologies has reduced the number of US workforce in the agriculture industry from 41% in 1900 to 2% in 2000. Another example stated by Bessen (2015), is the impact of Automated Teller Machines (ATMs) which were introduced in the 1970s that heavily contributed in the increase of bank branches. The expansion of the financial sector created more jobs for tellers in the banking industry. Contrarily, other occupations were completely replaced due to automation including telephone operators, cashiers, and bookkeepers (Bresnahan, 1999). Ultimately, Bresnahan, Brynjolfsson, and Hitt (2002) emphasized that the demanded skills of workers in the labor market are continuously changing to cope with present technological innovations.

The fourth industrial revolution. The founder of the Work Economic Forum, Klaus Schwab (2016), in his book *The Fourth Industrial Revolution* emphasized the role of technological development in shaping the world in near future. Klaus explained the fourth industrial revolution as a successor to the third industrial revolution, which started in the 1960s and was best known as the computer revolution. The fourth industrial revolution is the technological development that is causing rapid disruptions to the nature of work that distinguishes it from previous industrial revolutions. Advancements in technologies, as a result, will revolutionize how people operate as well as communicate with each other. Those advanced technologies are reshaping organizations systems in the public and private sectors. Additionally, the book indicated that the technological revolution would have a greater impact on

governments. Klaus identified the development of several technological fields as drivers of the fourth industrial revolution, which includes fields of (Schwab, 2016):

- Artificial Intelligence (AI)
- Robotics
- Internet of Things (IoT)
- 3D Printing
- Nanotechnology

Segars (2018) conducted a study on technologies that are transforming the world. The current technological revolution is universal due to its huge impact on society. Segars (2018) stressed that it is crucial for business leaders to fully understand the capabilities as well as the impact of the technologies driving the industrial revolution. The study highlighted four key aspects that are constantly influenced by technological development: healthcare, learning, environment, and commerce (Segars, 2018). Some of the disruptive technologies mentioned in his research included Artificial Intelligence, Robotics, and 3D printing that are remaking industries. Segars (2018) believed that three main points make those technologies more advanced than others which are their intelligence, their natural interface, and their ubiquity.

A study by Renjen (2018) was conducted to examine how ready are private and public sectors for the fourth industrial revolution, also known as Industry 4.0. Researchers believe that the current digital revolution represents the integration of intelligent technologies into organizations as well as people's daily lives. Thus, the study tackled four major areas associated with Industry 4.0 that involves social impact, strategy, talent and workforce, and technology (Laurent, Chollet, & Herzberg, 2015). Furthermore, the study concluded that organizations are in the early stages of preparing for this new industrial revolution. Deloitte researchers emphasized

leaders in organizations must start planning for the industrial revolution and embrace the disruptive changes from it (Laurent et al., 2015).

Brynjolfsson and McAfee (2014) referred to the fourth industrial revolution as the second machine age. The researchers indicated that current development in Artificial Intelligence systems is seen as one of the most important historical events occurred in the second machine age. Recent technological emergence will reduce costs, improve outcomes and ultimately enhance people lives.

The Evolution of Artificial Intelligence (AI)

Introduction to artificial intelligence (AI). In 1950, the mathematician and computer scientist Alan Turing, founder of modern computing, greatly contributed to the development of the field of Artificial Intelligence (AI) by submitting a proposal paper on *Computing Machinery and Intelligence* (Mijwel, 2015). Turing's (1950) paper explored the possibility of generating an intelligent computer machine that has an intellectual capability of human beings. An imitation game, which is also known as Turing Test, was introduced in the paper that involves three participants: an interrogator and two players, a human, and a computer machine. The role of the interrogator is to distinguish which of the players is human and the other computer machine. Thus, Turing Test was used to determine whether or not a machine is considered intelligent (Turing, 1950). Although the field was initially inspired by Alan Turing, the term Artificial Intelligence was coined in 1956 by computer scientist John McCarthy along with other scientists in a conference held at Dartmouth College located in the United States as a new field of computer science. Hence, Artificial Intelligence (AI) became a field that involves giving computers the ability to perform tasks that normally require human intelligence (Mijwel, 2015).

Ever since, the field of Artificial Intelligence has radically evolved, enabling the development of cognitive systems that ultimately surpassed human capabilities such as Deep Blue and IBM Watson (Campbell, Hoane, & Hsu, 2002; High, 2012). Campbell et al. (2002) described Deep Blue as a supercomputer, which defeated the 1997 World-Chess Champion. IBM Watson, on the other hand, is described by High (2012) as a cognitive technology that overcame the Jeopardy challenge for its deep natural language processing capabilities.

Additionally, Sallomi (2015) revealed how the field of Artificial Intelligence in computer science has existed for approximately 60 years. Today, AI with its current capabilities is now viewed as a transition point across a wide range of disciplines in which it started to drive an industrial revolution. The significant decreases in price of cloud computing and data storage outsourcing are two of the main reasons contributing in the feasibility of AI machines in many industries.

An article by McKinsey Global Institute indicated Artificial Intelligence over the years has drastically evolved, stimulating disruptive changes to the nature of work. The advancements in AI based technologies are allowing many opportunities and challenges to current businesses. McKinsey's study emphasized that rapid technological development will have a significant social as well as economic impact. Consequently, having the adoption of AI to enhance the performance of organizations as well as contributing in the global economy (Manyika, Chui, Madgavkar, & Lund, 2017).

Machine learning (ML). Brynjolfsson and McAfee (2012) stated that Machine Learning, a subset of Artificial Intelligence, is the most important technology in today's era, involves giving technologies the ability to continuously improve their performance without being programmed explicitly by humans through learning from experience. ML has mainly advanced

in two particular areas which are prediction and cognition. This, in turn, has allowed technologies perform tasks such as voice recognition, image recognition, natural language, and problem solving. Brynjolfsson and McAfee (2012) also indicated that ML will have a transformational impact on many businesses in the upcoming decades in which it will stimulate new business models for current businesses to sustain.

Many researchers have particularly highlighted three Machine Learning based applications that are among the top drivers of the current digital revolution, which include (Davenport & Ronanki, 2018; Laurent et al., 2015; Parloff, 2016; Reshamwala et al., 2013;):

- **Deep learning (DL):** a sub-field of Machine Learning comprising of algorithms that enable smart machines to perform certain tasks such as image and speech recognition through the exposure of multilayered neural networks to huge amount of data (Parloff, 2016). Deep Learning predicts activities in the human brain in order to recognize different patterns (Davenport & Ronanki, 2018).
- **Natural language processing (NLP):** a computer science field that combines Artificial Intelligence and linguistics. It involves the interaction between smart machines and human. Natural language algorithms are applied to develop intelligent machines that are capable of recognizing speech and text. (Reshamwala et al., 2013).
- **Robotic process automation (RPA):** the integration of different Artificial Intelligence based technologies with automation. It is deployed in businesses to configure smart technologies to take over a wide range of complex processes that are usually controlled by human (Laurent et al., 2015).

The role/functions of AI-based technologies in organizations. Agrawal, Gans, and Goldfarb (2018) indicated that the adoption of Artificial Intelligence (AI) based technologies

would play a major role in making more accurate predictions leading to enhanced decision-making. This, in turn will allow intelligent machines to heavily contribute in improving the overall efficiency, business processes, and customer experiences in organizations. However, Ryder (2017) outlined that intelligent machines are employed in organizations using two different methods. The first method is augmentation, in which AI systems are deployed to partially complement tasks performed by human. The second method is automation, which entirely takes over the performance of a human job. The two methods are best utilized based on the talents available in organizations (Ryder, 2017).

Davenport and Kirby (2015) emphasized that intelligent machines must be viewed as collaborators and partners that are deployed to augment human capabilities rather than automating them. People fear the phrase automation by which they sense a threat to their professions. Thus, Davenport and Kirby (2015) stressed using the term augmentation over automation to convince humans that intelligent machines are adopted to help them excel at their jobs. In fact, human and intelligent machines partnerships will create a great opportunity for employees to increase productivity and earnings. The terminological shift to augmentation is necessary to promote a positive mindset that will lead to a successful Artificial Intelligence (AI) transformation in organizations (Davenport & Kirby, 2015).

Recent research identified that intelligent machines may support various needs in organizations by automating organizational processes, using data analysis to solve problems, and interacting with customers as well as employees. Researchers divided the functions of intelligence machines into three main categories, which included process automation, cognitive insight, and cognitive engagement (Davenport & Ronanki, 2018; Schatsky, Muraskin, & Gurumurthy, 2015):

- **Process automation**: includes using Robotic Process Automation (RPA) in which robots are employed to primarily input and transfer data through multiple Information Technology (IT) systems. RPA will tremendously benefit organizations to automate general administrative and financial tasks that are usually performed in the office such as managing financial activities, transferring data from calls and emails into organizations database system. RPA is seen as the most common as well as cheapest AI function that brings the greatest Return On Investment (ROI) to organizations.
- **Cognitive insight:** is integrating Deep Learning (DL) AI systems to recognize patterns and interpret huge amounts of data. DL is particularly used for complex tasks that usually surpass human abilities such as analyzing huge amount of data as well as voice and image recognition. This, as result, improves the performance of organizations by making more accurate predictions such as predicting what a certain customer is likely to purchase.
- **Cognitive engagement:** involves utilizing Natural Language Processing (NLP), which deals with the capability of intelligent machines to interact with humans. NLP gives the capability to intelligent machines to recognize voice as well as text. NLP helps in employing intelligent machines to interact with employees and customers in particular circumstances as answering specific questions, recommending a treatment plan, and addressing certain issues. Hence, NLP is primarily used in organizations for customer service purposes.

Artificial Intelligence as a force of Discontinuous Change

Types of organizational changes. A book written by Nadler et al. (1995) summarized key points in leading organizational transformation in a period of discontinuous change. Changes

in organizations mainly originate from different environmental conditions. Organizational changes occur as a reaction or anticipation to an environmental event. The authors indicate changes in organizations are either incremental or discontinuous. Incremental changes are alterations within the scope of the organization. However, discontinuous changes are changes out of the scope of the organization. The book divides organizational changes into four types:

- Tuning: An anticipated incremental change, which requires no immediate reaction, to improve efficiency within organizations.
- Adaptation: A reactive incremental change that occurred to adapt to external environment such as adapting to new technologies.
- Reorientation: An anticipated discontinuous change that requires an organization to redefine their entire framework such as vision, strategy, and identity.
- Re-creation: A sudden discontinuous change from external conditions that require an organization's immediate reaction in order to survive. (Nader, Shaw, & Walton, 1995)

Forces driving organizational change. Alkaya and Hepaktan (2003) stressed that it is essential for organizations to identify the main causes of change. Organizations need to recognize these forces in order to be able to plan accordingly on what elements to improve upon. There are different environmental factors that compel organizations to evolve. Those factors are composed of internal and external forces driving organizational change. Some internal forces driving the transformation discussed by Mdletye, Coetzee, and Ukpere (2014) were:

- Managerial issues
- Ineffective organizational structure and processes
- Underperforming workforce

On the other hand, Lunenburg (2010a) identified several external forces triggering changes in organizations:

- Technological advancements
- Marketplace changes
- New government legislations
- Fluctuation in labor markets
- Changes in the economy

Discontinuous change. A popular economic concept originated by Schumpeter (1942), creative destruction, describes the emergence of radical innovation that drives industrial discontinuous changes. This Austrian-American economist emphasized that creative destruction plays a significant role in revolutionizing economic systems, which heavily obliges the development of new markets and organizations (Schumpeter, 1942). Thus, an article by Pullen (1993), published in *The International Journal of Public Sector Management,* stressed the impact of discontinuous change in which he described discontinuous change as a disruptive change that has no precedent due to an abrupt event; which, in turn, makes most of current organizational skills ineffective. All types of discontinuous changes have a common characteristic that is uncertainty, which distinguishes it from continuous or incremental changes. Therefore, managing the uncertainty aspect of discontinuous change is considered as the biggest organizational transition challenge.

A book written by Nadler and Nadler (1998), *Champions of Change*, defined discontinuous change as radical change from external environmental forces that might entail organizations to move entirely to a new direction. The book highlighted six key characteristics of discontinuous change to facilitate managing this distinctive type of organizational change in

particular. First, discontinuous change differs in magnitude of change, which leads organizations to alter their entire nature of work. Thus, in turn, reinforces organizations to make changes in their structure, strategy, and culture. Second, regarding organizational fit, discontinuous change forces organizations to develop new capabilities to become more innovative. Third, strategy and vision, organizations develop new strategy that entirely direct them towards a new focus. Fourth, multiple and concurrent changes, many changes are encountered simultaneously in discontinuous change. Fifth, incomplete transitions, changes are altered constantly due to continuous changes in the external forces. Sixth, there is an unclear future state. Seventh, time spam, takes 3 years minimum to effectively adapt to discontinuous change. Eighth, leadership, leading discontinuous change cannot be delegated in which it requires the coalition of entire personnel's at the very top level of the organization.

Ultimately, Nadler and Nadler (1998) indicated that technological advancements, shifts in industries, legislation change, and new business competitors as major external forces of discontinuous change. Therefore, the recognition of those external forces as well as acknowledging the characteristics of discontinuous change is extremely vital to strategically plan for organizational redesign to cope with all types of changes (Nadler & Nadler, 1998).

Schumpeter's creative destruction and discontinuous change. Creative destruction is an economic concept popularized by the Austrian-American economist Schumpeter (1942) in his book *Capitalism, Socialism and Democracy* that rationalizes the process of radical innovations in revolutionizing economic structures. Schumpeter (1942) explained the biological term of the process of creative destruction as an industrial mutation in which "incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (p. 83).

Schumpeter (1942) indicated that creative destruction is a significant element that capitalism consists in. Schumpeter (1942) emphasized capitalism as a form or method of economic change that is never stationary. In other words, Schumpeter stated that capitalism by its nature is an evolutionary process that continuously stimulates cooperative competition in different markets. Hence, creative destruction is derived by capitalist enterprises to sustain economic growth, which in turn have a great prospect of triggering industrial revolutions (Schumpeter, 1942). Schumpeter (1942) emphasized that "those revolutions are not strictly incessant; they occur in discrete rushes which are separated from each other by spans of comparative quiet. The process as a whole works incessantly however, in the sense that there always is either revolution or absorption of the results of revolution, both together forming what are known as business cycles" (p. 83).

Schumpeter (1942) outlined two essential facts about the process of creative destruction. First, the process of creative destruction takes a considerable amount of time in revealing its optimal impact on economic systems. The performance of the process of creative destruction cannot be appraised at a momentary amount of time in which its true performance as well as its ultimate effects on the economic system is ideally judged through decades or centuries. However, Schumpeter (1942) revealed that all types of systems, including economic or political, despite their superior performance are subject to discontinuity at any given point by an enhanced system on the long term.

Second, creative destruction is an organic process in which analyzing what occurs at a specific segment of it in an industry or individual level primarily explains certain details of mechanism, however, is indecisive beyond that. In fact, the true analysis of creative destruction requires comprehensive understanding of the background that triggered the current situation

(Schumpeter, 1942). Schumpeter (1942) stressed that investigators need to comprehend the past or future associated with the process of creative destruction in order to commendably be able to interpret the behaviors of firms in various industries. In other words, effective investigation requires a detailed understanding in what way the process of creative destruction contributed in creating as well as destroying existing structures (Schumpeter, 1942).

In the past, economists viewed price as the dominant variable that stimulates competition in capitalist industries. However, economists later acknowledged other key competition variables such as sales effort and quality, which supports the process of creative destruction. In particular, Schumpeter (1942) listed new technologies, new organizations, and new source of supply as forces of competition in capitalism that produce a quality or price advantage, which in turn strikes existing economic structures in various industries. Therefore, Schumpeter (1942) emphasized the process of creative destruction being a major source for business cycle that continuously prompts the production of innovations that simultaneously enhances outputs at significant lower prices.

Schumpeter (1942) noted power plants, railroads, and elevators as historical examples of creative destructions that caused discontinuous changes in various industries. All those productions destroyed preceding markets in which it ultimately resulted in the opening of new domestic as well as foreign markets. For instance, the development of airplanes introduced a new market in the transportation industry that severely obsoleted the market of mail coaches (Schumpeter, 1942).

Foster and Kaplan (2001) in their book *Creative Destruction* thoroughly analyzed Schumpeter's (1942) concept, the gales of creative destruction, in which they added several key insights to it. Foster and Kaplan (2001) indicated that what signifies Schumpeter's (1942)

concept is his interpretation of the correlation of destruction and creation. Schumpeter (1942) emphasized that creation and destruction go hand-in-hand in the development of markets and economies. The introduction of new innovations is responsible of destroying sacrificing innovations. In specific, the process of creative destruction is associated with the establishment and discontinuation of corporations in various industries.

Equally important, the concept of creative destruction explains how innovative corporations, with greater efficiency, have the tendency to economically outperform old corporations that didn't change their ways quickly enough. This, as a result, prompts a incessant competition among corporations in different industries to maintain their economic usefulness as well as inhibit them from elimination (Foster & Kaplan, 2001). Foster and Kaplan (2001) highlighted Cheyenne Software, which is a computer software company founded in 1983, as a great example reflecting the concept of creative destruction. Cheyenne Software since its establishment has made tremendous profit by selling software that is used to manage and protect data on computer's networks. However, in the mid-nineties the company failed to expand its product sales and was highly vulnerable by competitors in the market. Consequently, Cheyenne Software lost its economic power and was then acquired by Computer Associates International (Foster & Kaplan, 2001).

Foster and Kaplan (2001) listed fundamental economic forces that particularly occurred in the 1990's, which in return facilitated the arrival of the age of discontinuity. The four economic forces included (Foster & Kaplan, 2001):

1. Huge reduction in capital costs due to information technology as well as the continuous advances in technology and management, which highly contributed in increasing the efficiency of businesses.

2. An increase in the efficiency of capital markets from the drastic increase in the accuracy of corporations' performance data.
3. An improved profitability of American corporations that caused a growth in national liquidity.
4. Enhanced fiscal management by the US federal government, which led to a strengthened federal reserve as well as a reduction in corporate taxes.

All those forces manifested Schumpeter's (1942) creative destruction concept in which they aided in the rise of extremely competitive markets. Start-up businesses, particularly technological, are able to begin with almost zero capital (Foster & Kaplan, 2001). Hence, the age of discontinuity positions incumbent companies at a very high economic risk. Foster and Kaplan (2001) emphasized that company's need to master creative destruction and more importantly be built for discontinuity to survive.

Discontinuous technological change. Discontinuous technological changes are a major part of Creative Destruction, an economic concept coined by Schumpeter (1942), which are innovations that entirely revolutionize the economic system. Building on Schumpeter (1942) Creative Destruction concept, Christensen (1997) introduced the theory of disruptive innovations/technologies in which he explained as the emergence of new technologies that supplant how organizations used to operate in various industries. Similarly, Hill and Rothaermel's (2003) and Gilbert's (2005) described disruptive technologies, also referred to as discontinuous technological changes, as external forces that compel an internal adaptation of incumbent organizations. Christensen and Overdorf (2000) indicated that disruptive technologies force re-orientations in organizations in terms of their resources, processes, and values to cope with the changes. In other words, Cohen and Levinthal (1990) mentioned that integration of

disruptive technologies in organizations require the development of new capabilities. Consequently, disruptive technologies force organizations to rethink their structure in order to achieve superior performance (Brimley & Garfield, 2007; Lunenburg, 2010b).

Tidd, Bessant and Pavitt (1997) stated that radical innovations such as Information and Communications Technologies (ICTs) are great examples of disruptive technologies that triggered the revolution of many systems. According to Jorgenson and Vu (2016), ICTs had a significant economic impact in which it altered the ways organizations operate, learn, and communicate. However, Addis (2017) emphasized that world is now being exposed to a new set of technological trends such as Artificial Intelligence (AI), Internet of Things (IoT), blockchain that are disrupting a wide range of industries at a much greater pace than ICTs.

AI and world economic growth. Over the years, economists measured economic growth according to measurements in the main factors of production, which are capital and labor. Economic growth is generally indicated by an increase in either labor or capital (Kendrick, 1975). In addition, Total Factor Productivity (TFP) is another key indication of economic growth, which measures the output of technological and other innovations on the economy (Hulten et al., 2001). However, Purdy and Daugherty (2017) stated that traditional factors of production are no longer able to achieve economic progress. Thus, Purdy and Daugherty (2017) revealed that AI systems have the potential to drive TFP as well as being introduced as a new factor of production that will lead to enormous economic transformations in the nearby future. Indeed, Purdy and Daugherty (2017) outlined three ways AI can acquire economic growth: (a) adding a virtual workforce, (b) augmenting labor as well as physical capital, and (c) Increasing Total Factor Productivity (TFP).

Smart machines are capable of entirely automating or augmenting complex human tasks in a wide range of disciplines, which will dramatically enhance productivity and simultaneously achieve global economic growth. More importantly, Autor (2015) believed that the integration of AI technologies not only boosts overall productivity, but also enables organizations to focus on providing new products, services, and innovations. This, in turn, will further play a pivotal role in enhancing Total Factor Productivity (TFP) to sustain economic growth.

Furthermore, recent research studies by *Mckinsey Global Institute, PWC, and Accenture* were conducted to predict how AI technologies would alter the global economy. Different economic indicators were revealed as estimation to the impact of AI on the global economy (Manyika, Chui, et al., 2017; Purdy & Daugherty, 2017; Rao & Verweji, 2017).

- Mckinsey's study estimated that the adoption of AI technologies could be deployed to automate 50% of the tasks, which people are currently paid almost $15 trillion to perform in the global economy (Manyika, Chui, et al., 2017).
- PWC's research study indicated that AI has the potential of increasing 14% of the global GDP, which is equivalent to a $15.7 trillion growth, by 2030 (Rao & Verweji, 2017).
- Accenture's research analyzed the impact of AI on 14 different economies that concluded AI is expected to increase at least 1.8% Gross Value Added (GVA) by 2035 (Purdy & Daugherty, 2017).

The future workforce in the age of AI. According to Schwab (2016), Artificial Intelligence and other advanced technologies will have a pivotal impact on the future of employment. Autor and Dorn (2013) mentioned that previous industrial revolutions have mostly taken over routine tasks that require repetitive manual labor. However, Brynjolfsson and McAfee

(2012) stressed that current technological revolution; intelligent machines in particular, are capable of replacing a wide range of non-routine complex jobs. In addition, a recent report by *McKinsey Global Institute* revealed that a range of 400 to 800 million jobs worldwide have a great potential of being automated by 2030 (Manyika, Lund, et al., 2017). Hence, around 375 million employees globally are expected to switch their occupational types.

A study by *PWC* divided the tasks intelligent machines can perform into three waves, which are algorithm wave, augmentation wave, and autonomy wave (PWC, 2017). The algorithm wave involves the automation of tasks that require simple computation and data analysis in fields as finance and, information and communications. The augmentation wave includes the automation of routine and predictable tasks like communicating through different technological support and filling in forms. The autonomy wave includes the automation of complex tasks that require physical labor such as transport and manufacturing. The study concluded that algorithm and augmentation waves are already taking over many tasks; however, the autonomy wave tasks are expected to come underway in the 2030s (PWC, 2017).

According to Frey and Osborne (2017), some of the occupation that have a great possibility of being lost to automation involve (a) telephone operators, (b) accountants, (c) secretaries and administrative assistants, (d) telemarketers, and (e) agricultural and food science technicians. On the other hand, Wisskirchen et al. (2017) offered some examples of the professions that are least prone to automation and will remain vitally important in the age of intelligent technologies include (a) IT management and science, (b) teaching professions, (c) social science, humanistic, artistic, and media science professions, (d) lawyers, and (e) physicians and nurses. Furthermore, Chui, Manyika, and Miremadi (2016) indicated that occupations involving managing and developing other people, social interactions, and applying

expertise are the least prone to automation. Schwab (2016) mentioned that social, problem solving, and systems skills would be highly needed by workers in 2020.

Recent research by *McKinsey & Company* revealed that the potential automation of occupations will depend on five different factors, which involves (Chui et al., 2016):

- Technical feasibility
- The costs of automation
- Relative scarcity
- The skills available
- The cost of workers who can perform the job

For example, unpredictable occupation such as plumbers and gardeners will have less automation effects due to their low technical feasibility as well as required low wages (Chui et al., 2016).

However, Wilson et al. (2017) emphasized that as intelligent machines are eliminating a wide range of tasks and jobs, it will also aid in creating new jobs that has no precedent. The new occupation will encompass tasks that cannot be performed by algorithms. Thus, Wilson et al. (2017) outlined the emergence of three new occupational categories that will entail a new set of skills performed by human as shown in Figure 3.

Similarly, Daugherty and Wilson (2018) in their recent book *Human+Machine* indicated that AI systems would yield enormous innovations in which it will continuously generate substantial amount of jobs, particularly jobs that require human and intelligent machines interaction. However, Daugherty and Wilson (2018) emphasized it is crucial for governments and businesses to provide the necessary education as well as training for their workforce to develop the fusion skills to take over the new jobs in the age of AI.

TRAINERS	**Customer-language tone and meaning trainer**	Teaches AI systems to look beyond the literal meaning of a communication by, for example, detecting sarcasm.
	Smart-machine interaction modeler	Models machine behavior after employee behavior so that, for example, an AI system can learn from an accountant's actions how to automatically match payments to invoices.
	Worldview trainer	Trains AI systems to develop a global perspective so that various cultural perspectives are considered when determining, for example, whether an algorithm is "fair."
EXPLAINERS	**Context designer**	Designs smart decisions based on business context, process task, and individual, professional, and cultural factors.
	Transparency analyst	Classifies the different types of opacity (and corresponding effects on the business) of the AI algorithms used and maintains an inventory of that information.
	AI usefulness strategist	Determines whether to deploy AI (versus traditional rules engines and scripts) for specific applications.
SUSTAINERS	**Automation ethicist**	Evaluates the noneconomic impact of smart machines, both the upside and downside.
	Automation economist	Evaluates the cost of poor machine performance.
	Machine relations manager	"Promotes" algorithms that perform well to greater scale in the business and "demotes" algorithms with poor performance.

Figure 3. Three new categories jobs in the age of AI. From. "The jobs that artificial intelligence will create," by H. Wilson, P. R. Daugherty & N. Morini-Bianzino, 2017, *MIT Sloan Management Review*. Copyright [2017] by MIT Sloan Management Review. Reprinted with permission (see Appendix A).

Furthermore, a study was conducted by *The World Economic Forum* to identify the most effective workforce strategy for organizations in various industries to thrive in the machine age. The survey revealed that investing in re-skilling current employees is considered as the top future workforce strategy as shown in Figure 4 (World Economic Forum, 2016).

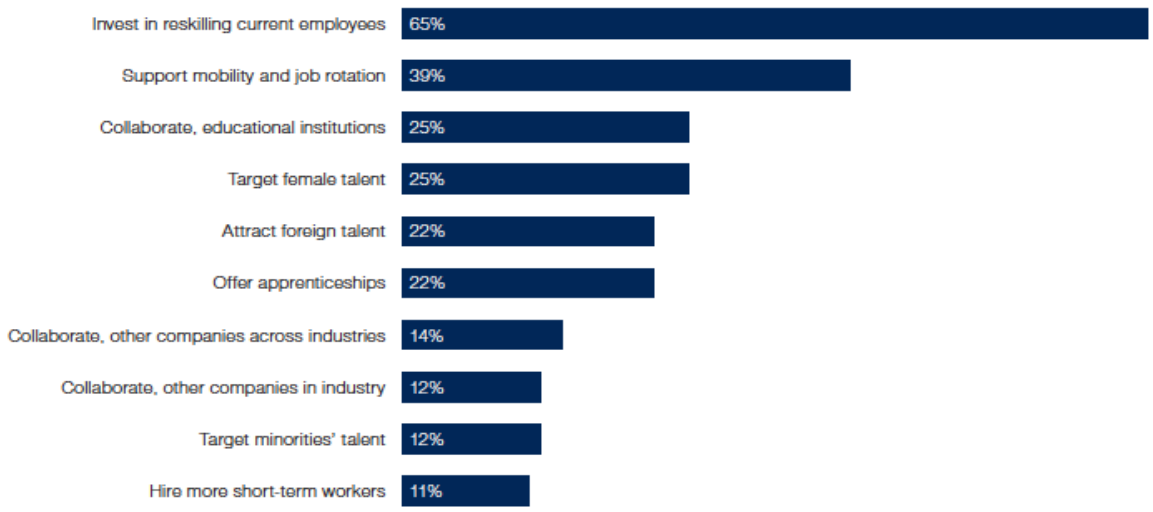

Figure 4. Future workforce strategies. From *Executive summary: The Future of jobs and skills*, by World Economic Forum, 2016, Geneva, Switzerland. Copyright [2016] by World Economic Forum. Reprinted with permission (see Appendix A).

AI reshaping governments. Over the decades, many governments have encountered a plethora of challenges that have ultimately impacted overall performance. Many of those challenges were tackled by utilizing ICT technologies. Researchers indicate that the adoption of AI based technologies in public sectors will have a pivotal impact. AI technologies will mainly aid the government to (Eggers et al., 2017):

- Increase efficacy
- Improve quality of work
- Save government spending

A study done by Renjen (2018) showed that AI technologies taking over current human tasks will at least free up 96.7 million labor hours annually, which would result in saving at least $3.3 billion of government spending (Eggers et al., 2017). The study also revealed that cognitive technologies could be in charge of digital tasks performed by government employees. This, in turn, will increase productivity and reduce governmental cost (Eggers et al., 2017).

Martinho-Truswell (2018) indicated that Machine Learning could be adopted in the government to take over human tasks that primarily require the collection of huge amounts of data, complex calculations, and routine tasks that follow a certain rule. He highlighted that using Machine Learning algorithms on those functions will increase the accuracy of the work done within the government.

Mehr (2017) acknowledged AI machines as a valuable opportunity for governments to improve many services to citizens. The researcher detailed that the majority of citizens are unsatisfied with public services involving information and inquiries. Citizens experience long calling waiting times to receive an answer. Hence, government can tackle this challenge by applying AI software to enhance customer service tasks in different public sectors. AI

technologies would be capable of answering citizens' questions as well as handling the usual required documents (Mehr, 2017).

Miller (2017) concluded that AI could benefit the government in 26 ways. Those 26 ways included the use of AI in different public sectors such as healthcare, transport, security, and water. The researchers discussed the impact of AI in transportation and traffic control. The integration of AI technologies in transport sectors in the government can be used to predict traffic congestion. Understanding these patterns will facilitate the government to plan a safe and less congested traffic (Miller, 2017).

Adapting and Leading Discontinuous Change

Adapting to discontinuous change. An article by Birkinshaw, Zimmermann, and Raisch (2016) discussed the ways organizations adapt to discontinuous changes. Discontinuous changes occur from external environmental factors which allow organizations to redefine their nature of work in order to succeed in a specific industry. The article highlighted two theoretical perspectives as insights for organizations to effectively overcome discontinuous changes. The two theoretical perspectives were discussed in the article were dynamic capabilities and ambidexterity.

According to Teece, Pisano, and Shuen (1997) dynamic capabilities are defined as the ability of organizations to continuously develop new competencies to thrive in a rapidly changing world. Thus, dynamic capabilities indicate organizations' strength to achieve innovative forms as a competitive advantage in the industry. Teece (2017) divided dynamic capabilities into three categories to essentially guide organizational transformations in an event of discontinuous change:

- Seize: Identify an organization's opportunities and threats from changes in the external environment.
- Sense: Build and refine organizational business model.
- Transform: Realign organizational structure and culture to develop additional capabilities.

O'Reilly and Tushman (2013) described the term organizational ambidexterity as an organization's ability to rapidly adapt to new markets generated by external forces as technological development. O'Reilly and Tushman (2004) identified exploiting and exploring opportunities as a key characteristic of an ambidextrous organization. In addition, ambidextrous organizations continuously seek for innovative methods to be implemented in their operations. Hence, embracing innovation within an organization is sustained as a great competitive advantage that, in turn, simplifies an organization's adaptation to discontinuous changes.

Leading organizational changes. An article in the *California Management Review* discussed the role of leadership in discontinuous organizational changes. The article focused on leading organization re-orientation, which is the most popular type of discontinuous change. Nadler and Tushman (1990) revealed that having an individual leader who possesses vision and charisma is insufficient in effectively producing changes in large-systems. Therefore, leadership functions of discontinuous changes should be distributed and institutionalized to the entire top management team. The article also highlighted the importance of leadership education in periods of discontinuous changes. Leaders and the rest of the top management team should develop new competencies in order to be more effective.

As important, Kotter (1996) in his book *Leading Change* provided a change model that facilitates the execution of various types of organizational change. Kotter's framework of change

guides leaders as well as organizations to successfully implement change. However, Kotter (1996) stressed the importance of acknowledging the most common change errors in order to prevent them. Therefore, the change management tool was thoughtfully generated by Kotter (1996) to overcome different roadblocks to organizational transformations such as resistance to change. The eight stages of process for executing major organizational changes involved (Kotter, 1996):

- Establishing a sense of urgency
- Creating the guiding coalition
- Developing a vision and strategy
- Communicating the change vision
- Empowering broad-based action
- Generating short-term wins
- Consolidating change and producing more change
- Anchoring new approaches in the culture

AI and the Future of Leadership/Management

Managerial tasks performed by AI machines. A research study conducted by the *Accenture Institute* determined how managers allocate their time on different tasks at work. The researchers surveyed 1,770 managers from 14 countries. The study revealed that managers spend most of their time on tasks that involve administration and problem solving as shown in Figure 5 (Kolbjørnsrud et al., 2016b).

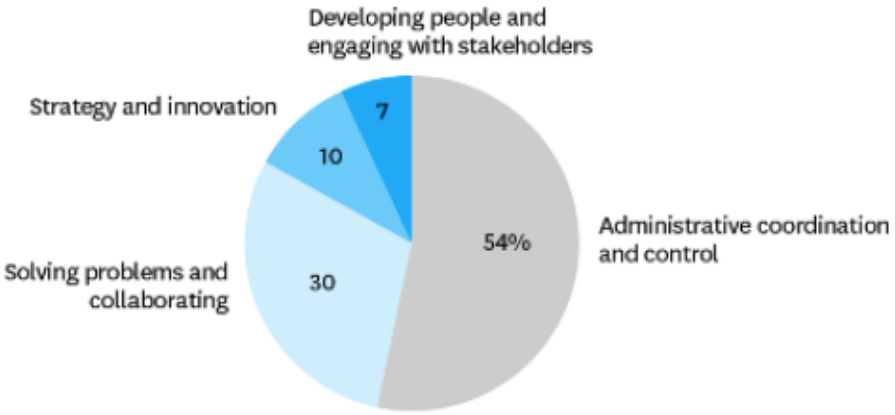

Figure 5. How managers allocate their time. From "How artificial intelligence will redefine management," by V. Kolbjørnsrud, R. Amico, & R. J. Thomas, 2016a, *Harvard Business Review*, *11*. Copyright [2016] by Harvard Business Review. Reprinted with permission (see Appendix A).

Fortunately, Kolbjørnsrud et al. (2016b) declared that AI based technologies are now capable of performing routine managerial tasks that such as tasks that mostly involves administrative coordination and control. Managers may deploy various AI-powered systems to serve as administrative assistants that have the different abilities such filling reports, scheduling meetings, and resource allocation. In addition, AI-based technologies, Expert Systems (ESs) in particular, are now being augmented to facilitate decision-making in specific domains for its powerful capabilities in processing huge amount of data and complex problem solving. This, as a result, will make managers more efficient and productive. Ultimately, the augmentation of AI systems will give managers more time to spend on more important tasks such as strategy and innovation as well as developing others.

AI redefining the role of organizational leaders. Recent research revealed that the integration of AI systems in organizations will have a huge impact on leadership. The study showed that leadership skills have to be rethought for leaders to thrive in the age of AI (Infosys, 2018). Infosys (2018) believed that the investment in human capital is crucial to successfully

implement AI strategy where leaders need to evolve and adapt the new complex working environment. Also, the research emphasized that effective leaders will be those who are capable of leading rapid changes caused by advancements in technology (Infosys, 2018). Educating leaders in organizations about the implications of AI technologies is vitally important to implement the new changes. Similarly, Schatsky et al. (2015) stressed that organizations implementing AI technologies also known as cognitive technologies will need to redefine their skills, roles, performance goals, and management practices. Also, intelligent systems will re-allocate how organizations spend their time on specific tasks.

Hyacinth's (2017) *The Future Of Leadership* indicated that leadership disruptions would be encountered from the adoption of AI systems in organizations. Also, Hyacinth believed that AI would encourage leadership challenges that will reshape the role of leaders. AI technologies will take over the majority of technical aspects of leadership, which will prioritize the development of soft aspects of leadership in the age of disruptions. Hyacinth also emphasized that the role of emotional intelligence in leaders will be as twice as important in AI era. As the adoption of AI technologies will stimulate professions that will require more human and social skills in the future. Kirkland (2014) concluded, as AI will take over more complex duties, the ultimate role of leaders will be directing, motivating and developing their employees.

A study by *PWC* was conducted to identify the critical leadership qualities, in the age of AI, which will enable workers to reach their full potential. The study revealed three essential leadership capabilities that will make leaders more effective in the future (Rao & Verweij, 2017):

- **Mindful tech-savvy humanist:** It is crucial for leaders to fully understand the role of advanced technologies and how it could optimally serve humankind. Leaders' roles will involve maintaining the human value in the age of AI machines.

- **Fostering systemic intelligence:** The collaboration of leaders with different levels of employees in the organization as an empowerment technique to achieve best outcomes. The role of leadership will be shared throughout the organization to stimulate collective decision-making.
- **Building trust:** Leaders must adapt authentic leadership in order to build trust among their team. In an era of constant change, individuals are continuously required to learn and grow. Hence, building trust is significant to make teams more comfortable and innovative.

Similarly, a white paper by *Stanton Chase* summarized the key qualities of leaders needed in the fourth industrial revolution (Herold, 2016). The leadership qualities included (Herold, 2016):

- Traditional Leadership: includes traditional leadership skills such as lead, manage, and inspire followers. Traditional leadership skills will remain critical in the second machine age.
- Diversity: the openness to different opinions and perspectives to improve leaders knowledge and understanding to a specific challenge.
- Agile Leadership: the ability of leaders in adapting to constant changing working environments.
- Ethical Responsibility: leadership ethics is crucial to consider how the employment of technological may affect the society.

An article by *McKinsey & Company* indicated that AI systems already surpass human in many problem-solving aspects (Kirkland, 2014). Thus, in an era of intelligence machines, the role of managers in leadership roles will focus heavily on fostering innovation in organizations.

Leaders will need to develop creative capabilities, leadership skills, and strategic thinking skills. In addition, Bourton, Lavoie, and Vogel (2018) claimed that effective leadership in the age of disruptions from technological advancements such as Artificial Intelligence calls for transformational leaders that are capable of managing uncertainty and have creative foresight.

Agile leaders. A research study was conducted by Wade et al. (2017) to address redefining leadership in the age of technological disruptions. The researchers surveyed 1,042 executives and interviewed 19 leaders in high technology oriented organizations to identify the most effective leadership approach needed to cope with disruptive technologies. The study revealed that the adoption of agile leadership is extremely important in navigating constant changing environments. Wade et al. (2017) indicated that agile leaders are distinguished from others by being (a) humble, (b) adaptable, (c) visionary, and (d) engaged.

Similarly, according to Bourton et al. (2018) an era that is characterized by rapid change, uncertainty and complexity due to advances in technology, calls for different kind of leadership, leaders who are inwardly agile. Bourton et al. (2018) argued that the adoption of AI systems will compel leaders to build a data driven mindset instead of an intuition mindset. Data driven mindsets require high levels of agility in order for leaders to trust the various data revealed by AI-powered systems to accelerate decision-making processes. Having an extremely agile workforce is essential to achieve the great promises of AI technologies in fostering continuous innovation and creativity in organizations.

Also, Loucks, MacCauly, Noronha, and Wade (2016) in their book *Digital Vortex* emphasized that in order for organizations to thrive in a world that is changing, leaders must adapt flexible agile leadership. Agile leaders are superior in behaviors as hyperawareness, informed decision-making, and fast execution. Hyperawareness includes the necessity of leaders

to scan their internal and external environments for possible opportunities as well as threats. In addition, hyperaware leaders are flexible and open-minded in which they are continuously courageous in spotting and adapting new technological opportunities that will contribute to their organizations success. Informed decision-making includes the ability of leaders in making use of data derived from intelligent systems as a support for evidence-based decision-making. More importantly, agile leaders are fast executers in which they take quick actions by fostering a fail-tolerant culture to facilitate accelerated executions (Loucks et al., 2016).

Digital-savvy leaders. A study done by *Accenture* revealed that digital competencies are viewed as the most critical leadership competencies in the age of AI. The study indicated that digital competencies will be extremely important for leaders to succeed in their roles (Kolbjørnsrud et al., 2016b). Perez (2017) emphasized that leaders in organizations, in the age of AI, need to be deeply understand the role of intelligent machines, what they can offer, and how they operate. Leaders understanding the technicality of the adopted AI based technologies in their organizations will play a vital role in facilitating the success of AI strategies (Perez, 2017).

More importantly, Kolbjørnsrud et al. (2016b) emphasized that leaders thriving in the age of AI need to treat intelligent machines as colleagues. Leaders must seize the competitive advantage of working closely with AI-powered systems that have super powers in augmenting human judgment skills, which include:

- Creative thinking
- Data analysis and interpretation
- Strategy development

Hence, the efficacious collaboration between leaders and intelligent machines will enable organizations to make superior decisions (Kolbjørnsrud et al., 2016b). Also, Thomas, Fuchs, and

Silverstone (2016) declared that intelligent machines have three continuum positions in augmenting leaders' capabilities that involve roles as assistants, advisors, and actors. However, Kolbjørnsrud et al. (2016b) indicated that achieving effective interactions among leaders and intelligent machines demands leaders to develop a set of advanced digital skills. Indeed, Daugherty and Wilson (2018) offered several skills that are essential for human to collaborate and interact with AI-based technologies such as:

- Intelligent interrogation: Understanding the capabilities and limitations of intelligent machines in order to receive the needed information from them to make informed decisions.
- Bot-based empowerment: The ability of individuals to effectively work closely with AI agents such as *x.ai* and *Clara* to complement their capabilities, which in turn will improve their efficiency and productivity at work.
- Holistic melding: The ability to project the mental models of AI systems, how they operate, to enhance process outcomes.

Emotional intelligence (EI). Many researchers, over the years, have signified Emotional Intelligence (EI) as a key factor of effective leadership (George, 2000; Kerr, Garvin, Heaton, & Boyle, 2006). Salovey and Mayer (1990) defined emotional intelligence as the management of a person's emotions and feelings that requires a set of intrapersonal and interpersonal skills to plan, motivate, and achieve in people's lives. Goleman (2005) stressed the importance of EI, which is seen as one of the major elements for workers to excel in their careers, being as important, or even more important, than hard technical skills also referred as Intellectual Intelligence (IQ).

People's emotions play a significant role in the level of mental efficiency. Thus, Goleman et al. (2013) indicated that positive emotions lead to an enhanced decision-making and information understanding in the workplace. On the other hand, negative emotions decelerate the work progress, which aids in stimulating an unstable culture in organizations. Hence, emotionally intelligent leaders promote a culture of knowledge sharing as well as collaboration. In addition, leaders with high emotional intelligence are capable of successfully lead their organizations in periods of change and uncertainty. Goleman et al. (2013) divided Emotional Intelligence (EI) into four pillars that includes:

- Self-Awareness (intrapersonal): is the foundation of Emotional Intelligence (EI) in which refers to individual's awareness of their own emotions and what triggers them.
- Self-Management (intrapersonal): includes abilities to manage own emotions in different circumstances.
- Social-Awareness (interpersonal): refers to individuals' abilities to sense, read, anticipate, and recognize other's feelings.
- Relationship management (interpersonal): comprises the required skillset for individuals' to induce the suitable responses in others.

According to Goleman et al. (2013), each of these four Emotional Intelligence (EI) main fundamentals is associated with a certain skillset that comprise a total of 18 soft skills as shown in the Table 1.

Goleman et al. (2013) indicated that the four fundamentals of EI shown in Table 1 have a dynamic relationship among them in which they interact and carry a great importance. For example, self-management can't be obtained without having self-awareness. Practicing the four fundamentals of EI is key to develop superior emotional intelligence. More importantly,

emotional intelligence accounts the essential competencies of resonant leadership. Emotional intelligent leaders have the power to distribute and cultivate their EI abilities to the entire workforce. This, as a result, helps building an emotional intelligence team and fosters effective leadership development in the organization. Goleman et al. (2013) concluded that primal leadership and emotional intelligence in specific will matter more in the future due to the constant changes in computing power in businesses from advances in technology. For instance, organizational strategies that are successful in today's world may not be effective in the near future. Thus, having high emotional intelligence is extremely crucial to expedite overcoming those drastic changes (Goleman et al., 2013).

Table 1

Emotional Intelligence Fundamentals

Emotional Intelligence Fundamentals	Skills
Self-Awareness	Emotional Self-Awareness
	Accurate Self-Assessment
	Self-Confidence
Self-Management	Emotional Self-Control
	Transparency
	Adaptability
	Achievement
	Initiative
	Optimism
Social-Awareness	Empathy
	Organizational awareness
	Service
Relationship management	Inspiration
	Influence
	Developing others
	Change catalyst
	Conflict management
	Teamwork and collaboration

According to Schwab (2016), overcoming the challenges triggered by the fourth industrial revolution will require highly emotional intelligent leaders that are able to coach and develop others rather than commanding others. Hyacinth (2017) emphasized that emotional intelligence (EI) in leaders will have double the impact in the AI era. Intelligent machines will be adopted to perform complex tasks, which in turn will leave humans with professions that require high emotional engagement, critical thinking, creativity, and innovative thinking. The adoption of AI-based technologies will stimulate numerous changes in organizations. Employees in highly disrupted organizations will need emotionally intelligent leaders that are capable of gauging their needs in transformational periods (Hyacinth, 2017).

Hyacinth (2017) stressed that in the past decades, organizations sought to hire individuals with hard skills, also referred as Intellectual Quotient (IQ), as the main intelligence indicator to achieve success. Conversely, Hyacinth (2017) signified that in present age of Artificial Intelligence (AI), Emotional Intelligence would be viewed as the main differentiating factor that defines true intelligence in organizations. Intellectual Quotient (IQ) and technical skills will undoubtedly remain relevant, however, it will be considered as the entry-level requirements for individuals in execution positions (Hyacinth, 2017).

Beck and Libert (2017) indicated that as Artificial Intelligence (AI) continues to grow, individuals would need to develop new skills in order to thrive in the workplace. Intelligent machines are mainly adopted in various industries to diagnose complex problems and recommend action plans. For example, in the healthcare industry, an intelligent machine will be deployed to diagnose diseases and predict different treatment plans for patients (Beck & Liber, 2017). However, it takes a person to interact with patients to understand their life situation, and further determine the optimal treatment plan. Similarly, intelligent machines and data science are

utilized in organizations to solve complex problems and recommend actions. However, it takes human beings that are equipped with high leadership qualities to lead and implement the action plans predicted by those intelligent machines. Thus, Beck and Libert (2017) stressed that organizations should consider the investment in human capabilities, also known as Emotional Intelligence (EI), as their first priority in terms of training and education in order for their AI strategy to succeed.

According to an article by *Working Voices* interpersonal skills, which is a major component of Emotional Intelligence (EI), will be extremely important to thrive in the age of intelligent machines (Working Voices, 2018). The article specifically addressed a total of five Interpersonal skills that can't be performed by intelligent machines (Working Voices, 2018). The five interpersonal skills included (a) Empathy, (b) Critical thinking and planning, (c) Building rapport, (d) Judgment, and (e) Teamwork and collaboration. Empathy will be highly needed to engender trust as well as effective relationships among employees in the workplace. Critical thinking and planning is fundamental skillset to develop strategies in organizations to achieve success. Building rapport is essential to establish successful relationships with customers. Judgment will be needed for circumstances that urge making ethical decisions, which considers various factors such as morality and emotions. Mastering teamwork and collaboration skills is vitally important to accomplish happiness as well as foster innovation in the workplace. All those interpersonal skills are vital to increase the productivity and retention in the age of Artificial Intelligence (AI; Working Voices, 2018).

Most research studies stressed that one of the main weaknesses of current intelligent machines, despite their enormous technical capabilities, is the lack of emotional capabilities (Beck & Libert, 2017; Fatemi, 2018; Working Voices, 2018). Emotional Intelligence is

significant when it comes to human interaction. Hence, Hyacinth (2017) indicated that scientists are currently working on a new field in Artificial Intelligence called Emotion AI or Emotional Artificial Intelligence. The field aims to bring Emotional Intelligence to AI-based technologies in the future. Human and intelligent machines will work very closely to achieve different goals. Thus, having an emotional intelligent AI system, such as Affectiva the forefront in the field of Emotion AI, is necessary to be able to recognize the emotions of their users. This, in turn will vastly make human and intelligent machine interaction more operational (Hyacinth, 2017).

Situational awareness (SA). In 1996, a study was conducted by Texas Tech University to explore the impact of automation on situational awareness. The researchers indicated that with technological advancements, in the 20th century, automating functions was a major trend (Jones & Endsley, 1996). The implementation of automation influenced the level of situation awareness in human to monitor technological systems performance due to their complexity. Jones and Endsley (1996) explained the term situation awareness (SA) as humans' cognitive ability to acknowledge their surroundings, which is critical to a person's decision-making particularly in complex situations. Consequently, the study revealed that adequate situation awareness contributes to the implementation of successful automated systems (Jones & Endsley, 1996). D'Aniello, Loia, and Orciuoli (2017) declared that insufficient situational awareness is found to be one of the main reasons of human errors dealing with complex environments.

A report by the American Institute for Research indicated as the development of complex systems continues, the need of situational awareness becomes more important (Salas, Prince, Baker, & Shrestha, 1995). Over the years, the term situation awareness is well known in the aviation community considering its complex environment. However, researchers believed that situational awareness is also critical to other areas such as police, fire, and healthcare. The report

highly suggested that individuals who operate in complex working environment to develop adequate situational awareness.

O'Brien and O'Hare (2007) conducted a study on situational awareness skills and training. The researchers indicated that situational awareness plays a huge role in the effectiveness of performance in complex dynamic environments. Also, the study explained situational awareness skills entail cognitive abilities in memory, perception, attention, and control.

Endsley (2001) declared that the achievement of situational awareness (SA) comprises three critical levels.

- Level 1: includes an individual ability to perceive the existence of different elements in a complex environment.
- Level 2: required in achieving SA is the comprehension of the significance of the perceived elements in level 1.
- Level 3: involves the prediction of the future status of those elements. Succeeding in those three levels are crucial to achieve effective situational awareness in complex dynamic environments (Endsley, 2001).

Summary

Chapter 2 included a review of the literature concerning the study investigation. A brief overview of UAE's government vision plans was first introduced in Chapter 2, which included UAE Centennial Plan for 2071 and UAE Strategy for Artificial Intelligence. In addition, this chapter overviewed the evolution of several leadership theories and their associations with organizational effectiveness. Furthermore, a historical background of the impact of technological

development in revolutionizing industries was presented. Similarly, Chapter 2 involved a review of Artificial Intelligence that is among the leading disruptive technologies in the fourth industrial revolution. AI technologies, intelligent machines in specific, are driving tremendous discontinuous changes that are currently reshaping the nature of work in many industries. Ultimately, key concepts of leadership in the age of AI were reviewed, which involved agility, emotional intelligence, situational awareness, and digital-savvy leaders.

Chapter 3: Methodology

Introduction

This chapter discusses the detailed steps that were required to conduct the research study. The main purpose of this chapter is to identify the most appropriate methodology approach and design that effectively aided in addressing the research questions. Also, the methodology, which consists of the description of samples and instrumentation deployed, is key in achieving the ultimate goal of the purpose of the study.

Restatement of the Purpose

The purpose of this research was to study aspects of effective leadership in the UAE's future Artificial Intelligence (AI)-driven government by ascertaining the perceptions of different individuals who are currently associated with UAE government and who have sufficient knowledge in Artificial Intelligence (AI). The study particularly attempted to (a) explore how adopting AI-based technologies could redefine leadership roles in UAE government (b) understand how the adoption of AI-based technologies can make leaders more efficient and productive (c) identify the critical leadership competencies required to achieve the vision of becoming a highly successful technology-oriented government (d) determine the steps required to develop effective leaders that meet the UAE's AI-driven government needs.

Restatement of Research Questions

According to Kolbjørnsrud et al. (2016a), the adoption of Artificial Intelligence (AI)-based technologies will redefine the requirements of leadership. Thus, the following research questions were formulated as a contribution to assist UAE government identify the key factors involved in having effective leaders in UAE's future Artificial Intelligence (AI)-driven government.

The inquiry aims to address the following main research question:

In the perception of individuals associated with UAE government, what key factors could contribute to effective leadership in the UAE's future Artificial Intelligence (AI)-driven government?

The following were the sub-research questions:

a. How will AI redefine leadership roles in the UAE government?
b. How will AI-based technologies help UAE government leaders become more efficient and productive?
c. What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government?
d. What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's future AI-driven government?

Description of the Research Methodology

A mixed methods approach was utilized in this study as guidance for data collection, data analysis, and data interpretation (Creswell & Plano, 2006). Mixed methods studies mainly involve the collection of both qualitative and quantitative data. A major assumption associated with mixed methods research is that utilizing a combination of qualitative and quantitative methods will contribute in providing more accurate results than either a quantitative or qualitative method alone.

A quantitative method is used to identify key factors through statistical measurements. Thus, in this research a survey was used as an instrument to quantify quantitative results. A qualitative method, however, was utilized to explore individual's perspectives on a certain

problem using different instruments. For this research study an interview protocol was used as an instrument for the qualitative portion of the methodology.

According to Creswell and Plano (2006), there are four major types of designs in mixed methods studies. The selection of research methodology design depends on multiple factors such as intent, strengths, challenges, and procedures. In addition, researchers choose the most suitable design based on the formulated research questions the research aims to address. Therefore, an explanatory sequential design, which is one of the most common mixed methods designs, was chosen as the most appropriate type of research design to meet the objectives of this study (Creswell & Plano, 2006).

The explanatory sequential design is a two-phase mixed methods design that incorporates the collection of dependent quantitative and qualitative data to address the research questions. Thus, quantitative and qualitative data are collected sequentially in an explanatory sequential design, in which quantitative data are gathered and analyzed in the first phase. The second phase involves the collection of qualitative data that are dependent on the quantitative data. The main purpose of this sequential order is that qualitative data aid in expanding and building upon the statistical results derived from the quantitative data (see Appendix B).

Similar to other research designs, the explanatory sequential design has several strengths and challenges. On one hand, strengths of the design include a two-phase data collection procedure that is simple to follow. Explanatory sequential design is considered one of the most straightforward designs discussed in mixed methods literature. Another strength of using explanatory sequential design is that researchers are able to write the findings report in two phases, which provide a coherent guide for readers. In addition, the design allows a multiphase analysis, which heavily contributes to the final conclusions of the study. Consequently, the

explanatory sequential design puts a greater emphasis on the quantitative data that are collected and analyzed in the first phase, which in turn, makes it more suitable for researchers who have stronger expertise in quantitative methods (Creswell & Plano, 2006).

On the other hand, there are some challenges of using explanatory mixed methods. Most notable is the fact that it is time consuming since it is a two-phase study. The researcher needs to allocate sufficient time for the sequential quantitative and qualitative data procedures. Another challenge involves the process of selecting the most appropriate participants needed for the second phase of investigation. Hence, obtaining Internal Review Board (IRB) approvals for the participants in the second phase of the explanatory design may be challenging, since they are frequently identified following the quantitative data analysis (Creswell & Plano, 2006).

Population, Sample and Sampling Procedures

According to Hatcher (2013), a population is a specific as well as well-defined group of individuals that share a set of common characteristics or traits. A sample is a subset of a group of individuals that represent the entire population (Hatcher, 2013). In research studies, data are collected and analyzed from the sample of the study to address the research problems (Hatcher, 2013).

This study aimed to identify the key leadership concepts that would contribute to the success of UAE's future intelligent government. The UAE Centennial Plan 2071 and UAE AI Strategy for 2031 are comprehensive plans that cover various public sectors in both federal and local level of UAE government (UAE Government Leaders Programme, 2018). The UAE federal government consists of numerous ministries and entities. The local government, however, involves executive councils that are in charge of local governmental municipalities. Hence, the targeted population for this study involved individuals associated with UAE government. The

sample that was recruited for the study was volunteers who are currently (a) associated with UAE government (b) have sufficient knowledge in Artificial Intelligence (AI) in which they have pursued academic work that is AI-related and/ or have received some degree of training/courses in Artificial Intelligence (AI).

The researcher aimed to gather qualitative and quantitative data from a minimum sample size of 50 individuals (*N=50*). The sampling design for the quantitative survey wase based on a purposive sampling (also known as purposeful sampling; Creswell & Creswell, 1997). The quantitative portion incorporated sending an electronic survey through a mailing list provided and approved by UAE government that was sent randomly to more than 100 individuals who met the criteria required for the study. The researcher aimed to receive responses from at least 40 participants in the electronic survey for more accurate insights.

Following the quantitative analysis, the researcher conducted 6 to 10 interviewees for the qualitative portion of the study. To obtain more accurate perspectives, purposive sampling design was utilized in the qualitative method (Creswell & Creswell, 1997). The 6 to 10 participants were from the same population as those identified in the quantitative phase of the study. However, individuals with appropriate experience were required in order to be able to expand and build on the quantitative data. Hence, for the qualitative phase the researcher aimed to recruit individuals who are currently in leadership positions or/and have deep knowledge in Artificial Intelligence (AI)-based technologies in order to reach optimal responses. Equally important, the 6-10 participants were selected from different public, as well as private, entities associated with the UAE government. Consequently, the qualitative interview incorporated in-depth questions that complemented the data received from the quantitative database.

Human Subject Considerations

The protection of human subjects for the people participating in the research study was strictly taken into consideration. The study adhered to the guidelines provided by Pepperdine University's Internal Review Board (IRB) in which several steps were completed in order to obtain IRB approval (see Appendix C):

- Submit IRB application
- Obtain IRB approval
- Begin recruitment for the research study
- Obtain consent forms from all participants in the study (see Appendix D)
- Request voluntary participation
- Collect data needed for the study.

The research study did not proceed until IRB approval was obtained. However, a copyright clearance was not required since all data collection instruments were developed and validated by the researcher in this study. In addition, the researcher sought exempt classification since there would be minimal risk to the participants.

Instrumentation

The mixed methods study utilized two instruments to address the research questions. These include an electronic survey and an interview protocol that were generated by the researcher.

1. **Survey**. A survey is a statistical tool that is utilized in research to determine characteristics, behaviors, or perceptions of individuals in a certain population (Creswell & Creswell, 1997). In addition, a survey design facilitates inquirers to answer different types of questions that mostly incorporate descriptive questions or questions about the

correlations between multiple variables (Creswell & Creswell, 1997). For this study, the researcher designed an electronic survey through a web-based software, Survey Monkey. The survey consisted of various forced-choice questions that were generated to address the research questions. The survey questions mostly incorporated types of questions such as multiple choice questions, Likert-scale questions, rank-order questions, and rating-scale questions (see Appendix E).

2. **Interview**. An interview is an instrument that is frequently used by researchers to collect qualitative data (Rubin & Rubin, 2005). Particularly, an interview is an extremely valuable tool to researchers who are seeking certain knowledge and perceptions from individuals in a specific topic. The design process as well as the selected type of an interview play a significant role in obtaining the data the researcher is aspiring for. There are different types of interviews, which include structured, semi-structured, and unstructured (Rubin & Rubin, 2005). Each of these types of interviews requires different design processes. In particular to this research study, the researcher followed a semi-structured interview. Semi-structured interviews enable more flexibility, which in turn provide an opportunity for the interviewer to explore additional themes or responses (Rubin & Rubin, 2005). Hence, for this research study the investigator generated a semi-structured interview that was composed of 7 open-ended questions (see Appendix F). The questions were designed to encourage interviewees to give their opinions and views on the specific problem being studied by the researcher. The researcher took up to 45 minutes to interview each participant. As a result, the researcher aimed to gather, as much as possible, in-depth insights concerning the research problem.

Instrument Validity and Reliability

Establishing instrument validity includes the researcher following a generated procedure set to ensure the instrument is accurately measuring the desired outcomes of the study. In research, there are different approaches used as a method to ensure the validity of an instrument. Subsequently, qualitative and quantitative methods have distinctive ways in establishing their validity from the drawn research conclusions. Hence, in this mixed methods study, several steps were taken into consideration by the researcher to plan for the threats that might impact the validity of the data. The quantitative portion of the study involved establishing external and internal validity (Creswell & Creswell, 1997). On other hand, the qualitative portion concerning the validity of the study was established by ensuring the trustworthiness of its findings.

To establish the validity of the quantitative portion, the research obtained feedback from two experts to ensure the content validity of the instrument. First, the research received feedback from a survey expert as well as an individual who has experience in the topic being studied. The two experts' judgments helped the researcher in ensuring that the instrument questions were aligned with the research questions.

In addition, the researcher ran a pilot/usability test as a pre-test strategy to establish the validity and internal consistency of the survey. The pre-test included a subset of the targeted sample participating in the survey. The results from the pre-test allowed the researcher to make several iterations of the instrument until the validity and reliability of the survey were maximized.

For the qualitative method, however, the researcher used multiple procedures to enhance the accuracy of the data. The researcher compared the results with the quantitative database in which the matching inferences would indicate a high level of validity of the dataset.

Furthermore, the researcher spent the maximum time possible in the interview to gain sufficient knowledge of the problem in order to increase credibility and accuracy (Creswell & Creswell, 1997).

Data Collection Procedures

In mixed methods studies both qualitative and quantitative data are collected. However, the data collection procedure varies based upon the mixed methods design selected. In this research, a sequential explanatory mixed methods design was chosen as the most appropriate design to address the research problem. Hence, the study incorporated a sequential two-phase data collection procedure, which required the collection of quantitative data prior to the collection of qualitative data (Creswell & Plano, 2006). The researcher adhered to Creswell and Plano's (2006) recommendations on mixed methods data collection procedures, which consists of the following steps:

Phase One: Steps for Quantitative Data Collection

1. Sampling procedure: The sampling design of the quantitative method was based on a purposive sampling in which a survey was sent through a mailing list provided and approved by UAE government that contains more than 100 individuals. .
2. Obtaining permission and recruiting participants: The researcher first obtained approvals from higher level representatives within UAE government to conduct the study and who had access to the mailing list that contained the targeted sample e-mail addresses. The data source instrument was sent electronically to the targeted sample. Hence, the participants were required to sign a consent agreement that gave the researcher the authority to use their responses as data for the study. In addition, the

researcher obtained permissions from university-based Internal Review Board (IRB) to conduct the quantitative portion of the study.

3. Data sources: An electronic survey was created by the researcher using a web-based survey development software. The survey consisted of several closed-ended statistical questions in line with the research questions of the study.
4. Recording data: The quantitative data were recorded in the survey development software. In addition, the quantitative data were exported from the electronic survey to Microsoft Excel as a backup file. Furthermore, the data were organized in highly secured electronic files that were imported to the statistical software used by the researcher for analysis.

Phase Two: Steps for Qualitative Data Collection

1. Sampling procedure: The researcher identified participants based on a purposive sampling design. The researcher aimed to elicit information from 6 to 10 interviewees. The participants were individuals who are currently in leadership roles within the UAE government. The researcher used one of the interview methods to gather data, which includes phone, Skype, or in-person interview, depending on each participant's preferable method.
2. Obtaining permission and recruiting participants: The researcher obtained permissions from the individuals participating in the study as well as the university-based Internal Review Board (IRB).
3. Data sources: A semi-structured interview protocol with 7 open-ended questions was designed by the researcher to obtain the necessary insights to reach the desired research conclusions. A semi-structured interview was chosen as a preferred method

due to its strength in prompting in-depth discussion with the interviewees (Rubin & Rubin, 2005). The interview protocol was typed in a Word document that was sent to participants prior to the interview.

4. Recording data: The interviews were recorded using an audio recording device with the permission and approval of the participants. The interviews were saved and converted to MP3 files for further transcription and analysis. The researcher sought the help of available transcription services to transcribe the qualitative data recordings. In addition, the researcher recorded data in the interview protocol as a backup system in case the digital devices employed malfunctioned.

Data Management

The researcher stored the data in highly secured digital files. The researcher granted access to data only to individuals related to the research study. The researcher's chairperson, committee members, and personnel from UAE government had access to the data for further guidance. However, after 4 years, upon the study completion, the data will be entirely destroyed from all computer devices software that will be used in the study, as the researcher promised in the IRB application.

Data Analysis

Creswell and Plano (2006) stated that in explanatory sequential mixed methods design, quantitative and qualitative datasets are analyzed and interpreted utilizing integrative analysis occurring in multiple phases. The first phase includes the analysis of the collected quantitative data. The second phase incorporates analyzing the qualitative data from the interviews to build on the quantitative analysis. Subsequently, the researcher integrated both datasets to deeply understand the final results.

Quantitative and qualitative data were analyzed using different computer-based analytical tools. The data analysis in both methods followed the same procedures in which the researcher prepared the data for analysis, explore the data, analyze the data, and ultimately interpret the analysis for conclusions (Creswell & Plano, 2006). Hence, in this research study the inquirer considered the following steps encouraged by Creswell and Plano (2006) for data analysis and interpretation:

Quantitative Data Analysis Steps

- Exported the raw data from electronic survey to an Excel spreadsheet
- Explored and organized the data in the Excel spreadsheet by utilizing numeric values to be imported to the analytical tool Statistical Program for the Social Sciences (SPSS)
- Imported data from Excel spreadsheet to SPSS
- Conducted the quantitative data analysis through SPSS by performing descriptive statistics, which will incorporate using the most appropriate statistical tests such as measures of central tendency by Hatcher (2013) to address the research questions
- Presented the quantitative data analysis in different forms of tables, and narratives explaining the overall analysis

Qualitative Data Analysis Steps

- Prepared the digitally recorded interviews for transcription
- Imported data transcriptions into the qualitative analytical tool ATLAS.ti.
- Explored the transcriptions of the qualitative datasets to have a better understanding of the collected data prior to analysis

- Ran the qualitative data analysis software ATLAS.ti for coding and developing themes
- Presented the qualitative data analysis by discussing the results derived from the coding themes

Ultimately, after completing the dependent quantitative and qualitative analyses, the researcher integrated the results from the two databases for further interpretations. The researcher explained the connections between the two datasets obtained, particularly by identifying the added value of the qualitative analysis on explaining the statistical results attained in the first phase. Consequently, the integration of both analyses facilitated the investigator to obtain a deep as well as comprehensive understanding to address the mixed methods research questions (Creswell & Plano, 2006).

Summary

This chapter discussed the methodology approach and design that were used in the study. The explanatory design required collecting quantitative and qualitative data sequentially; data that are dependent on each other. In addition, the researcher identified the purposive sampling design processes that were applied in the quantitative as well as qualitative method. The study incorporated two instruments, survey and interview, which were created and validated by the researcher through multiple procedures. Furthermore, the researcher provided an in-depth plan that was used for collecting qualitative and quantitative datasets. As a result, an integrative analysis was utilized comprising of various analytical tools and methods to interpret the results of the study.

Chapter 4: Results

Introduction

This chapter presents the results of the explanatory mixed methods study that was divided into two sequential phases. Phase One shows the quantitative results obtained from the electronic survey. Phase Two displays the qualitative results from the follow-up semi-structured interviews. In addition, this chapter introduces the demographics of the sample that participated in both phases. The findings of each phase are thoroughly explained using tables and narratives.

Restatement of the Purpose

The purpose of this research was to study aspects of effective leadership in the UAE's future Artificial Intelligence (AI)-driven government by ascertaining the perceptions of different individuals who are currently associated with UAE government and who have sufficient knowledge in Artificial Intelligence (AI). The study particularly attempted to (a) explore how adopting AI-based technologies could redefine leadership roles in UAE government (b) understand how the adoption of AI-based technologies can make leaders more efficient and productive (c) identify the critical leadership competencies required to achieve the vision of becoming a highly successful technology-oriented government (d) determine the steps required to develop effective leaders that meet the UAE's AI-driven government.

Phase One: Quantitative Data Analysis

Phase One of the study included the collection of quantitative data through an electronic survey that was generated by the researcher via the online survey development software SurveyMonkey. The electronic survey included 11 forced-choice questions that primarily sought for the perceptions of individuals who are (a) associated with UAE government (b) have sufficient knowledge in Artificial Intelligence (AI). In addition, the 11 forced-choice questions

were focused on the impact of the adoption of various Artificial Intelligence (AI)-based technologies by the UAE government in redefining the roles of leaders, ways AI can help leaders become more efficient and productive, the critical competencies of leaders, and ultimately the steps required by UAE government to develop the most competent leaders that will contribute in the success of UAE's AI-driven government.

Demographics of the Sample (Phase One)

The electronic survey was sent to more than 100 individuals who are (a) associated with UAE government and (b) have sufficient knowledge in Artificial Intelligence. A total of 80 respondents (*N=80*) participated in the first phase of the study. However, the demographics data were collected after conducting the pre-test strategy that entailed 30 participants, who were considered as a subset of the 80 participants. The demographic questions were added to ensure that the respondents fit the purposive sampling. In addition, the demographic data were gathered to help the researcher recruit the most suitable participants in the second phase of the study.

Table 2 displays the frequency counts for the demographic variables of the remaining 50 participants that participated after the pre-test. The 50 participants were mostly male (82.0%). The ages of the participants ranged from 18 to 24 years (8.0%) to 55 to 64 years (2.0%) with the median age of *Mdn* = 39.50 years. Most (84.0%) were from the UAE. Seventy-two percent had either a master's and/or doctoral degree. Years of experienced ranged from 0 to 5 years (12.0%) to 21+ years (22.0%) with the median years of experience being *Mdn* = 15.50 years. The most common association to UAE government was currently working for the UAE (70.0%). When respondents were asked about their level of knowledge about AI, 36.0% described their knowledge as deep or very deep. Eighty percent reported being in a leadership position.

Table 2

Frequency Counts for Phase One Demographic Variables

Variable	Category	*n*	%
Gender			
	Male	41	82.0
	Female	9	18.0
Age Range [a]			
	18-24	4	8.0
	25-34	13	26.0
	35-44	25	50.0
	45-54	7	14.0
	55-64	1	2.0
Nationality			
	Other	8	16.0
	UAE	42	84.0
Highest Education			
	Bachelor's	12	24.0
	Master's	30	60.0
	Doctorate	6	12.0
	Other	2	4.0
Years of Experience [b]			
	0-5	6	12.0
	6-10	7	14.0
	11-20	26	52.0
	21+	11	22.0
Association to UAE Government			
	Currently working for UAE	35	70.0
	Sponsored by UAE government to go to school	3	6.0
	Working at a private entity that has partnerships / agreements with UAE Government	10	20.0
	Other	2	4.0
Level of knowledge in AI-based technologies			
	Very Deep	3	6.0
	Deep	15	30.0
	Moderate	23	46.0
	Basic	5	10.0
	No	4	8.0
Leadership Position			
	Yes	40	80.0
	No	10	20.0

[a] Age: *Mdn* = 39.50 years.
[b] Experience: *Mdn* = 15.50 years.
Note. *N* = 50.

Answering the Research Questions (Phase One)

The main research question for this study was: In the perception of individuals currently associated with UAE government, what key factors could contribute to effective leadership in the UAE's future Artificial Intelligence (AI)-driven government? This main research question had four sub-questions.

Sub-Research Question One

Sub-research question 1 was: How will AI redefine leadership roles in the UAE government? In Table 3, 76.3% of the respondents either agreed or strongly agreed with the premise that the adoption of AI technologies in the UAE government will redefine government roles.

Table 3

Frequency Counts for Opinions Pertaining to Premise That Adopting AI Will Redefine Leadership Roles

Variable	Category	*n*	%
11. Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will redefine leadership roles?			
	Strongly agree	32	40.0
	Agree	29	36.3
	Neither agree nor disagree	14	17.5
	Disagree	5	6.3

Note. $N = 80$.

In Table 4, the most commonly endorsed potential benefits of AI-based technologies were "enhances the quality of public services (77.5%)," "reduces governmental operating costs (67.5%)," and "increases customer satisfaction (67.5%).

Table 4

Frequency Counts for Potential Benefits of AI-Based Technologies

Benefit	*n*	%
10a. Enhances the quality of public services	62	77.5
10g. Reduces governmental operating costs	54	67.5
10f. Increases customer satisfaction	54	67.5
10d. Improves decision making	53	66.3
10b. Optimizes internal business processes	50	62.5
10c. Frees up employee's time so they can engage in more innovative and creative activities	43	53.8
10e. Creates new public services	37	46.3

Note. Multiple responses are given so totals equal more than 100%.
N = 80.

Table 5 displays the ratings of importance for selected leadership roles. These ratings were based on 4-point scale: 1 = *Not Important* to 4 = *Very Important*. The highest importance rating was for "foster a culture of innovation in the workplace (*M* = 3.58)." The lowest importance rating was for "building trust within employees in the organization (*M* = 3.36)."

Table 5

Ratings of Importance for Selected Leadership Roles

Leadership Role	*M*	*SD*
13f. Foster a culture of innovation in the workplace	3.58	0.63
13a. Directing, motivating, and coaching employees	3.54	0.73
13b. Solving Problems and collaborating	3.53	0.59
13e. Spend time on developing strategies	3.51	0.66
13g. Monitor AI strategy in the organization	3.41	0.71
13h. Manage AI-based systems in the organization	3.39	0.70
13d. Ensures the organization goes digital, however, remains human	3.38	0.77
13c. Building trust within employees in the organization	3.36	0.78

Note. Ratings based on 4-point scale: 1 = *Not Important* to 4 = *Very Important*.
N = 80.

Sub-Research Question Two

Sub-research question 2 was: How will AI-based technologies help UAE government leaders become more efficient and productive? Table 6 displays the frequency count for ways AI-based technologies could improve efficiency and productivity. The most commonly endorsed ways were "take advantage of AI-based technologies capability in prediction to assist them with solving complex problems (76.3%)," and "employ AI-based technologies to help them make better decisions (70.0%)."

Table 6

Frequency Counts for Ways AI-Based Technologies Could Improve Efficiency and Productivity

Way	*n*	%
14b. Take advantage of AI-based technologies capability in prediction to assist them with solving complex problems	61	76.3
14a. Employ AI-based technologies to help them make better decisions	56	70.0
14c. Utilize AI-based technologies to assist them with routine tasks such as administrative and managerial tasks	40	50.0
14d. Use AI-based technologies as their personal assistance to help them with tasks as schedule meeting and sending/responding to official letters	32	40.0
14e. None of the above	2	2.5

Note. Multiple responses are given so totals equal more than 100%.
N = 80.

Sub-Research Question Three

Sub-research question 3 was: What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government? Table 7 displays the frequency counts for selected variables pertaining to critical competencies. Ninety-four percent of the respondents either agreed or strongly agreed that the adoption of AI technologies in the

UAE government will require leaders to develop new competencies. Three quarters of the respondents believed that hard and soft skills were equally important for leaders to be effective. In addition, 72.5% believed that the level of AI technical knowledge that is required of leaders needed to either be deep or very deep.

Table 7

Frequency Counts for Selected Variables Pertaining to Critical Competencies

Variable	Category	*n*	%
12. Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will require leaders to develop new competencies?			
	Strongly agree	42	52.5
	Agree	33	41.3
	Neither agree nor disagree	4	5.0
	Disagree	1	1.3
17. Are soft competencies or hard competencies more important to effective leaders in the UAE's future AI-driven government?			
	Soft skills are more important	17	21.3
	Soft and hard skills are equally important	60	75.0
	Hard skills are more important	3	3.8
18. What level of AI-technical knowledge do leaders require to be effective in the UAE's future AI-driven government?			
	Very Deep	16	20.0
	Deep	34	42.5
	Moderate	30	37.5

Note. $N = 80$.

Table 8 displays the importance ratings for leadership soft competencies. These ratings were based on 4-point scale: 1 = *Not Important* to 4 = *Very Important*. Highest rated leadership soft competencies were "ability to lead change ($M = 3.73$)," "willingness to learn ($M = 3.70$)," and "adaptability and flexibility ($M = 3.56$)."

Table 8

Importance Ratings for Leadership Soft Competencies

Competency	*M*	*SD*
15h. Ability to lead Change	3.73	0.53
15e. Willingness to learn	3.70	0.49
15d. Adaptability and Flexibility	3.56	0.59
15g. Teamwork and collaboration	3.56	0.65
15i. Developing and Coaching Others	3.44	0.65
15c. Motivational Inspiration	3.43	0.76
15b. Relationship management	3.31	0.72
15j. Emotional engagement	3.23	0.84
15a. Social Networking	3.23	0.83
15f. Judgement	3.16	0.79

Note. Ratings based on 4-point scale: 1 = *Not Important* to 4 = *Very Important*.
N = 80.

Table 9 displays the importance ratings for leadership hard competencies. Highest rated hard competencies were "innovative thinking (*M* = 3.69)," "critical thinking and planning (*M* = 3.46)," and "strategic development (*M* = 3.43)."

Table 9

Importance Ratings for Leadership Hard Competencies

Competency	*M*	*SD*	
16d. Innovative thinking		3.69	0.59
16c. Critical thinking and planning		3.46	0.65
16g. Strategy Development		3.43	0.63
16f. Data analysis and interpretation		3.39	0.79
16b. AI-Technical knowledge		3.38	0.82
16a. Project Management		3.34	0.67
16j. Research skills		3.18	0.94
16e. Domain expertise		3.13	0.80
16h. Administrative and managerial skills		3.04	0.92
16i. Computer programming		2.86	1.11

Note. Ratings based on 4-point scale: 1 = *Not Important* to 4 = *Very Important*.
N = 80.

Sub-Research Question Four

Sub-research question 4 was: What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's future AI-driven government? Table 10 displays the frequency count for steps to identify and prepare leaders. When queried as to the most important step UAE government should consider when developing effective leaders, the most commonly endorsed answers were "identify potential leaders in different government sectors (38.8%)," and "redesign leadership frameworks that align with the needs of the UAE AI driven government (30.0%)." In addition, almost half the respondents (48.8%) believe that numerous innovative ways are required to develop the leaders that will be needed in the UAE's future AI driven government.

Table 10

Frequency Counts for Steps to Identify and Prepare Leaders

Variable	Category	*n*	%
19. What is the most important step UAE government should consider when developing effective leaders for the UAE's future AI-driven government?			
	Identify potential leaders in different governmental sectors	31	38.8
	Re-skill current leaders	10	12.5
	Promote younger people into leadership positions faster	12	15.0
	Redesign leadership frameworks that align with the needs of the UAE AI-driven government	24	30.0
	Intensify leadership development programs	3	3.8
20. Do you think traditional leadership programs are sufficient for developing the leaders that will be needed in the UAE's future AI-driven government?			
	Yes, traditional leadership programs are sufficient	13	16.3
	Leadership programs only a small amount of modification	28	35.0
	No, numerous innovative ways are required	39	48.8

Note. $N = 80$.

Phase Two: Qualitative Data Analysis

Phase Two of the study included the collection of qualitative data through audio-recorded phone interviews. The semi-structured interviews included seven open-ended questions that allowed the researcher to gain more in-depth accounts related to the topic being studied. More importantly, Phase Two of the study was utilized as a complementary phase to Phase One, which included the collection of quantitative data, to allow the researcher to fully address the research questions by explaining as well as confirming the findings derived from phase one.

Demographics of the Sample (Phase Two)

Phase Two of the study included the participation of seven individuals who are (a) associated with UAE government, (b) have sufficient knowledge in Artificial Intelligence (AI), and (c) volunteered to participate in the second phase of the study. However, to obtain the planned more in-depth insights, the researcher had to include participants who have appropriate experience and knowledge in AI-based technologies. Hence, the researcher selectively recruited participants who had deep knowledge in AI as a minimal requirement to remove biased conclusions. Table 11 includes the demographic data of the seven individuals who participated in the second phase of the study. In the fifth category in Table 1 “Level of Knowledge in AI,” deep knowledge indicates that participants have experienced working with AI systems. Whereas very deep knowledge indicates that participants have conducted research and developed AI-based technologies.

Table 11

Key Profile and Demographic Data on Phase Two Participants

Name/ pseudonym	Gender	Years of Experience	Sector	Level of Knowledge in AI
Participant 1	Male	0-5	Electronics and Software	Deep
Participant 2	Male	10+	Security and Safety	Very Deep
Participant 3	Male	10+	Health	Very Deep
Participant 4	Male	10+	Higher Education	Very Deep
Participant 5	Male	5-10	Research and Development	Very Deep
Participant 6	Male	0-5	Satellite and Communications	Deep
Participant 7	Male	10+	Higher Education	Very Deep

Participant 1 obtained his Bachelors of Science in electrical engineering from a prestigious school in the United States. He is currently in the phase of getting a sponsorship from the UAE government to pursue his graduate studies in engineering management. He has worked in entities associated with the UAE government that are specialized in electronics and software. He has worked on several projects that are artificial intelligence (AI)-related.

Participant 2 works in one of the largest entities in the security and safety sector within the UAE government. He has pursued multiple academic degrees in the field of electrical engineering and computer science from different universities in the United Kingdom. He is the head of the Development and Change section that mainly develops strategies to implement

change. He is also an artificial intelligence (AI) expert in which he is leading the artificial intelligence (AI) strategy in his organization.

Participant 3 has more than 10 years of experience working in the health sector in the UAE government. He is currently in charge of the E-health department in one of the health entities in the UAE government. He has worked on multiple projects that focus on digital transformation in the health sector. He is also currently leading the artificial intelligence (AI) strategy in his organization in which he working on adopting the best AI-based technologies to solve complex problems in the health sector.

Participant 4 works in the higher education sector in the UAE government in which he is a computer science professor in one of the well-known public universities in the UAE. He holds a Doctor of Philosophy degree in computer science. He has more than 10 years of experience in the higher education sector in which he has conducted research and taught different courses in computer science. He is currently teaching a course on the different artificial intelligence (AI) models.

Participant 5 is a machine learning (ML) expert and currently works in one of the artificial intelligence (AI) research and development (R&D) centers that is associated with the UAE government. He has built various AI-powered statistical models that could contribute to solving complex problems in the UAE government. He has experience training leaders within the UAE government on the different uses of AI predictive models that may help with decision making as well as policy development.

Participant 6 is a spacecraft systems engineer in one of the entities in the Satellite and Communications sector in the UAE government. He holds a Bachelor's of Science degree in computer engineering. His current work focuses on satellites and image analysis. He has some

degree of experience working with different machine learning (ML) algorithms. Also, he is working on designing systems that are compatible with different types of artificial intelligence (AI) enhanced software. He aspires to become one of the first AI experts in his field.

Participant 7 is a higher education expert in the UAE government. He holds a Doctor of Philosophy degree in electrical engineering. He has more than 10 years' experience as a professor who has taught and contributed to developing several of the current leaders within the UAE government. He also has multiple publications in well-known science journals. He is currently leading different projects and initiatives in the higher education sector. His vision is to develop new science leaders of the future in the UAE.

Answering the Research Questions (Phase Two)

To answer the study's research questions, the seven participant interview transcripts were analyzed using thematic analysis techniques (Braun & Clarke, 2013) that included open-coding for individual category codes of information and searching for themes emerging from those codes. The analysis revealed 13 themes relevant to the research questions; these are presented in Table 12 by participant and ordered from highest to lowest frequency.

Table 12

All Themes by Participants

Themes	P1	P2	P3	P4	P5	P6	P7	Totals
Strategic Management/Human Resources	2	0	4	2	8	6	9	31
Data Processes/Benefits	8	4	4	4	2	4	1	27
Impact on Existing Leadership Roles	12	3	2	1	2	4	2	26
Impact on Organizational Leadership Structure	2	2	4	6	5	1	4	24
AI Technology Proficiency	4	3	3	5	1	5	0	21
Provide Education and Training	2	6	3	3	2	1	2	19
Data Intelligence	2	0	2	0	8	0	0	12
Transformational Leadership Qualities	2	1	0	2	1	2	1	9

(continued)

Themes	P1	P2	P3	P4	P5	P6	P7	Totals
Engage Leaders in Internal Research and Development	0	1	1	0	3	2	0	7
Agile Mindset	0	0	0	1	0	0	4	5
Encourage External Formal Scholarly Pursuits	0	2	0	0	0	0	2	4
Totals	40	26	27	28	38	26	28	213

In the following sections, the 13 themes are discussed relevant to the research questions. Definitions are provided for each theme. Category codes of information identified during the open-coding phase of the analysis are presented in tables for each theme. Lastly, selected representative participant quotes for each theme are provided.

Sub-Research Question One

The first guiding sub-research question was: How will AI redefine leadership roles in the UAE government? Two emergent themes are relevant to this research question: "Impact on Existing Leadership Roles" and "Impact on Organizational Leadership Structure." Findings relative to each of these themes are presented in the following subsections.

Impact on existing leadership roles. This theme refers to the role of Artificial Intelligence (AI) in augmenting existing leadership roles. All study participants discussed aspects of this theme, which had the third highest frequency counts (n = 26). Table 13 shows the 15 individual category codes of information associated with this theme.

Table 13

Theme: Impact on Existing Leadership Roles: Category Codes of Information

Category Codes of Information
1. AI as a complementary technology
2. AI augmenting leaders (continued)

Category Codes of Information
3. AI augmenting leaders capabilities through Augmented Intelligence
4. AI eliminating leadership roles
5. AI enhancing leadership roles
6. AI lack communication skills
7. AI lack emotional intelligence
8. AI lacks creativity
9. AI lacks problem solving
10. AI may change the dynamics of leadership roles
11. Human strengths in imagination
12. Human strengths over AI
13. Humans are complex
14. Humans are visionary
15. Weaknesses of AI

When discussing Artificial intelligence (AI) and its impact on leadership roles, Participant 1 explained that AI “should be enhancing existing leadership roles.” He emphasized the nature of AI technologies as adaptive tools leaders should use to accelerate the attainment of specific strategies in various fields such as the health sector, financial services, and automation services. He further explained that AI “should be used as a tool to help us to do our job better” and that “it’s not replacing people.” Participant 6 and Participant 7 agreed that AI will not replace leaders in the UAE government. Participant 6 stated that “AI will augment leaders. It's going to enhance them and it's probably just going to change the dynamic of the role itself.” Like Participant 1, Participant 6, and Participant 7, Participant 2 discussed how AI enhances leadership roles, using the example of the game of chess to explain:

> There is something that I always have in mind, people say AI is the best chess player. That's not basically true, because the AI chess player uses a lot of human data from previous experiences. So, basically not AI itself, is the best chess player, but it's basically human plus AI that made the world chess champion happen. This example shows that instead of bringing a new leader that is an expert in technology, you can keep the same leaders and adapt AI technologies to augment their capabilities with all the powerful data AI has from previous experiences.

Similarly, Participant 3 described AI in terms of "augmented technology, which means that AI-technologies will never replace leaders." Like Participant 1, Participant 6, and Participant 7, Participant 3 views AI as a tool "to assist leaders in making intelligent decisions" that also help leaders to focus on "more critical tasks by allowing AI-based technologies to take over the routine and less critical tasks." Participant 7 explained why AI, although it may impact the roles of lower-level operational employees who perform repetitive and routine tasks, will not be replacing leaders:

> But, I don't think it will be replacing people at the highest levels. Because when you go up the ladder, expertise is a very important factor AI is a tool, but it does not replace expertise and wisdom. This is why, when you go up the ladder, you will need a wise and expert leader who will use A.I. as an extra tool, but it will not replace leadership.

Participant 1 believes that, at this present time, autonomous intelligence is irrelevant to the AI field. He argued that augmented intelligence, which is a mix of human and AI, is more fitting because "you need human inputs integrated with the AI technology." Participant 1 projected that AI technology will mature within the next 20-30 years, but for now, UAE leaders should "integrate AI with their day-today work life" as a decision-making tool.

Participant 1 further clarified why AI is not going to eliminate leadership roles by comparing and contrasting AI capabilities versus human capabilities:

> AI is really good with processing a lot of data, giving you a lot of outputs within a certain frame that it was programmed for, and that's about it. If you take that training model, if you take it out of health services and then you go put it in investment or stocks, it's not going to do you well. It's not going to serve you well. Because, it was not trained for that. Humans on the other hand, our brain is so complex. We can make connections faster than computers, because computers, yes, they are very, very fast. They process information very fast. But, they lack creativity. They lack creativity and they lack problem solving, because a computer at the end of the day is as good as you program it. That AI is as good as you train it with the data it's seen before and yes, it will take some ... It will develop its model so it can predict future outputs but at the end of the day, it's as good as you programmed it. As good as you trained it. Period.

Impact on organizational leadership structure. This theme refers to the need of organizations to restructure/reframe their leadership roles to successfully cope with the adoption of artificial intelligence (AI). All study participants discussed aspects of this theme, which was in the mid-range of frequency counts (n = 24). Table 14 shows the thirteen individual category codes of information associated with this theme.

Table 14

Theme: Impact on Organizational Leadership Structure: Category Codes of Information

Category Codes of Information
1. AI creating leadership roles
2. AI requires change (continued)

Category Codes of Information
3. AI requires restructuring organizations
4. AI requires reviewing roles and functions in organizations
5. Building infrastructure for AI
6. CDO leading data scientists
7. Chief Data Officer
8. Chief Innovation Officer
9. Chief Technology Officer
10. CINO role in implementing change
11. Create a New Technologies Section
12. Entities Must be Data-Driven
13. Every era requires different types of leaders

When discussing the changes AI may stimulate to leadership roles, most participants agreed that UAE government needs a solid infrastructure that will heavily support the AI transformation. Participant 2 believes that the adoption of any technological innovation in organizations requires some changes. In that sense, Participant 2 stated that:

> The government, over the past years, has been moving from being smart, to smarter, and even smarter today. Each of these transitions was successfully made after building solid infrastructures, because every technology needs a strong infrastructure in order to support it. However, not all public entities are yet completely ready for that transformation. Therefore, there should be a lot of projects, training, and initiatives related to AI, robotics, and other advanced technologies that will help the UAE government fully prepare for the new AI transformation. To transition into being an AI-driven government,

> the government needs to work on the infrastructure first, which for AI to effectively work the government should start collecting and organizing data within different public entities.

Participant 1, Participant 3, and Participant 5 agreed that different entities in UAE government should work on being data-centered for a successful AI transformation. Participant 1 stated that “for leaders to implement AI in their organizations and even before start talking about implementing it, their organizations have to be data centered.” Similarly, Participant 3 stated that “The adoption of AI cannot be utilized without having a holistic data strategy in each organization. Leaders in UAE government should consider data as one of its valuable assets to effectively utilize AI-based technologies in every sector.” In addition, Participant 7 stated that “To transition from a traditional government to becoming a super AI-driven government, there are essential steps in the middle that need to be considered to successfully achieve that.” He emphasized that different entities within UAE government should “spend a huge amount of time on the creation, gathering, the collection of data. The manipulating of it, extracting useful meaning from it and then, finally, informing the organization decisions based on that.”

Like Participant 1, Participant 2, Participant 3, Participant 5, and Participant 7, Participant 4 believes that organizations should consider some changes when adopting any new technology to get its full potential, whether in terms of restructuring roles or reviewing the organization internal processes:

> If you decide to embrace AI and make sure that you benefit from AI, you have to review the existing practices at the organizational level. For example, you might have to create more roles; you might have to review roles descriptions in terms of duties and responsibilities. You might also have to review the functions of the organization, maybe

> because of AI you will spend less time on processing, for example, user requests. You have to review whatever is available. It's not only you take AI and then you plug it to the organization, you plug it in a way that should benefit your organization by reviewing the culture, the practices, the processes and so on.

Furthermore, participants perceived that the adoption of AI will certainly stimulate the creation of new leadership positions such as chief data officer, chief innovation officer, and chief technology officer. In that matter, Participant 7 stated:

> AI is for sure going to create new leadership roles, because there are different AI degrees and domains that you're going to adopt a certain tool, you need the knowledge that comes with that tool. And that can only come by creating in the hierarchy, a section so that you put your resources into that section, to give it impetus to give it impact. Also, you need the word to go out to everyone else that you are creating this and it is more visible. So, I think it will help in creating new leadership roles related to AI It is important to give it weight and make it impactful.

Particularly, Participant 3 and Participant 5 agreed that there will be huge need for a chief data officer in every entity within UAE government to properly take advantage of the adoption of AI. Participant 3 mentioned that “the role of a Chief Data Officer (CDO) is a must in every organization within UAE government. The adoption of AI cannot be utilized without having a holistic data strategy in each organization.” In addition, Participant 5 said:

> I think the adoption of AI in UAE government will create a leadership position that is referred to Chief-Data-Officer (CDO) by many organizations. The CDO team will consist different types of data people, which are also known as data scientists. A data scientist is someone who will sit, for example, on a product team or on a particular sales team or

something and they'll work with that product manager in order to find the data and pull the statistics in order to help the product manager make good decisions and that team to be successful.

Participant 3 and Participant 7 both believe that a leadership position that is referred as chief technology officer is critical in implementing AI in different organizations. Participant 3 stressed that organizations in UAE government need a new department that is controlled by the chief new technologies officer that takes the lead in experimenting new technologies before being officially introduced in the organization:

> One of the leadership roles that the adoption of AI will create is a Chief-Technology Officer (CTO) because we believe that within every organization we should create some sort of Research and Development (R&D) department that will be responsible of taking the lead in experimenting new AI-based technologies and other emerging technologies through a proof of concept or a pilot study before officially adopting and implementing within the system. That's why the role of CTO is critical in ensuring that new AI-based technologies are being utilized effectively.

Furthermore, Participant 7 mentioned that this role will also "help equipping leaders and the remainder of the workforce with the skills needed to successfully implement a new technology such as AI." Participant 4 stated that "I have witnessed here in the UAE, when the UAE government was promoting innovation and entrepreneurship and creativity, new positions emerge. And one of them is a Chief Innovation Officer." He believes the adoption of AI will increase the demand for a chief innovation officer "because the role of that position is to make sure that the innovation is taking into account, is taken seriously. And the adoption of AI is

innovative itself." Consequently, he strongly encouraged the adoption of a chief innovation officer in every entity within UAE government to successfully become AI-driven government

Sub-Research Question Two

The second guiding sub-research question was: How will AI-based technologies help UAE government leaders become more efficient and productive? Three emergent themes are relevant to this research question: "Strategic Management/Human Resources" and "Data Processes/Benefits," and "Customer Relations." Findings relative to each of these themes are presented in the following subsections.

Strategic management/human resources. This theme refers to how AI can enhance leaders' decision-making abilities and necessary actions to achieve desired outcomes in the areas of human resources, management, and associated processes. All study participants discussed aspects of this theme, which had the highest frequency counts (n = 31). Table 15 shows the 20 individual category codes of information associated with this theme.

Table 15

Theme: Strategic Management/Human Resources: Category Codes of Information

Category Codes of Information
1. Ability to make decisions that considers different factors
2. AI guides to desired outcomes
3. AI helps in achieving strategies
4. AI helps in achieving UAEs future vision
5. AI helps reaching desired Outputs
6. AI to analyze the productivity of workers
7. Data-Driven Decision Making (continued)

Category Codes of Information
8. Difficulty of selecting the right talent
9. Machine learning is math and statistics
10. Machine Learning use to accurately benchmark systems
11. Making decisions based on UAE government needs
12. matching Algorithms to acquire right talent
13. ML creates models that are interpretable to human
14. ML helps understanding a particular phenomenon
15. Use AI to acquire right talents
16. Use AI to increase the number of graduate students
17. Use AI to make informed-decisions based on risk/reward
18. Use AI to start/asses programs in universities
19. use of interactions between data sets for better decisions
20. Use of ML prediction to create policy or program

When discussing different artificial intelligence (AI)-based technologies and their impact on leaders in UAE government, most participants emphasized the use of machine learning (ML), a subset of artificial intelligence (AI), that helps leaders understand a phenomenon and make accurate decisions based on data. Like Participant 2, Participant 3, Participant 4, Participant 5, Participant 6, and Participant 7, Participant 1 said:

> The power of machine learning lies into how good of a prediction it could come up with. And also the pattern it sees in your data, right? So, leaders could use that, like especially nowadays, we have a vast amount of data and then we as a human can't really see all of the patterns in those data. And we might not be as good as just picking it up as fast as AI technologies. So we can use machine learning within that, and have all those data

> insights. Have all those predictions lied in front of a leader and then from those results, a leader can make a decision for his government entity, whatever it was.

Similarly, Participant 5 mentioned that "the premise of machine learning models is to create models that are very interpretable for a human towards making predictions." Hence, he believed that by "taking that raw information and making some meaningful, useful, and interpretable conclusions will help decision makers, the leaders, make the best possible decisions." He also mentioned one the major benefits of using machine learning (ML) models is its ability in "incorporating various factors into account" that will help leaders make decisions considering the interactions among different factors. Participant 7 stated that the beauty of AI is that it allows leaders to "build tools for a specific objective purpose." He also agreed with Participant 1 and Participant 5 that AI will be utilized as an additional tool for leaders to become more efficient:

> AI will help the UAE government and the leaders in terms of efficiency. Efficiency means the time that it takes, when you take a decision, you want to see the effort to that decision. So, it will reduce the risk of going wrong by making decisions with proven record, because AI is mainly about using software tools for prediction based on previous real data that you collected from past records and from other countries, and incorporating many factors, so a leader is aware of all the issues.

To get a deeper sense on the many different ways AI can help leaders in UAE government, Participant 3, Participant 5, Participant 6, and Participant 7 shared different cases on the use of AI, machine learning (ML) in specific, as an augmenting technology to guide leaders to desired outcomes in terms of human resources, management, and internal processes. Participant 3 used the healthcare sector as an example to explain the role of AI in augmenting

leaders in which he stated “AI’s deep learning and classification methods will help doctors effectively identify diseases such as tuberous sclerosis or cancer through image recognition.” Therefore, he believed that AI will be used by leaders in the healthcare sector as “a decision support to identify the point of care level” patients need. Moreover, Participant 3 stressed that AI now can overcome the challenge of acquiring the right talent in UAE government:

> One of the most difficult challenges that leaders face in UAE government is selecting the right talent that will be a capital worth. Trying to acquire the right people and the right talent and keep them within the organization is extremely significant. Thus, AI-technologies can now be utilized by leaders to acquire the right talent by developing algorithms that will assist in matching the achievements, education, and experience presented in applicants CV’s with the organization’s needs.

Participant 5 highlighted an example on the use of ML predictive models to create a certain program or policy that can contribute in reducing a particular effect from a phenomenon:

> Let’s say you’re trying to predict a phenomenon. You can use machine learning to create a model to predict a phenomenon. Then you're using the interpretability of that model in order to tell you about what are the factors that are likely to increase the probability, according to different machine learning models. Then you're putting in an intervention or creating a policy or a program or something of that nature in order to try to reduce that effect.

Participant 6 believes that “leadership decisions that are usually made, have to do with any risk/reward analysis” and for that reason he encourages leaders to use “very advanced risk-analysis AI-powered software that runs on very complex algorithms, in order to try to predict the future, and make decisions with minimal risk associated.” He also stated that “leaders can use AI

algorithms to help them in analyzing the productivity of specific workers" as a new intelligent way of assessing productivity in the workplace.

Furthermore, Participant 7 said that "there are many things you can use with the data you have" in which he explained further by highlighting two real cases on how AI is being adopted to redefine decision making processes in the higher education sector. The first case included the process of starting a new program or course in universities in the UAE. He mentioned that before the adoption of AI "the ministry of higher education used to appoint some experts in that area from international universities, form a committee, send in a proposal, and then make a decision to accept offering new programs or courses." However, now with the adoption of AI and its predictive capabilities, this traditional process is no longer necessary in which leaders in the higher education sector can make decisions based on AI models:

> With the adoption of AI, leaders now can look at all the data from the current students, and from the history of previous students, all the records from the labor market. Plus, by having the vision of U.A.E. you can easily make this interpretation and extrapolation, using Data science tools, and AI that will give you an extra feedback or element to make an intelligent decision about a starting a new program or course. This allows the ministry of higher education to focus more on programs that will fit the UAE strategy and the need for UAE labor market in the next twenty or thirty years. So, this is what happened, and without AI this could not have been possible.

The second case involved the use of AI to "help leaders make decisions more accurately that is based on the needs of the government." in which Participant 7 mentioned that one of the main goals of the higher education sector in the UAE government is to "increase the number of graduate students." Leaders facilitate achieving this goal by using "AI to tell them how many

people went to graduate studies and on what basis they went to graduate studies. AI will try to give leaders recommendations based on predictions to increase that percentage."

Data processes/benefits. This theme refers to AI's strength in processing big data to perform simple repetitive/routine tasks faster. All study participants discussed aspects of this theme, which had the second highest frequency counts (n = 27). Table 16 shows the 16 individual category codes of information associated with this theme.

Table 16

Theme: Data Processes/Benefits: Category Codes of Information

Category Codes of Information
1. AI follows a certain set of rules to perform a tasks
2. AI helping business processes
3. AI improves processing time of services
4. AI perform repetitive/routine tasks
5. AI performs simple processes faster
6. AI strength in processing big data
7. AI use of previous experiences data
8. Benefits of adopting AI in UAE
9. digitizing manual records
10. image recognition and classification
11. NLP digitizing paper
12. Use of CNN
13. Use of deep learning and classification methods
14. Use of NLP
15. Use of NLP and CNN
16. Voice Recognition to collect data

Besides AI being a valuable decision-making tool to achieve desired outcomes, all participants believed that leaders can benefit from AI's various capabilities to perform simple repetitive/routine tasks. Like Participant 4, Participant 1 mentioned that "AI is really good with processing a lot of data" in which he also stated that leaders can take advantage of its strength in processing big data to perform "routine tasks or repetitive task faster, because leaders don't need to spend 10, 20 minutes of their time just changing the data and putting outputs." Participant 2 said that "One important feature of AI is that it could process huge amount of data, that will mostly help in any routine tasks." Similarly, Participant 3 stated that "AI will be utilized as augmented technology to "help leaders with the routine that are less critical tasks," which he believed that it will in turn make leaders "focus more on critical tasks." Participant 5 added that "Artificial Intelligence, or even rather, Machine Learning, is generally going to help us disseminate and analyze very large amounts of data."

Participant 1 and Participant 3 agreed that AI, Natural Language Processing (NLP) in specific, will help tremendously in the digitization of government data. Participant 1 explained how NLP can be help leaders in digitizing all the paper they have:

> Leaders just scan documents in and instead of having them inputting and sitting all day in front of a computer and putting each single paper, they can just scan it in and just let the NLP technology do its work.

Similarly, Participant 3 stated that the use AI and its NLP capabilities will allow leaders "very soon to no longer deal with keeping manual records of what occurred in their organizations to support their work." Participant 5 stated that:

> AI is really good at performing some set of tasks on whatever the input was. Eventually I complete the task which I've been programmed to do. That is how a piece of AI software

> works, essentially. In a sense, that it's not able to make any decision outside of a strict set of rules, which has been written, in order to do so.

Similarly, Participant 6 mentioned that humans are really good at performing repetitive tasks, however, "by teaching the computer to do repetitive tasks, I can almost guarantee that the tasks is going to be a faster, much more versatile process." He also added that AI surpasses human in terms of "dealing with huge amount of data." However, to get a better understanding of AI's capability in performing repetitive/routine tasks more efficiently, Participant 2 shared a real case scenario on how AI, Convolutional Neural Networks (CNN) and computer vision in specific, was utilized to perform routine/repetitive tasks faster in UAE airport:

> Let's take the UAE airport as an example, the number of travelers in the airport is way less than the number of people working at the airport. This means, it will take a long of waiting time if employees process all the travelers entering the country. Hence, we have something called the smart gate, which is an AI-based technology that assists in processing the huge number of people coming into the country via face recognition and other features. Hence, AI can help you with business processes, transportation, logistics, and more.

Customers/people relations. This theme refers to the ability of leaders to solve complex customer-related problems by capturing customers' emotions and needs using AI. All study participants discussed aspects of this theme, which was in the mid-range of frequency counts (*n = 15*). Table 17 shows the 10 individual category codes of information associated with this theme.

Table 17

Theme: Customers/People Relations: Category Codes of Information

Category Codes of Information
1. AI capturing user needs
2. AI gets you deep information about people
3. AI offering 24/7 services
4. AI to understanding people and customer needs
5. Capturing user needs is challenging
6. Customer satisfaction
7. NLP solving customer-related problems
8. NLP understanding people from written documents
9. People complaining
10. Voice Recognition to recognize people emotions

When discussing how AI can help leaders become more productive and efficient, Participants believed that AI can vastly help in enhancing leaders understanding of their customers/people's needs. Participant 1 emphasized that leaders should take advantage of AIs Natural Language Processing (NLP) capability to understand "what people are worried about, what people are struggling with." He used an example of the use of NLP and its capability to understand "people's emotions" or "peoples personality" or "the goals peoples trying to achieve" from written documents such as personal essays. Participant 2 said that leaders "can use AI data analytics, to understand their customers, understand their people, and to serve them better." Participant 4 highlighted that "humans are complex machines, and defining what they really want is and has been and will always be very challenging." Hence, he believed that AI will help conquer this challenge by "capturing end-users needs" Participant 5 stressed that "AI helps

leaders get information about their people that just would never have had at their disposal without it."

Furthermore, Participant 4 added that "AI will open doors to new opportunities" in which it will help offering "24 hours services to end users" and it will "adhere to help out the government to provide better services." Participant 1 provided an example that thoroughly explains how AI can help leaders capture customers/people's needs to improve government processes:

> Let's say, you as a leader want to know what people are complaining about. But you can't have so many people in your team to handle all those complaints. So you need to collect, again, going back to a lot of data from people. Now, if you have a radio station or a call center that is allocated to listen to all those people worries and concerns. You can have AIs voice recognition transcribing all the calls from every single person that called, it just automatically does it for you, it sorts it out, what this person has called. And then you have all the other AI software's that collect all those data together using voice recognition, with the NLP, to give you a summary of people complaints in a dashboard for you to address as soon as possible

Similarly, Participant 5 mentioned that "AIs voice recognition can use people's voices over the phone to detect whether they were happy or unhappy about a service" In addition, like Participant 1, Participant 4, and Participant 5, Participant 6 believed that AI will increase overall customers/people satisfaction:

> As for its adoption by the UAE government, I think the government, because of the artificially intelligent computer being able to disseminate large amounts of data, I think the key here is for governments to use a very highly-trained and advanced computing

system in order to disseminate all of the data that they have about a citizen, in order to be able to extract things like the metrics for the quality of life, the general happiness of the people with regards to the nation. The things that the people are very concerned about.

Sub-Research Question Three

The third guiding sub-research question was: What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government? Four emergent themes are relevant to this research question: "Agile Mindset," "Data Intelligence," "AI Technology Proficiency," and "Transformational Leadership Qualities." Findings relative to each of these themes are presented in the following subsections.

Agile mindset. This theme refers to leader's openness to change and willingness/ability to quickly shift cognitively with ease. Participant 4 and Participant 7 discussed aspects of this theme, which had the second lowest frequency counts (n = 5). Table 18 shows the 5 individual category codes of information associated with this theme.

Table 18

Theme: Agile Mindset: Category Codes of Information

Category Codes of Information
1. Ability to learn new technologies
2. Leaders need to be adaptable and accept different changes
3. Leaders need to be agile
4. Leaders need to be flexible and tolerant
5. Mindset over skills

When discussing the critical competencies needed by leaders in UAEs AI-driven government, Participant 4 and Participant 7 agreed that key skills are constantly changing due to

technological innovations. Thus, both Participant 4 and Participant 7 believe that having an agile mindset is the most critical competency leaders should develop in order to successfully adapt with all sorts of changes trigged by the AI transformation. In addition, Participant 4 mentioned that “today we live in an era that in constantly changing at an exponential rate” that is driven by technological innovations “so today we're talking about AI and maybe two, three years down the road, there will be another technology that maybe would come and question why do we need AI?” Hence, he emphasized that effective leaders will be those who can “adapt quickly to changes.”

Similarly, Participant 7 said that “with the right mindset” leaders will be able “to acquire all kinds of skills, either through themselves or through their team.” He also stressed that leaders having a mindset that is “tolerant, flexible, and agile” will be the most effective, not only in the artificial intelligence (AI) transformation, but also in all types of transformations:

> In my opinion the most important skill is to be tolerant and flexible. Individuals who are flexible and tolerant and have agile leadership and dynamics, are open to change. Whether that change will require learning new technology, such as AI or adopting new theories of leadership or accepting feedback from younger leaders and people who will come and join the system. So, the UAE government needs leaders who are agile, tolerant, dynamic and flexible. The mindset of new leaders should be open to accepting feedback. If you have this type of leadership, then everything will be possible whether it is the technical know-how or accepting to learn new things.

Data intelligence. This theme refers to leader’s ability to interpret data and analyze how to apply/implement in a real-world context. Participant 1, Participant 3, and Participant 5

discussed aspects of this theme, which had a frequency counts (n = 12). Table 19 shows the 10 individual category codes of information associated with this theme.

Table 19

Theme: Data Intelligence: Category Codes of Information

Category Codes of Information
1. Context (First research category)
2. Critical thinkers
3. Diagnostics (Second research category)
4. Evaluative (Third research category)
5. Leaders being data analytics
6. Leaders having quantitative skills
7. Leaders having research skills (four-stage framework)
8. Leaders need judgement to make decisions of AI
9. People creating business opportunities from data
10. Strategic (Fourth research category)

When discussing critical competencies needed by leaders in UAEs AI-driven government, Participant 1, Participant, and Participant 5 emphasized that the adoption of AI requires leaders who are capable of interpreting data that comes from different AI-based models. Participant 1 mentioned that leaders should be “critical thinkers” and “kind of like data analytics translator in a way” to be able “to make intelligent judgments” from AI. Participant 3 explained that leaders should be “familiar with data analytics” to “create business opportunities from data:”

> Leaders have to be capable of interpreting and connecting different types of data with each other. Understanding the data opportunities that will allow them to imagine potential

> scenarios. This kind of an imagination is very important for leaders to acquire, that will help them solve very complex problems within their organizations using AI-based technologies.

Similarly, Participant 1 signified that leaders should understand different types of datasets used in AI-based technologies in order to be able “to make appropriate judgements:”

> Leaders should be able to say this is AI. This is going to help me big time. This is going to do a lot of stuff for us. But you know what? I don't think it's a good fit for this project, or for this period of time, or for this type of data, at least. Leaders have to be able to answer that because AI is not as smart as a human being because it's just as good as the guy who programmed it. It's not going to tell you, "Oh, you just feed me low quality data and I'm going to refuse to do the analysis for you because this is terrible data.

Like Participant 1, Participant 5 agreed that it is important for leaders “to know where these outputs are coming from and kind of how they're coming” when making a data-driven decision to “assess how much they should trust it.”

Ultimately, Participant 5 specifically outlined two essential group skills leaders need to master in order to effectively make sense of data-driven AI models. The first group skills that he mentioned were Research Skills that focuses on identifying problems that could be solved by AIs different interpretable models, which he simply explained as a four-stage framework. The first stage of the framework is Context, which includes writing down “all of the questions that need to be answered in order to describe exactly how something is currently working.” The second stage of the framework is Diagnostics in which includes “asking diagnostics questions” such as “what are the issues in the current system?” The third stage of the framework is Evaluative that indicates “what would we quantify as success and what is good according to us.” The fourth

stage of the framework is Strategic that deals with the development of "forms or policies or steps in order to maximize what you can do on your evaluative metric." The second group skills that Participant 3 also explained were "quantitative skills" mainly focuses on interpreting data:

> Quantitative skills include understanding and being able to reason about what different results mean, what different data means, what you should trust, what you think and don't think. But necessarily we need to trust these figures as much, because maybe of how they were created or whatnot and to not just take experiments or observations about the country at face value. But to read through how they came to those decisions and to critically analyze them.

AI technology proficiency. This theme refers to the importance of having leaders process deep knowledge and intermediate-level skills with AI technologies. All participants, besides Participant 7, discussed aspects of this theme, which was in the mid-range of frequency counts (n = 21). Table 20 shows the 11 individual category codes of information associated with this theme.

Table 20

Theme: AI Technology Proficiency: Category Codes of Information

Category Codes of Information
1. AI mindset
2. AI Not for Everyone
3. AI-related skills
4. Aware of AI impact from different perspectives
5. Aware of capabilities and limitations of AI
6. Leaders as AI-citizens (continued)

Category Codes of Information
7. Leaders being fluent in using a computer
8. Leaders don't need to understand AI algorithms deeply
9. Need Context of AI Application
10. Role of leaders in educating end-users about AI
11. Understanding how AI operates

When discussing the level of knowledge and skills leaders need to develop to effectively utilize AI-based technologies in their entities, participants believed that leaders should be equipped with deep knowledge to understand how different types of AI operates, and intermediate-level skills to be able to interact with AI-powered systems. Participant 3 highlighted that leaders need to be “AI-citizens” that have the ability to “interact with data scientists and AI-experts”. Participant 1 emphasized that it is extremely important for leaders to “know how, where, what and which type of AI technology are we using? Who are using it? Is it the right answer for their organizations?” He mentioned that leaders “don’t need to know the programming behind AI;” however, should have a sufficient understanding on “how AI operates:”

> Leaders have to understand how AI operates? The answer they got from this computer or from this program, at least have an idea what's the algorithm that the program want to give you, to spit out this answer. What technique did it use? At least know that. You don't need to know the programming behind it, or how you set up all your variables. That doesn't matter. At least know the pseudocode or the algorithm behind it.

Like Participant 1 and Participant 3, Participant 2 agreed that "leaders don't need to understand python and AI algorithms" they just need to "what's behind the codes and algorithms being implemented, and how it will benefit them."

Furthermore, Participant 1 emphasized that AI has various applications related to different fields that leaders should be mindful of in which he explained that by saying "we can use AI in health sector. We can use AI with financial services. We can use AI with automation services. Every field has its own application." Like Participant 1, Participant 2 agreed that "leaders don't need to understand every detail about AI, they need to understand what, when, where, and how to use AI." He also used the example of the internet to rationalize the knowledge and skills leaders need to have in AI:

> I'm one of the people that understand deeply the technicality behind AI, I understand what is machine learning, deep learning, supervised learning, and unsupervised learning. But do leaders need to understand all these concepts and how they work, absolutely no. Also, for example, leaders been using the internet for years now, do they understand how the internet actually works and know all the networking behind it, no. So this tells you in order to effectively use a technology you don't need to understand how it was developed, you just need to understand how to use it.

Participant 6 argued that if you have leaders who are "fluent in using a computer" you can easily "build AI software for them to use." He believed that the challenge is more of "the software designers that are going to be developing the software that will be utilized by leaders." Hence, he stated that "any leader would be able to use any Artificial Intelligence software with very minimal training as long as it is designed well by the developer."

Moreover, Participant 1 signified that leaders should be aware of the "key steps to implement AI," that "AI and machine learning might not be the answer to everyone," and that AI is "not one size fits all:"

> AI might not be the answer to everyone and specifically machine learning is definitely not the answer to everyone. It's not one size fits all. Machine learning is a very, very, very powerful tool, but it really depends on how you're implementing it, where you're implementing it. So, it would be as we both know, we got some government entities in the UAE who are still in the initial steps in digitizing their own data. And for you to implement AI in your organization, your organization has to be data centered.

Similarly, Participant 4 believed that when adopting new technologies, it is important to have leaders understand two things "What are the capabilities?" and "What are the limitations?" of that technology. He signified that a leader understanding the capabilities and limitations of AI is very important in which he justified that by stating "AI is not a solution to all the problems:"

> Leaders need to have skills that would make them first of all understand what they can do with AI, what are the capabilities of AI, and what are the limitations? Knowing these two I would say it's really important. What I mean by capabilities and limitations, not only from making them from a technical perspective but also from a broad perspective. What can I do with AI? And what are the limitations of AI? Because, if I know the limitations of AIs, I might reach out to other, for example, or might consider other technologies that could come in support of AI.

He also explained one of AI's biggest limitations in which he said "when you do deep learning, okay, you run some AI algorithms, you might discover some personal data, some private data and we don't want to end up in that situation."

Transformational leadership qualities. This theme refers to the importance of having leaders demonstrate qualities associated with transformational leadership theory. All participants, except Participant 3, discussed aspects of this theme, which had a frequency counts (n = 9). Table 21 shows the 8 individual category codes of information associated with this theme.

Table 21

Theme: Transformational Leadership Qualities: Category Codes of Information

Category Codes of Information
1. AI lacks expertise and wisdom
2. AI lacks oversight
3. Critical Leadership Qualities that will never change
4. Human resist change
5. Human showing empathy
6. Importance of soft skills
7. Need of leaders that are able to lead change and advocate for AI
8. Some leadership qualities will never change

When discussing the critical competencies of leaders in UAE's AI-driven government, participants agreed that the adoption of AI will increase the demand of leaders with transformational qualities to successfully implement the changes enforced by the new technologies. Like Participant 5, Participant 1 indicated that advanced technologies, such as AI, are very powerful in performing roles that require "reading inputs and giving outputs," however, are very weak when it comes to roles that require "soft skills." Hence, Participant 1 and Participant 5 both stressed that it is extremely important for leaders to have the skills that AI

lacks, such as “influencing change,” “influencing people,” “emotional intelligence,” and “oversight.” Participant 1 further explained that point by stating:

> Leaders should have the people skills, the soft skills, because believe it or not, in the next 30 years, the soft skills are going to become more valuable and valuable because we will start realizing as we implement more AI and more robots show up around, that they lack emotions, they lack emotional intelligence. They can't influence people. They can't just influence change, especially when it comes to human being, right? So we need leaders who are really good with the soft skills. Who have strategy and vision.

Participant 4 emphasized that the adoption of AI will require “a lot of changes” in organizations, however, “humans don't like changes, and that resistance, you need somebody who will fight that resistance in a peaceful way, by educating for example end users, by discussing the pros and cons of AIs.” Similarly, Participant 2 mentioned that the adoption of AI requires leaders that have “skills in change management to successfully lead and adapt their organizations to the technological changes.” Thus, he stressed that “the UAE government need to work on adding change management courses and leadership courses” to build transformational leaders.

Participant 6 believed that there are some leadership qualities that will always remain important, such as strength, vision, and the ability to unite people together towards a common goal:

> I think if we try to take a lot of leaders, good and bad, and we try to pool them all and we try to find the common denominator, it is confidence, strength, the ability to unite people together under a common cause and the ability to make any decision that translates that cause into actual work that is being done in order to make that dream come true, or that

> cause come true. So, I think any person with these kinds of qualities is going to be a great leader. And these leaders can be young, they can be old, they could be well-educated. They might not be educated at all, or not as well-educated

Similarly, Participant 7 stressed that individuals in leadership positions will always need wisdom and expertise, despite AIs and other advanced technologies super capabilities:

> when you go up the ladder, expertise is a very important factor. AI is a tool, but it does not replace expertise and wisdom. This is why, when you go up the ladder, you will need a wise and expert leader who will use A.I. as an extra tool, but it will not replace leadership.

Sub-Research Question Four

The fourth guiding sub-research question was: What steps should be taken to identify and prepare the government leaders who will be needed in the UAE;s future AI-driven government? Four emergent themes are relevant to this research question: “Define, Identify, and Invest in Potential Leaders,” “Provide Education and Training,” “Engage Leaders in Internal Research and Development,” and “Encourage External Formal Scholarly Pursuits.” Findings relative to each of these themes are presented in the following subsections.

Define, identify, and invest in potential leaders. This theme refers to identifying potential leaders that have the essential requirements to achieve the UAE’s government vision. All participants, except Participant 6, discussed aspects of this theme, which was in the mid-range of frequency counts (n = 13). Table 22 shows the 8 individual category codes of information associated with this theme.

Table 22

Theme: Define, Identify, and Invest in Potential Leaders: Category Codes of Information

Category Codes of Information
1. A methodology to select people that meet UAE vision
2. Combination of technical and soft skills
3. Identifying potential leaders
4. Individuals having multidisciplinary background
5. Investing in potential leaders
6. Leaders need to be self-learners
7. Leaders that are updated with the newest technologies
8. Technical ability

When discussing the steps that the UAE government should take to build the required leaders for its heavy technological transformation, participants agreed that defining as well as identifying potential leaders who meet UAEs future plans is extremely important. Participant 3 indicated that the government should first "come up with a methodology" that will help them "identify the potential leaders who meet UAEs government future vision plans" to start "investing in them." Participant 2 defined potential leaders as individuals who "adapt with different changes," "able to work with teams," and "have technical ability" combined with "leadership skills:"

> Leaders should be able to adapt with different changes, should be up-to-date with the newest technologies, and also be able to experiment those new advanced technologies by working on small scale projects to monitor its effectiveness on larger-scale projects. Hence, potential leaders should have technical ability combined with traditional

> leadership skills. Also, potential leaders should be able to work with teams in different projects, whether technical projects or non-technical projects. Experience is with no doubt important, however, skills and technical ability are more important that will be the main differentiator to effectively lead in AI-driven organizations.

Similarly, Participant 7 agreed that potential leaders are individuals who have "a combination of technical, managerial and leadership capabilities:"

> I think the UAE government should invest in building leaders with certain goals, particularly the technical know-how, because most of the economies now and the government's operate based on advanced technologies such as AI technologies and tools. They need to build leaders that have a combination of technical, managerial and leadership capabilities. So, this new leadership combination is very important for all kinds of leaders and they will be the ones who will be able to bring the UAE government into the next level, or next phase of confidence on the world stage.

Like Participant 1, Participant 2, and Participant 7, Participant 3 emphasized that "having some sort of a technological background will be a great asset for potential leaders:"

In addition, Participant 3 signified that potential leaders should have "multidisciplinary backgrounds that at least have some sort of technological background" in order to be able to "communicate and interact with their peers from different disciplines." Similarly, Participant 4 agreed that having a "multi-disciplinary background" is "very useful" for potential leaders in UAEs AI-driven government:

> Having a multi-disciplinary background would be very useful for the future leaders We live in an era where you cannot just survive by ourselves, mainly if you are in a leadership or role, you cannot just specialize yourself in one discipline and the drive, for

> example, the whole community towards specific objective or targets. As a leader, it's very important to have multi-disciplinary background. If I say AI, it's good from a technology perspective but also you need to be aware, for example, you need to have some kind of social background. What is the impact of AI on the social life, for example? What is the impact on AI on the culture of the country? What is the impact of AI on the economy of the country? On the growth of economy? Leaders need to have that kind of multi-disciplinary background and multi-discipline analysis.

Furthermore, Participant 4 mentioned that "every year there are new technologies that emerge" and "today we're talking about AI and maybe two, three years down the road, there will be another technology that maybe would come and question why do we need AI?" Hence, he believed that potential leaders should be self-learners. Like Participant 4, Participant 5 stressed that:

> People who are interested, engaged, and curious that decide to take an uncredited online course, for example, just to learn about a new technology and next year something else that's relevant, so they go and start learning about that. Those who are naturally going to end up being the leaders.

Provide education and training. This theme refers to the different types of education methods and training programs needed to prepare leaders for an AI-driven government. All participants discussed aspects of this theme, which was in the mid-range of frequency counts (*n = 19*). Table 23 shows the 13 individual category codes of information associated with this theme.

Table 23

Theme: Provide Education and Training: Category Codes of Information

Category Codes of Information
1. AI council to gain and share skills
2. Basic AI training
3. Blended training programs
4. Change management training
5. Conferences and workshops to gain skills
6. Customized and Tailored training for each entity
7. Identifying the kind of training needed
8. Importance of training people to be self-learners
9. Innovative training
10. Need of AI Training
11. Real scenarios on uses of AI
12. The role of the community in promoting new technologies
13. The role of the education system in accepting change

All participants agreed that it is important for the UAE government to work on various types of education methods and training programs to equip the current as well as future leaders with the skills and knowledge needed for a successful AI transformation. Participant 7 explained that it is important for each entity within the UAE government to add a "new technologies department" that will facilitate identifying "what types of trainings are required to build the most effective workforce from leadership to basic level employees to successfully implement a new technology such as AI." Participant 1 explained that leaders need to be trained to have an "AI mindset" that will make them aware of the different capabilities of AI to "make better decisions,

become faster, and more productive." He believed that leaders should be involved in "corporate training" on AI that is "not too deep" and "to be too broad." He mentioned that training programs should focus on educating the leaders on "how an AI-based application is operating? What's the algorithm behind it? What is it doing? What is machine learning?"

> We need leaders to understand that AI is key to the government success. It's a key to be more productive, be more efficient, be more accurate, be faster. And that's why I'm saying, you've got the current people and if we can just train them at least into that AI mindset, because they probably have an appreciation of all the struggles and the problems and the shortcoming that they're suffering from, or they're struggling with. And then we just need to show them that if you've got this AI mindset and understand how to implement those technologies, your life will be way better. You can do way more with your team than what you're doing now. You can be at least 100 times more productive than where you are at this point.

Like Participant 1, Participant 5, and Participant 6, Participant 2 believed that with "proper training" leaders will be "ready for the age of AI:"

> Leaders in UAE government are highly encouraged to adapt to AI, such as they adapted to previous government digitization's using ICT technologies. AI is considered as the main driver to achieve UAEs Centennial plan 2071 objectives. I believe that with the proper training and the wide variety of initiatives related to AI those leaders will easily adapt and will be ready for the age of AI.

Furthermore, like Participant 2, Participant 1 signified that the UAE government should work on "tailored" and "customized" training programs that targets different sectors. He further explained that the use of AI differs from sector to sector:

> But which kind of training is the question, right? And that boils down to not just going around and bringing leaders from the health sector, leaders from the ministry of interior and leaders from the education sector, and give them the same training every time. No, we should have tailored and customized training programs for each government entity

Participant 2 explained that "innovation is an important aspect to successfully being an AI-driven government," and that "Innovation and future foresight work together and they work in parallel. Thus, he encouraged that leaders should be trained to be "innovative and have foresight" by involving them in training programs that have "real-scenarios from other governments or organizations that used AI to solve particular problems:"

> Every leader has big data under his/her control in the organization. So we should show them real scenarios on how to innovative AI uses these big data to solve complex problems and make sense of these big data as well as making intelligent predictions out of these big data. Also, we can use AI data analytics, to understand our customers, understand our people, to serve them better.

Like Participant 1 and Participant 2, Participant 3 agreed that "the government should take current as well as potential leaders" in training programs "with different AI-experts across the world" to educate them about "actual use cases of AI-based technologies" and how it can be implemented to "boost organizations performance." He also suggested that training programs can be offered to leaders through "a blended educational program that consists of a mixture of face to face courses and online courses."

Participant 2 believed that the adoption of AI in UAE government will drive various changes in entities. Hence, he emphasized that the government should prepare the leaders "to lead change" by providing "change management training courses:"

> One thing the government needs to work on is adding change management training courses. Having skills in change management is key for leaders to successfully lead and adapt to all the continuous technological changes enforced by the adoption of AI and also other advanced technologies in the future.

Moreover, Participant 4 argued that both the "traditional education" as well as the "non-traditional education" have a major role in developing the required leaders in UAEs future AI-driven government. He explained that "traditional education" is "where you go from kindergarten onwards until university:"

> Traditional education has a role to play to instill, not only technologies, but the willingness to learn and accept new technologies. The willingness to look for new technologies that will improve life in general. So this is, I would say, the regular courses, KG and family school and so on.

On the other hand, he explained "non-traditional education" as "parents, the society, and the community:"

> The community, the society, parents have also a role to play in educating the future generation that we live in a dynamic world and be ready to continue with changes. Every year they are getting something new. Every year there are new technologies that come, new technologies that disappear, is an advantage. So be ready to embrace all these changes in a positive way.

Engage leaders in internal research and development. This theme refers to the engagement of current and future leaders in innovative projects that includes experimenting and developing advanced technologies. Participant 2, Participant 3, Participant 5, and Participant 6

discussed aspects of this theme, which had a frequency counts (n = 7). Table 24 shows the 4 individual category codes of information associated with this theme.

Table 24

Theme: Engage Leaders in Internal Research and Development: Category Codes of Information

Category Codes of Information
1. Having in-house AI products
2. involving Emirati nationals in AI-projects
3. Involving People in innovative projects
4. R&D to experiment technologies

Most participants believed that engaging individuals in innovative Research and Development (R&D) projects is a major step to develop the needed leaders in UAEs future AI-driven government. Participant 2 emphasized to start investing in "young Emirati nationals" by engaging them in "innovative projects" related to "AI and advanced technologies" to "build new AI algorithms that are customized for the UAE." He believed that this engagement will strongly enable "young Emirati nationals" to "become the leaders that the UAE government needs in the future."

Similarly, Participant 3 explained that every organization within the UAE government "should create some sort of Research and Development (R&D) department." He believed that R&D will encourage the engagement of the workforce in taking the lead "in experimenting new AI-based technologies and other emerging technologies through a proof of concept or a pilot study" prior to "officially adopting and implementing" any new technology within the organization system.

Moreover, Participant 5 explained that the UAE government "should push for establishing Emirati tech companies" that are primarily "led by Emirati nationals:"

> If the UAE wants to be a world leader in AI in the future, the UAE should push for establishing Emirati tech companies that are led by Emirati nationals that build AI in the UAE and gradually decrease buying AI products from other companies from outside the UAE.

Like Participant 5, Participant 6 agreed that the UAE government should not only aim to turn into a "technological encouragement for the future," but also aim for "how much of that technology is going to be home-grown here in the UAE." He further justified his point by stating:

> The UAE is a melting pot of people from around the world, and it would be great to have the Machine Learning algorithms of tomorrow developed here in the UAE, so that not only our governments, but all of the governments around the world can use that technology. And I really do believe in this by the way. We can attract a lot of people here with really great programming experience, with a really great engineering background, and they can make something great. But there just needs to be that little economic push from the government. And I think that this is the only thing that the government should be doing. Everything else is going to sort itself out in the future.

Encourage external formal scholarly pursuits. This theme refers to pursing academic research in topics that addresses the needs of UAE government vision plans and strategies. Participant 2 and Participant 7 discussed aspects of this theme, which had the lowest frequency counts (n = 4). Table 25 shows the 3 individual category codes of information associated with this theme.

Table 25

Theme: Encourage External Formal Scholarly Pursuits: Category Codes of Information

Category Codes of Information
1. Encourage conducting academic research related to UAE vision
2. Universities investing in AI-research
3. Use academic research to bridge the gap between theory and practice

Both Participant 2 and Participant 7 agreed that the UAE government should encourage Emirati nationals to pursue academic research related to UAE government future vision and strategies. Participant 2 mentioned that he strongly "encourage universities and education centers in the UAE to invest more in AI and advanced technologies." Similarly, Participant 7 explained that to prepare the needed "future leaders," the UAE government should encourage "UAE students in various higher education institutions to conduct academic research in topics that are related to UAEs future vision plans." He stressed that the government should "keep students engaged" in UAE future plans and strategies "through regular visits and feedback from what's going on in the government" in order for it to "become the theme and focus of their research." He also signified that pursuing academic research will help in "bridging the gap between theory and practice:"

> UAE students can utilize the findings that address all those different technical tools and concepts mainly from the UAE point of view. This is great step in which it bridges the gap between theory and practice, because when those students get to work, they will practice and implement what they learned from their research in the UAE context.

Summary

This explanatory sequential mixed methods study analyzed the data collected from the quantitative survey and the qualitative interviews to address the four sub-research questions. The quantitative survey involved significant findings that partially answered the research questions. One significant finding indicated that 76.3% of the respondents either agreed or strongly agreed with the premise that the adoption of AI technologies in the UAE government will redefine government roles. Furthermore, the follow-up qualitative interviews showed noteworthy findings that contributed in providing in-depth explanations of the quantitative survey. Using thematic analysis, a total of 13 themes emerged from the qualitative interviews that greatly helped in answering the research questions. The 13 themes indicated that the adoption of AI will have a major impact on leadership roles, help leaders become more efficient and productive in three major aspects, redefine critical competencies demanding a combination of soft and technical skills, and require several essential steps to identify and prepare the needed leaders in UAEs AI-driven government.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This chapter presents a discussion of the key findings, conclusions, methodologies implemented, implications, and recommendations determined from this study. The discussion of the key findings involves comparing and contrasting findings to the literature. The conclusions include the ultimate inferences derived from the key findings. Finally, this chapter discusses the implications encouraged by this study as well as a series of recommendations for further research.

Restatement of the Purpose

The purpose of this research was to study aspects of effective leadership in the UAE's future Artificial Intelligence (AI)-driven government by assessing the perceptions of different individuals who are currently associated with UAE government and who have a high level of knowledge in Artificial Intelligence (AI). The study particularly attempted to (a) explore how adopting AI-based technologies could redefine leadership roles in UAE government, (b) understand how the adoption of AI-based technologies can make leaders more efficient and productive, (c) identify the critical leadership competencies required to achieve the vision of becoming a highly successful technology-oriented government, and (d) determine the steps required to develop effective leaders that meet the UAE's AI-driven government needs.

Restatement of Research Questions

According to Kolbjørnsrud et al. (2016a) the adoption of Artificial Intelligence (AI)-based technologies will redefine the requirements of leadership. Thus, the following research questions were formulated to help UAE government identify the key factors required to produce effective leaders in UAE's future Artificial Intelligence (AI)-driven government.

The inquiry aimed to address the following main research question:

In the perception of individuals currently associated with UAE government, what key factors could contribute to developing effective leadership in the UAE's future Artificial Intelligence (AI)-driven government?

The following were the sub-research questions:

a. How will AI redefine leadership roles in the UAE government?
b. How will AI-based technologies help UAE government leaders become more efficient and productive?
c. What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government?
d. What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's future AI-driven government?

Discussion of Key Findings

Sub-research question one. The first guiding sub-research question was: How will AI redefine leadership roles in the UAE government? To help answer this research question, data findings from the quantitative survey and the qualitative interviews were analyzed. A significant finding from the quantitative survey was that 76.3% of respondents either agreed or strongly agreed with the premise that the adoption of AI technologies in UAE government will redefine government roles. Noteworthy findings from the qualitative interviews expanded upon how AI will redefine leadership roles in UAE government in which the participants interviewed perceived Artificial Intelligence (AI) as a "complementary technology" that will immensely augment leaders' capabilities to perform their roles more efficiently and accurately.

Although the qualitative interview findings showed that the adoption of AI will change the dynamics of work of leaders, it will not replace any of the strategic leadership roles due to its weaknesses in several aspects. The participants interviewed explained that AI-based technologies are not yet capable of replicating aspects of the cognitive human abilities such as communications skills, emotional intelligence, foresight, creativity, imagination, and problem-solving, all of which are extremely important for leadership roles. Additionally, the participants interviewed indicated that AI-based technologies are limited with the datasets that are inputted from previous human experiences, and that human intervention will always remain the key to achieve success and prosperity in all fields. For example, Participant 2 mentioned that IBM Deep Blue itself "is not the best chess player, but it is basically human plus AI that made the world chess champion happen."

Another critical finding from the quantitative survey was identifying the top five critical leadership tasks to successfully transform to an AI-driven government, which included (a) fostering a culture of innovation in the workplace; (b) directing, motivating, and coaching employees; (c) solving problems and collaborating; (d) spending time on developing strategies; and (e) monitoring AI strategy in the organization. The participants interviewed explained that the UAE government successfully achieved previous technological transformations, the e-government and the m-government, through building proper infrastructures and plans. Participant 2 stated that "UAE government transitions were successfully made after building solid infrastructures, because every technology needs a strong infrastructure in order to support it."

Consequently, the qualitative interviews showed that the adoption of AI would require public entities within UAE government to work on several reformations such as restructuring

roles and reviewing internal processes. Additionally, the qualitative interviews indicated that the adoption of AI and other advanced technologies will strongly require public entities to (a) cultivate a holistic data-driven strategy, (b) encourage Research and Development (R&D), (c) develop and implement change strategies, and (d) foster a culture of innovation. Hence, the qualitative interviews agreed that reframing the organizational leadership structure will be a key to accomplish these objectives. The reframing should consist of reviewing existing leadership roles and responsibilities, along with the emergent of three essential leadership roles that were described as the backbone to the adoption of AI-based technologies and other advanced technologies in the UAE government:

- **Chief Data Officer (CDO).** Participant 3 mentioned that data are considered as "one of the valuable assets in every sector." Thus, the role of the CDO along with his/her team of data scientists will be working on a "holistic data strategy" that will be used to empower AI-based technologies in the organization.
- **Chief Technology Officer (CTO).** The CTO will be in charge of experimenting emerging technologies through "a proof of concept" or "pilot study" before officially adopting such technologies in the organization. The CTO will also be responsible of identifying the most appropriate trainings and education methods to develop the skills and knowledge needed, at all levels of the organization, to effectively operate a new technology.
- **Chief Innovation Officer (CINO).** The CINO is a role that has been already introduced in many organizations; it will be a critical leadership role that assures "innovation is seriously taken into account" within all internal processes in the organization using AI-technologies and other advanced technologies. The CINO is

responsible for change and development strategies that primarily enable technological transformations such as AI-transformation in UAE government.

All participants interviewed contributed to all aspects of sub-research question one findings. The participants interviewed had experienced working with AI as well as other technologies as impactful as AI, which reflected on their perception in acknowledging the magnitude of change the adoption of AI can trigger on the UAE government, and leadership roles in specific.

Sub-research question two. The second guiding sub-research question was: How will AI-based technologies help UAE government leaders become more efficient and productive? To address this research question, data findings from the quantitative survey and the qualitative interviews were utilized. A significant finding from the quantitative survey included that more than 50% of the respondents agreed that AI will make leaders more productive and efficient by augmenting them in (a) solving complex problems, (b) making better decisions, and (c) performing routine tasks. The qualitative interviews provided an in-depth understanding of the quantitative finding. The participants interviewed showed that Machine Learning (ML), a subset of Artificial Intelligence (AI), can augment leaders' decision-making abilities and necessary actions to achieve desired outcomes.

The qualitative findings further discussed that ML predictive models that involve huge numbers of datasets can be utilized by leaders as a strategic management tool to achieve the vision of UAE government. The participants interviewed shared several examples on the use-cases of ML that included: (a) understanding a phenomenon, (b) acquiring the best talent, (c) creating policies or programs based on prediction, (d) increasing the percentage of graduate students, and (e) identifying the level of care based on classification models. Additionally, the

participants interviewed indicated that one of the challenges leaders face is recognizing patterns in huge amount of data. Thus, Deep Learning (DL), a sub-category of ML, may help leaders make data-driven decisions that consider multiple factors. Participant 5 mentioned that "the premise of machine learning models is to create models that are very interpretable for a human towards making predictions." Participant 7 explained that ML predictive models will redefine how leaders make decisions to solve complex problems. He mentioned that ML will replace "appointing experts" who were necessary to make complex decisions.

In addition, the qualitative interviews revealed that AI would help leaders become more efficient in performing tasks that are repetitive or routine. This, in turn will allocate more time for leaders to spend on tasks that are more critical to the organization. AI's power in Natural Language Processing (NLP), computer vision, and, processing and analyzing huge amounts of data may help leaders with a routine task such as scanning and sending documents to different divisions within the organization. By using that as an example, participants interviewed indicated that AI will tremendously help to achieve a complete digitization within UAE government.

Another notable finding from the qualitative interviews included the ability of leaders to utilize AI-powered technologies to augment them with capturing people needs and emotions. The participants interviewed stressed that "humans are complex machines, and defining what they want is challenging." NLP will help public entities capture customers complains with regards to a specific service through "customer centers" or "radio stations." Through the use of AIs NLP and data analytics, organizations will be able to collect and analyze large sets of data relating to customers concerns. Ultimately, leaders can utilize the data collected and analyzed through AI-powered technologies to make decisions that will enhance the quality of life and

general happiness of customers. Participant 5 stressed that “AI helps leaders get information about their people that just would never have had at their disposal without it.”

Most participants interviewed contributed in all aspects of sub-research question two findings. The participants interviewed were recruited with respect to their deep knowledge in Artificial Intelligence (AI) in which they have either conducted academic work in AI or have experiencing working with AI. This, as a result, allowed all participants to justify their perceptions with sharing real-case applications of AI-based technologies that could be incorporated to augment leaders’ capabilities in UAE government.

Sub-research question three. The third guiding sub-research question was: What are the critical competencies of UAE government leaders required for success of UAE’s future AI-driven government? To help answer this research question, data findings from the quantitative survey and the qualitative interviews are discussed. A significant finding from the quantitative survey included 93.8% respondents agreeing with the premise that the adoption of AI-technologies in the UAE government will require leaders to develop new competencies. In addition, 75% of the quantitative survey respondents showed that soft and hard skills are equally important for leaders to have in UAEs AI-driven government. Also, 42.5% of the quantitative survey respondents indicated that leaders should have deep knowledge in AI. The quantitative survey found the top six competencies needed by leaders in UAE AI-driven government, which include: (a) ability to lead change, (b) willingness to learn, (c) adaptability and flexibility, (d) innovative thinking, (e) critical thinking and planning, and (f) strategy development.

The qualitative interviews were used to expand upon the quantitative findings. The participants interviewed contributed in listing four major competencies leaders should have in UAEs AI-driven government explained in Table 26.

Table 26

Leaders Critical Competencies in UAEs AI-Driven Government

Competency	Description
Agile Mindset	Openness to change and willingness/ability to quickly shift cognitively with ease.
AI-technology proficiency	Process deep knowledge and intermediate-level skills with AI technologies.
Data Intelligence	Ability to interpret data and analyze how to apply/implement in a real-world context.
Transformational leadership qualities	Adopt qualities associated with transformational leadership theory to lead change and foster a culture of innovation.

Each of the participants interviewed contributed in different aspects of the four competencies based on demographics variables and positionality. Participant 4 and Participant 7 contributed in the agile mindset competency. Both Participant 4 and Participant 7 had more than 10 years of experience in higher education in which they have taught various technology-related courses. Hence, they have witnessed that having an agile mindset is the key to learning new sets of skills related to AI or any new technology that may come up in the future.

Most participants contributed in the AI-technology proficiency competency, which involves the importance of having leaders process deep knowledge and intermediate-level skills with AI technologies. Participants interviewed have experience working with AI in which they realize that it is crucial for individuals utilizing AI-powered systems to at least have the knowledge and skills that will allow them to understand how those systems operate to reach the optimal results.

Participant 1, Participant 3, and Participant 5 contributed in the Data Intelligence competency. Participants contributed in this competency have experience developing ML-based predictive models, which makes them cognizant of the importance of having the ability to distinguish the different data types inputted in those predictive models in order to make a proper judgment. In addition, most participants agreed that qualities associated with transformational leadership theory is an essential competency for leaders in UAEs AI-driven government. Participants interviewed had deep technical knowledge, which makes them aware of the magnitude of change AI may stimulate in which it is necessary to have a leader that is capable of leading technological transformations through the adoption of transformational leadership qualities.

Consequently, there was a slight disagreement between the quantitative and qualitative findings related to sub-research question three. This slight disagreement could be due to the variance of knowledge in AI between the participants in the quantitative survey versus the qualitative interviews. The participation criteria in the quantitative survey obligated individuals with moderate knowledge in AI, whereas the qualitative survey required participants with deep knowledge in AI in order to provide deeper explanations. Additionally, this disagreement might have occurred due to the quantitative survey forced-questions, where respondents were limited with the options provided in the questionnaire.

Sub-research question four. The fourth guiding sub-research question was: What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's future AI-driven government? To address this research question, data findings from the quantitative survey and the qualitative interviews were utilized. A critical finding from the quantitative survey included that 38.8% of respondents who believed that identifying potential

leaders is the most important step the UAE government should consider in fostering leaders needed in its AI-driven government. Whereas 30% of the respondents believed that redesigning leadership frameworks that align with the needs of the AI-driven government is the most important step to consider. In addition, the quantitative survey found that the largest of the respondents (48.8%) believed that traditional leadership development programs are not sufficient, and that numerous innovative ways are required to build the needed leaders in UAEs future government.

The qualitative interviews revealed remarkable findings that were used to provide greater depth explanations of the quantitative findings. The diverse demographic variables and positionality of the participants interviewed contributed in specifying four steps that encompassed various innovative methods. Each of the following steps was considered essential in developing current and future leaders needed to contribute in achieving the vision of becoming an AI-driven government:

- **Define, identify, and invest in potential leaders.** This step involves the importance of UAE government to start identifying and investing in potential leaders. The qualitative interviews identified potential leaders in UAE's AI-driven government as individuals that are self-learners, have combination of technical and soft skills, updated with the newest technologies, and come from multidisciplinary background.
- **Provide innovative education and training.** This step incorporates the need of involving current and potential leaders in corporate trainings that are tailored, innovative, and customized for each sector. The corporate trainings should include real-scenarios on the use of AI to help current leaders gain the skills and knowledge required to interact with AI-powered systems. In addition, the government should

provide courses on change management for leaders to be able to successfully lead AI-transformations. In addition, the government should work on an innovative education system that promotes the newest technologies, and incorporates educational methods that develop adaptability and self-learning.

- **Engage leaders in internal research and development.** This step includes involving potential and future leaders in innovative projects that include experimenting and developing AI-powered technologies. Having in-house products, in the UAE, will immensely help in localizing the knowledge associated with the technology.
- **Encourage external formal scholarly pursuits.** This step includes encouraging Emirati nationals to conduct academic research in topics that address the needs of UAE government vision plans and strategies. Pursing academic research will help in bridging the gap between theory and practice. More importantly, it will equip potential leaders with the knowledge required in terms of UAE government context.

Linking Key Findings to Literature and Theoretical Framework

Sub-research question one. The study's findings in regards to the impact of AI in redefining leadership roles were consistent with Infosys (2018) study that stressed the role of AI in enhancing leadership roles through "augmented intelligence." Infosys (2018) defined augmented intelligence as a blend of human inputs and AI-based systems to perform a certain task. However, Infosys (2018) emphasized that the use of augmented intelligence will require leaders to develop different skillsets. A 2016 study by Stanford University explained that AI will reshape the nature of work in organizations by replacing tasks, and not replacing jobs.

In addition, the findings of the study corresponded with Brynjolfsson and McAfee (2014) in that intelligent machines lack soft skills such as emotional intelligence and communications

skills. Brynjolfsson and McAfee (2014) explained that technologies are generally programmed to follow a set of rules in order to perform a task. Thus, they will never be capable of performing tasks that requires "thinking outside the box," which includes ideation, creativity, and innovation. Hence, Brynjolfsson and McAfee (2014) signified that leaders use technologies as a driver to accelerate achieving their goals. Additionally, the study findings were in line with Kolbjørnsrud et al. (2016b) in which the adoption of AI will make leaders focus more on roles involve strategy and innovation, solving problems and collaboration, and developing people.

Moreover, the study's findings were linked with Schwab (2016), which emphasized organizations implementing AI will adapt their structures and functions to the advanced technologies. Agrawal et al. (2018) emphasized that the adoption of AI-based technologies will transform and improve work within different fragments of the organization. Thus, the responsibility of transitioning to an AI-driven organization cannot be fully delegated to the Information Technology (IT) department. The emergence of new structures and roles will be needed to contribute in the various aspects associated with the adoption of AI such as the collection and synthesis of data to be consumed by AI-based systems. Agrawal et al. (2018) indicated that data are as valuable as oil, which is a strategic asset and essential fuel to power AI-based technologies. Hence, Gartner's study signified that organizations adopting AI to encourage a leadership position that is delegated to establish a data-driven culture as a fundamental mechanism to achieve successful AI-transformation (Gartner Report, 2016).

Sub-research question two. The study's findings, concerning how the adoption of AI can help leaders become more efficient and productive, were linked with an article by Schank and Slade (1991) that explained how learning from experience, a cognitive model, impacts human reactions in different scenarios. Schank and Slade (1991) signified the advantage of

having AI-based algorithms that imitate the human cognitive model, learning from experience, in enabling AI-based expert systems to guide humans in specific domains. Agrawal et al. (2018) indicated that recent advances in AI have ultimately allowed the emergence of AI-based models that are able to make predictions through learning from experience, which is currently known as Machine Learning.

More importantly, Agrawal et al. (2018) explained that ML-based systems capabilities in prediction as well as learning and improving over time augment human capabilities such as decision-making. Prediction is seen as a major element of the decision-making process that could be guided by ML predictive models to augment decision-makers capabilities. However, Agrawal et al. (2018) stressed the importance of acknowledging that ML prediction machines have strengths as well as weaknesses in the context of prediction. Prediction machines surpass humans in predictions that involve complex interactions in familiar situations with rich data. On the other hand, humans surpass prediction machines in making predictions on rare events with thin data. Hence, Agrawal et al. (2018) emphasized that human and prediction machines collaborations lead to optimal decision making by complementing each other's predictive capabilities.

In contrast, the study's findings were inconsistent with Kolbjørnsrud et al.'s (2016b) study findings indicating that AI-based technologies can be utilized by individuals in leadership positions to help with repetitive administrative tasks, which in turn, will give them more time to focus on more critical tasks. Contrary, the findings of the study were greatly linked with Halaweh's (2018) article that stressed the role of AI in achieving customers' happiness. Halaweh (2018) indicated that AI-based systems can be utilized by organizations for customer service interactions to gather deep customer insights. This engagement, as a result, will allow

organizations to continuously learn about their customers to continuously provide them with high quality services.

Sub-research question three. The study's findings addressing the critical competencies of leaders in UAE's AI-driven government was consistent with a study by Wade et al. (2017) that found agility as the most important competency of leaders in organizations characterized by increasing technological disruptions. Wade et al. (2017) identified that agility allows leaders to become adaptable by changing their mindset based on new information. Similarly, Loucks et al. (2016) stressed that agility enables hyperaware leaders who are flexible and open-minded in which they are continuously courageous in spotting and adapting new opportunities that will contribute to their organization's success.

Furthermore, the study's findings agreed with Perez (2017) that emphasized the necessity of leaders in AI-driven organizations to have deep understanding of the different types of AI-based technologies, how they operate, and what they can offer to achieve optimal results from the adoption of AI. Daugherty and Wilson (2018) indicated that human collaborating with AI-based technologies to augment their capabilities do not need to understand the deep technicality behind AI-based technologies such as programming, however, need to develop the knowledge and skills allowing them to effectively interact with AI-based systems. An article by Chui, Kamalnath, and McCarthy (2018) emphasized that leaders should be aware that AI-based technologies operate using different types of algorithms to accomplish different objectives. Chui et al. (2018) outlined the common types of AI-based algorithms that are supervised learning, unsupervised learning, and reinforcement learning, all of which are distinct Machine Learning algorithms used to make predictions and provide recommendations to achieve a certain goal.

Moreover, the findings of the study agreed with a study by Gartner (Gartner Report, 2016) that stressed that AI-based algorithms are primarily fueled with data for a specific purpose, which makes data literacy a core competency for individuals utilizing AI-based technologies such as decision makers. Data literacy explained by Gartner (Gartner Report, 2016) is the ability to understand different types and sources of data in order to communicate and interpret data in context. Agrawal et al. (2018) discussed three grades of data that are utilized in AI-based systems, which are (a) training data, (b) input data, and (c) feedback data. Training data comprise of previous datasets that are used to train AI-systems to make predictions to a specific scenario. Input data are the data fed to the AI-based system, which is used to generate a prediction. Feedback data are used to enhance the performance of the AI-systems. Consequently, a study by Kolbjørnsrud et al. (2016b) indicated that being familiar with data interpretation and analysis derived from AI-based systems will allow leaders to make the appropriate judgments in a particular situation.

In addition, the study's findings were consistent with Hyacinth (2017) that stressed the adoption of AI-based technologies will stimulate numerous changes in organizations. This, in turn, will require transformational leaders who are emotionally intelligent and capable of gauging employees' needs through critical periods of change. Similarly, a study by Kirkland (2014) that involved interviewing top AI experts emphasized that AI-transformation in organizations demands leaders who are capable of fostering innovation through developing and motivating employees.

Sub-research question four. A study by MBRSG (2016) echoed aspects of this study's findings reasoning that traditional leadership development programs are insufficient, and that more innovative ways are required to develop the needed leaders in UAE's future government.

MBRSG (2016) study suggested an experience-based learning as an innovative approach that exposes individuals to real scenarios through practical training to gain the competencies needed. In addition, MBRSG (2016) emphasized pursuing research detailing UAE government work as a method to gain tailored and specific insights to develop the needed leaders. An article by Abbatiello et al. (2017) was also related to the findings of this study indicating that defining the requirements of future leaders is a fundamental step for organizations to consider in order to build leaders that meet their digital transformation needs. This, as a result, allows organizations to start investing in potential leaders by equipping them with the skills and knowledge needed through various development methods.

More importantly, Ng (2018) heavily agreed with the study findings with regard to providing current leaders with efficient trainings on AI-based technologies as an essential step to achieve a successful AI-transformation. Ng (2018) emphasized that AI trainings should involve case studies on AI use-cases that are customized and tailored targeting specific industries. Ng (2018) further stressed that those AI trainings should be distinctly designed for different leadership roles within the organizations. Ng (2018) pointed that AI trainings are crucial for leaders to gain skills and knowledge associated with AI technology, data, as well as the capabilities and limitation of AI-based technologies.

Linking key findings to theoretical framework. The key findings of the study were linked with the initial theoretical framework utilized as a foundation for this study, which involved discontinuous change, technological development, leadership, and emotional intelligence. The key findings were in line with Nadler et al.'s (1995) discontinuous change theory, which is a major type of change that requires the reorientation of organizations due to anticipated external factors such as technological advancements. Nadler et al. (1995) emphasized

that reorientation involves essential redefinition that are fundamental to successfully cope with external factors in which organizations are required to redefine their capabilities, structure, processes, and more importantly its culture. Correspondingly, the key findings echoed the effects of Nadler et al. (1995) discontinuous change by indicating that the adoption of AI in the UAE government will demand a redefinition of leadership roles and competencies. In addition, the key findings indicate that in order to successfully implement AI-based technologies, leaders need to foster a culture of innovation.

In addition, the key findings were associated with the theory of transformational leadership, which was explained by Northouse (1997) as a leadership approach that facilitates organizational transformations. This study stressed that leaders need to adapt the qualities associated with transformational leadership theory as a major competency to lead the AI-transformation. Specifically, the key findings showed that adopting a transformational leadership approach will contribute in achieving a successful AI-transformation by enabling leaders to inspire employees, lead change, and encourage innovation within the organization.

Although Goleman (2005) believed that the concept of emotional intelligence, which incorporates soft skills, is the most important competency defining an effective leader, the study revealed that other competencies are as important for effective leaders to have such as agility and technical abilities. This may be a consequence of the infusion of AI-based technologies in the UAE government that will trigger dynamic working environments. Horner (1997) stated that environmental factors trigger changes in the nature of work, workforce talents, and organizational structures, which compel new concepts of leadership in organizations to remain effective. Hence, the findings of the study encourage an extension of theory encompassing a

framework for leading in dynamic working environments driven by technological disruptions such as AI.

Conclusions

The analysis, interpretation, and synthesis of the study's key findings has led to five essential conclusions that are in accord with the objectives of UAE's future AI-driven government:

AI-transformation demands reforming organizational structure. The adoption of AI-based technologies in the UAE government will trigger various changes in which a solid infrastructure will be highly needed as a critical success factor to support the AI-transformation. Hence, to achieve the objectives of the UAE's AI-driven government, public entities within the UAE government need to redefine their structures, processes, functions, and most importantly incorporate new leadership roles in the organizational structure as a cornerstone to the adoption of AI-based technologies. The new leadership roles will collectively contribute in establishing a culture of innovation, building a data-driven organization, and encouraging in-house Research and Development (R&D) to accomplish an effective AI-transformation.

AI is enabling augmented leaders. Although the literature revealed several controversies on AI and its impact on the future of work in various levels, this study heavily agreed with the standpoint that AI-based technologies will help humans excel in their roles. Through the concept of augmented intelligence, AI will complement human capabilities, enabling an AI-augmented workforce that is more efficient and productive. From the leadership perspective, AI-based technologies will enhance leader's efficiency and productivity in three major ways by providing supplementary cognitive capabilities. First, AI-based technologies predictive models will guide leaders to implement data-driven decision-making to achieve

desired outcomes. Second, AI-based technologies capabilities in processing and allocating information will help leaders with performing routine tasks, which in turn, will give them the time needed to focus on critical work. Third, AI-based Natural Language Processing (NLP) capabilities will equip leaders with deep insights to sustain customers' happiness. Hence, leaders seizing the wide range of opportunities from AI-based technologies will be the most effective in UAE's AI-driven government.

AI and advanced technologies are redefining the measurements of effective leadership. While some aspects of being an effective leader such as having a variety of soft skills will never change, this study found that the adoption of AI in UAE government will partially redefine effective leadership. Given that AI-based technologies are stimulating a new dynamic working environment, technical skills will become as important as soft skills for leaders. Hence, the UAE AI-driven government demands leaders with multidisciplinary backgrounds that have an equal combination of technical and soft skills to be effective. Softs skills will remain fundamental to enable transformational leaders who are capable of leading continuous changes and inspiring innovative teams in the organization. Whereas, technical skills are essential for leaders to be cognizant of the new dynamic working environment that is driven by AI and other advanced technologies.

Agility is the number one competency. The UAE government is viewed as a dynamic government that is constantly seeking for new innovations to enhance the quality of work and increase citizens' happiness. However, the challenge with implementing an advanced technology as impactful as AI is the magnitude of change associated with it. AI is yet advancing at an exponential rate allowing new advanced technologies to come up along the way that constantly requires new knowledge and skills. Hence, a focus on having leaders with an agile mindset is the

key to acquiring any type of new knowledge and skills. Agile leaders are flexible, adaptable, and open to all sorts of changes to thrive in a dynamic environment.

Innovative methods are essential to develop needed leaders. To successfully achieve the objectives of the AI-transformation, the UAE government will need to build and prepare new types of leaders using various methods. Professional development programs such as corporate trainings are undoubtedly still essential to acquire the talents needed for the AI-driven government. However, the UAE government should move beyond traditional methods to deliver professional development programs and encourage more innovative methods to receive optimal return on investment. Some innovative methods found in this study included the concepts of experiential learning, scenario-based training, and blended training programs. UAE government should utilize innovative educational methods to build and prepare leaders that meet the AI-driven government needs. More importantly, another essential step the UAE government should consider is to target building the next generation of leaders by developing an education system that promotes innovative pursuits and self-learning. In an era characterized by continuous technological change in which concepts as innovation, agility, and self-learning altogether will be the key to hastily cope with rapid changes.

Implications for Policy and Practice

This study found that public entities within the UAE government would need to consider a reorientation in their organizational structure by reviewing roles in addition to incorporating new leadership roles that will facilitate AI-transformation. The new leadership roles should help in fostering innovation, and establishing a data-driven culture. More importantly, this study found that the adoption of AI-based technologies in the UAE government will redefine the measurements of effective leadership. The transition to an AI-driven government demands new

types of leaders that are equipped with specific mindset, knowledge, and skillsets. Hence, upon the findings of this study, various public entities within the UAE government are encouraged to redefine their leadership framework by incorporating concepts that fit the needs of UAE's AI-driven government. The key findings of this study have contributed in a leadership framework that could be implemented by various public entities within UAE government to facilitate the AI-transformation. The leadership framework included the critical competencies of an effective leader in UAEs AI-driven government as shown in Figure 6.

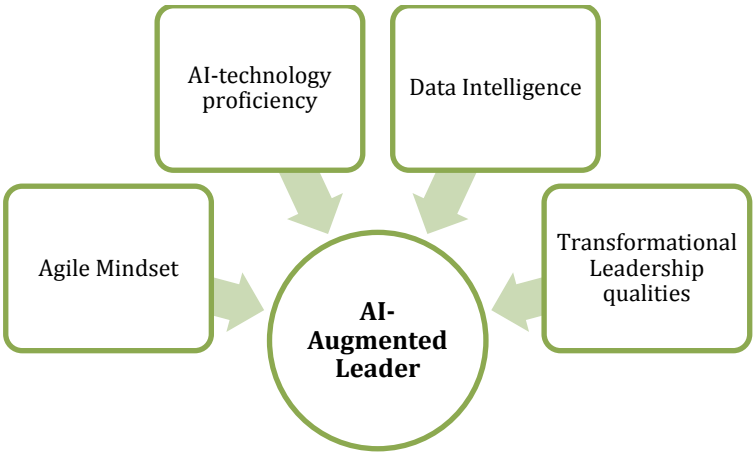

Figure 6. AI-augmented leader framework.

The AI-augmented leader framework provides the fundamental competencies to be instilled in leaders in order to leverage the wide variety of capabilities associated with AI-based technologies. This framework also allows leaders not to only effectively utilize AI-based technology, but also overcome the challenges and obstacles related to implementing any sorts of advanced technologies such as leading and adapting change. Equally important, the key findings of this study can be utilized by the UAE government to redesign their leadership development programs by including the most effective and innovative methods. Also, the results of this study signified that the UAE government profoundly needs to develop an education system that

promotes innovation, creativity, and most importantly self-learning in order to build the next generation of leaders that are capable of attaining the future vision to become a successful high technology-oriented government.

Recommendations for Further Study

One of the major limitations initially associated with this study was the lack of empirical research discussing the impact of adopting AI-based technologies on organizational leadership. The adoption of AI-based technologies is considered relatively innovative to most organizations in the world, particularly in the public sector, that is transforming the nature of work. Although AI-based technologies offer a wide range of opportunities, it also stimulates challenges that organizations must conquer to accomplish desired objectives. Hence, conducting research is an extremely vital method to proactively address the various implementations needed in organizations to embrace the opportunities and overcome the challenges entailed with AI-transformations.

Consequently, this study has contributed to the field by providing noteworthy empirical evidence as an additional body of knowledge that could be expanded through further research. The findings of this study indicated several possible research questions that could further guide organizations for a successful AI-transformation:

- What are the best ways that could be implemented to build an agile, flexible, and adaptable workforce?
- What are the key factors to foster a culture of innovation in the public sector?
- How should organizations redesign their organizational structure to effectively cope with AI-transformation?

- What are some of the innovative methods organizations can implement to facilitate re-skilling employees for a successful AI-transformation?
- What are the best practices to build and implement an education system that promotes self-learning, adaptability, and innovation?

Furthermore, the demographic analysis of the sample participated in this study revealed that more than 82% of the participants were male. Hence, replicating this study with a more gender-balanced sample is another key recommendation for further study to determine if this demographic modification will elicit altered conclusions.

Summary

The adoption of AI-based technologies in the UAE government offers major opportunities to boost overall performance, and achieve employees as well as customers' happiness (Government.ae, 2018). The major breakthrough between AI-transformation and previous digital transformation is the magnitude of change produced by AI-based technologies. AI-based technologies are deemed to reshape the nature of work in many sectors in terms of altering how work was previously done. Hence, a successful implementation of an advanced technology as impactful as AI requires developing a solid infrastructure to support it.

Over the decades, effective leadership has played a pivotal role to support organizations' vision and strategy. However, advances in technology are one of the major forces redefining effective leadership in organization (Goleman et al., 2013). Thus, the main purpose of this study was to identify how effective leadership will be measured in UAE's Artificial Intelligence (AI)-driven government. Consequently, the study concluded that a successful AI-transformation will require UAE government to review the organizational leadership structure in public entities. The new structure should include leadership roles that foster a culture of innovation, establish a data-

centered organization, and encourage experimenting new technologies as a foundation for the AI-transformation.

Moreover, the study found that effective leaders in UAE AI-driven government will utilize AI-based technologies to augment their capabilities to make them more efficient and productive in the workplace. AI cognitive capabilities are able to guide leaders in decision-making and to solve complex problems. In addition, this study found that a successful AI-transformation demands leaders with four major competencies that entail an equal combination of soft and technical skills. The four major competencies are agile mindset, AI-technology proficiency, data intelligence, and qualities associated with transformational leadership theory. Ultimately, the study indicated that several innovative methods are required to build and prepare the type of leaders that meet the UAE AI-driven government needs.

REFERENCES

Abbatiello, A., Knight, M., Philpot, S., & Roy, I. (2017). *Leadership disrupted: Pushing the boundaries*. Retrieved from https://www2.deloitte.com/ insights/us/en/focus/ human-capital-trends/2017/developing-digital-leaders.html

Addis, B. (2017). *Managing digital disruption requires the right strategy and mindset*. Retrieved from http://www.digitalistmag.com/future-of-work/2017/11/14/ managing-digital-disruption-requires-strategy-right-mindset-05482801

Afuah, A. N., & Utterback, J. M. (1997). Responding to structural industry changes: A technological evolution perspective. *Industrial and Corporate Change, 6*(1), 183-202. doi: 10.1093/icc/6.1.183

Agrawal, A., Gans, J., & Goldfarb, A. (2018). *Prediction machines: The simple economics of artificial intelligence.* Cambridge, MA: Harvard Business Press.

Alkaya, A., & Hepaktan, C. E. (2003). Organization change. *Yönetim ve Ekonomi, 10*(1), 31-58. Retrieved from http://dergipark.ulakbim.gov.tr/yonveek/article/ viewFile/5000069045/5000063949

Al-Khouri, A. M. (2012). eGovenment strategies: The case of the United Arab Emirates (UAE). *European Journal of ePractice, 17*, 126-150. Retrieved from https://www.ica.gov.ae/assets/kKbkN9NSOGI.pdf.aspx

Antonakis, J. (2012). Transformational and charismatic leadership. In D. D. Day & J. Antonakis (Eds.), *The nature of leadership* (pp. 256-288). Thousand Oaks, CA: Sage.

Arabian Business. (2018). *MoU signed to train Emiratis in AI at Oxford*. Retrieved from http://www.arabianbusiness.com/technology/394194-mou-signed-to-train-emiratis-in-ai-at-oxford

Autor, D. (2014). Skills, education, and the rise of earnings inequality among the "other 99 percent." *Science, 344*(6186), 843-851. doi: 10.1126/science.1251868

Autor, D. H. (2015). Why are there still so many jobs? The history and future of workplace automation. *Journal of Economic Perspectives*, *29*(3), 3-30. Retrieved from https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.29.3.3

Autor, D., & Dorn, D. (2013). The growth of low skill service jobs and the polarization of the US labor market. *The American Economic Review*, *103*(5), 1553-1597. doi: 10.3386/w15150

Avolio, B. J. (2004). *Leadership development in balance: Made/born*. Mahwah, NJ: Lawrence Erlbaum.

Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York, NY: The Free Press.

Bass, B. M., & Avolio, B. J. (1993). *Improving organizational effectiveness through transformational leadership*. Thousand Oaks, CA: Sage.

Bass, B. M., & Bass, R. (2008). *The Bass handbook of leadership: Theory, research, and managerial applications*. New York, NY: Free Press.

Bass, B. M., & Riggio, R. E. (2006). *Transformational leadership*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bennis, W. G. (1989). Managing the Dream: Leadership in the 21st Century. *Journal of Organizational Change Management, 2(*1), 6-10. doi:10. 1108/09534818910134040

Bernard, L. L. (1926). *An introduction to social psychology*. New York, NY: US: Henry Holt.

Bessen, J. (2015). Toil and technology. *Finance and Development, 52*(1), 16-19. Retrieved from http://www.imf.org/external/pubs/ft/fandd/2015/03/bessen.htm

Bhindi, N. L., & Duignan, P. (1997). Leadership for a new country: Authenticity, intentionality, spirituality and sensibility. *Educational Management & Administration, 25*(2), 117-132. doi:10. 1177/0263211X97252002

Birkinshaw, J., Zimmermann, A., & Raisch, S. (2016). How do firms adapt to discontinuous change? Bridging the dynamic capabilities and ambidexterity perspectives. *California Management Review, 58*(4), 36-58. https://doi.org/10.1525/cmr.2016.58.4.36

Blanchard, K. H., Zigarmi, D., & Nelson, R. B. (1993). Situational leadership after 25 years: A retrospective. *Journal of Leadership & Organizational Studies, 1*(1), 21-36. doi:10.1177/107179199300100104

Blanchard, K. H., Zigarmi, P., & Zigarmi, D. (1985). *Leadership and the one minute manager. Increasing effectiveness through situational leadership.* New York, NY: William Morrow.

Bolden, R., Gosling, J., Marturano, A., & Dennison, P. (2003). *A review of leadership theory and competency frameworks*. Exeter, UK: Centre for Leadership Studies, University of Exeter.

Bourton, S., Lavoie, J., & Vogel, T. (2018). Leading with inner agility. *McKinsey Quarterly*. Retrieved from https://www.mckinsey.com/business functions/organization/our-insights/leading-with-inner-agility

Braun, V., & Clarke, V. (2013). What can "thematic analysis" offer health and wellbeing researchers? *International Journal of Qualitative Studies on Health and Well-Being, 9*, 26152. doi: 10.3402/qhw.v9.26152

Bresnahan, T. F. (1999). Computerisation and wage dispersion: An Analytical reinterpretation. *The Economic Journal, 109*(459), 390-415. doi: 10.1111/1468- 0297.00442

Bresnahan, T. F., Brynjolfsson, E., & Hitt, L. M. (2002). Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence. *The Quarterly Journal of Economics, 117*(1), 1st ser., 339-376. https://doi.org/10.1162/003355302753399526

Brimley, V., & Garfield, R. R. (2007). *Financing education in a climate of change* (10th ed.). Boston, MA: Allyn & Bacon.

Bryman, A. (1986). *Leadership and Organizations*. Boston, MA: Routledge & Kegan Paul.

Bryman, A. E. (1992). *Charisma and leadership in organizations*. London, UK: Sage.

Brynjolfsson, E., & McAfee, A. (2012). *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy*. Lexington, MA: Digital Frontier Press.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age*. New York, NY: W.W. Norton & Company.

Burns, J. M. (1978). *Leadership*. Oxford, UK: Harper & Row.

Campbell, M., Hoane, A., & Hsu, F. H. (2002). Deep blue. *Artificial Intelligence, 134*(1-2), 57-83. doi: 10.1016/S0004-3702(01)00129-1

Certo, S. C. (1992). *Modern management*. Upper Saddle River, NJ: Prentice-Hall.

Chamorro-Premuzic, T., Wade, M., & Jordan, J. (2018). As AI makes more decisions, the nature of leadership will change. *Harvard Business Review*. Retrieved from https://hbr.org/ 2018/01/as-ai-makes-more-decisions-the-nature-of- leadership-will-change

Chand, E. R. (2017). *What 4 key goals set for UAE Centennial in 2071?* Retrieved from http://www.emiratesnews247.com/4-key-goals-set-uae-centennial-2071/

Chou, P. (2014). Does transformational leadership matter during organizational change? *European Journal of Sustainable Development*, 3(3), 49. doi: 10.14207/ejsd.2014.v3n3p49

Christensen, C. M. (1997). *The innovator's dilemma*. Boston, MA: Harvard Business School Press.

Christensen, C. M., & Overdorf, M. (2000). Meeting the challenge of disruptive change. *Harvard Business Review*, *78*(2), 66-77. Retrieved from https://hbr.org/2000/03/meeting-the-challenge-of-disruptive-change

Chui, M., Kamalnath, V., & McCarthy, B. (2018). *What a CEO needs to know about machine learning algorithms*. Retrieved from https://www.datasciencecentral.com/profiles/blogs/what-a-ceo-needs-to-know-about-machine-learning-algorithms

Chui, M., Manyika, J., & Miremadi, M. (2016). Where machines could replace humans—and where they can't (yet). *McKinsey Quarterly*. Retrieved from https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines- could-replace-humans-and-where-they-can't-yet

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128-152. doi: 10.2307/2393553

Covey, S. R. (1991). *Principle centered leadership*. New York, NY: Simon & Schuster.

Creswell, J. W., & Creswell J. D. (1997). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.

Creswell, J. W., & Plano, C. V. L. (2006). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Daft, R. L. (1999). *Leadership: Theory and practice*. Fort Worth, TX: Dryden Press.

D'Aniello, G., Loia, V., & Orciuoli, F. (2017). Adaptive goal selection for improving situation awareness: The Fleet management case study. *Procedia Computer Science, 109*, 529-536. doi:10.1016/j.procs.2017.05.332

Daugherty, P. R., & Wilson, H. J. (2018). *Human + machine: Reimagining work in the age of AI*. Cambridge, MA: Harvard Business Press.

Davenport, T. H., & Kirby, J. (2015).*Only humans need apply: Winners and losers in the age of smart machines.* New York, NY: Harper Collins.

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*. Retrieved from https://hbr.org/2018/01/artificial- intelligence-for-the-real-world

Deane, P. M. (1979). *The first industrial revolution*. London, UK: Cambridge University Press.

De Vries, K., Manfred, F. R., & Florent-Treacy, E. (2002). Global leadership from A to Z: Creating high commitment organizations. *Organizational Dynamics*, *30*(4), 295-309. doi: 10.1016/S0090-2616(02)00067-0

Den Hartog, D. N., Van Muijen, J. J., & Koopman, P. L. (1997). Transactional versus transformational leadership: An analysis of the MLQ. *Journal of Occupational and Organizational Psychology, 70*(1), 19-34. doi:10.1111/j.2044-8325.1997.tb00628.x

Dvir, T., Eden, D., Avolio, B., & Shamir, B. (2002). Impact of transformational leadership on follower development and performance: A field experiment. *The Academy of Management Journal, 45*(4), 735-44. doi:10.2307/3069307

Eggers, W. D., Schatsky, D., & Viechnicki, P. (2017). *How artificial intelligence could transform government*. Retrieved from https://www2.deloitte.com/insights/us/en/focus/cognitive-technologies/artificial-intelligence-government-summary.html

Ekvall, G., & Arvonen, J. (1991). Change-centered leadership: An extension of the two-dimensional model. *Scandinavian Journal of Management, 7*(1), 17-26. https://doi.org/10.1016/0956-5221(91)90024-U

Endsley, M. R. (2001). *Designing for situation awareness in complex systems.* Paper presented at the Second International Workshop on Symbiosis of Humans, Artifacts and Environment, Kyoto, Japan.

Erickson, R. J. (1995). The importance of authenticity for self and society. *Symbolic Interaction, 18*(2), 121-144. doi:10.1525/si.1995.18.2.121

Ferris, G. R., & Rowland, K. M. (1981). Leadership, job perceptions, and influence: A conceptual integration. *Human Relations, 34*(12), 1069-1077. doi:10.1177/001872678103401204

Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change, 114*, 254-280. doi: 10.1016/j.techfore.2016.08.019

García-Morales, V. J., Lloréns-Montes, F. J., & Verdú-Jover, A. J. (2008). The effects of transformational leadership on organizational performance through knowledge and innovation. *British Journal of Management, 19*(4), 299-319. doi: 10.1111/j.1467-8551.2007.00547.x

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. doi: 10.1016/j.leaqua.2005.03.003

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

George, B., Sims, P., McLean, A. N., & Mayer, D. (2007). Discovering your authentic leadership. *Harvard Business Review, 85*(2), 129. Retrieved from https://www.simplylifeindia.com/uploads/8/1/1/5/8115412/discovering_your_authentic_leadership.pdf

George, J. M. (2000). Emotions and leadership: The role of emotional intelligence. *Human Relations, 53*(8), 1027-1055. doi: 10.1177/0018726700538001

Gilbert, C. G. (2005). Unbundling the structure of inertia: Resource versus routine rigidity. *Academy of Management Journal, 48*(5), 741-763. Retrieved from https://journals.aom.org/doi/abs/10.5465/amj.2005.18803920

Goleman, D. (1998). *Working with emotional intelligence*. New York, NY: Bantam Books.

Goleman, D. (2005). *Emotional intelligence*. New York, NY: Bantam Books.

Goleman, D., Boyatzis, R. E., & McKee, A. (2013). *Primal leadership: Unleashing the power of emotional intelligence*. Boston, MA: Harvard Business Review Press.

Government.ae. (2017). *UAE strategy for artificial intelligence*. Retrieved from https://government.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/uae-strategy-for-artificial-intelligence

Government.ae. (2018). *The United Arab Emirates’ government portal*. Retrieved from https://government.ae/en#/

Graeff, C. L. (1983). The situational leadership theory: A critical view. *The Academy of Management Review, 8*(2), 285-291. doi: 10.2307/257756

Halaweh, M. (2018). Artificial intelligence government (Gov. 3.0): The UAE leading model. *Journal of Artificial Intelligence Research, 62*, 269-272. https://doi.org/10.1613/jair.1.11210

Harter, S. (2002). Authenticity. In C. R. Synder, & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp.382-394). New York, NY: Oxford University Press.

Hatcher, L. (2013). *Advanced statistics in research: Reading, understanding, and writing up data analysis results*. Saginaw, MI: ShadowFinch Media, LLC.

Herold, G. (2016). *Industry 4.0: Leadership in the fourth industrial revolution*. Retrieved from https://www.stantonchasemontreal.com/en/industry-40-leadership/

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

Hersey, P., & Blanchard, K. H. (1977). *Management of organization behavior: Utilizing human resources* (3rd. ed.). Englewood Cliffs, NJ: Prentice-Hall.

Higgs, M. (2003). How can we make sense of leadership in the 21st century? *Leadership & Organization Development Journal, 24*(5), 273-284. Retrieved from https://www.researchgate.net/profile/Malcolm_Higgs/publication/235314014_How_can_we_make_sense_of_leadership_in_the_21st_century/links/0046352a0434fc9fd7000000.pdf

Higgs, M. J., & Dulewicz, S. V. (2003). *Design of a new instrument to assess leadership dimensions and styles*. Reading, UK: Henley Working Paper Series. Retrieved from https://eprints.soton.ac.uk/51494/

High, R. (2012). *The era of cognitive systems: An inside look at IBM Watson and how it works*. Retrieved from http://www.redbooks.ibm.com/red papers/pdfs/redp4955.pdf

Hill, C. W., & Rothaermel, F. T. (2003). The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review, 28*(2), 257- 274. https://doi.org/10.5465/amr.2003.9416161

Hogan, R., Curphy, G. J., & Hogan, J. (1994). What we know about leadership: Effectiveness and personality. *American Psychologist, 49*(6), 493-504. doi: 10.1037//0003-066X.49.6.493

Horner, M. (1997). Leadership theory: Past, present and future. *Team Performance Management: An International Journal, 3*(4), 270-287. doi: 10.1108/13527599710195402

Howell, J. M., & Avolio, B. J. (1993). Transformational leadership, transactional leadership, locus of control, and support for innovation: Key predictors of consolidated-business-unit performance. *Journal of Applied Psychology, 78*(6), 891-902. doi: 10.1037/0021-90 10.78.6.891

Hughes, T. G. (2005). *Identification of leadership style of enrollment management professionals in post-secondary institutions in the Southern United States* (Doctoral dissertation, Texas Tech University) (pp.1-140). Lubbock, TX. Retrieved from https://ttu-ir.tdl.org/handle/2346/15542

Hulten, C. R., Dean, E. R., & Harper, M. J. (2001). *New developments in productivity analysis*. Chicago, IL: University of Chicago Press.

Hyacinth, B. T. (2017). *The future of leadership: Rise of automation, robotics and artificial intelligence*. Port of Spain, Trinidad & Tobago: MBA Caribbean Organisation.

Infosys. (2018). *Leadership in the age of AI* (Rep.). Retrieved from https://www.infosys.com/age-of-ai/Documents/age-of-ai-infosys-research-report.pdf

Jansen, J. J. P., Vera, D., & Crossan, M. (2009). Strategic leadership for exploration and exploitation: The moderating role of environmental dynamism. *The Leadership Quarterly, 14*(1), 5-18. doi: 10.1016/j.leaqua.2008.11.008

Johnston, R. E. (1966). Technical progress and innovation. *Oxford Economic Papers, 18*(2), 158-176. Retrieved from https://www.jstor.org/stable/2662432

Jones, D. G., & Endsley, M. R. (1996). Sources of situation awareness errors in aviation. *Aviation, Space, and Environmental Medicine, 67*(6), 507-512. Retrieved from http://psycnet.apa.org/record/1996-04760-001

Jorgenson, D. W., & Vu, K. M. (2016). The ICT revolution, world economic growth, and policy issues. *Telecommunications Policy, 40*(5), 383-397. Retrieved from http://daneshyari.com/article/preview/556532.pdf

Judge, T. A., & Bono, J. E. (2000). Five-factor model of personality and transformational leadership. *Journal of Applied Psychology, 85*(5), 751-765. Retrieved from https://www.researchgate.net/profile/Joyce_Bono/publication/12271857_Five-Factor_Model_of_Personality_and_Transformational_Leadership/links/54341a1b0cf294006f734c7c/Five-Factor-Model-of-Personality-and-Transformational-Leadership.pdf

Jung, D. I., Chow, C., & Wu, A. (2003). The role of transformational leadership in enhancing organizational innovation: Hypotheses and some preliminary findings. *The Leadership Quarterly, 14*(4-5), 525-544. Retrieved from https://pdfs.semanticscholar.org/1a06/ad4313b1f0a5d2fb1aaad22eca8595f6df60.pdf

Kendrick, J. W. (1975). *Productivity trends in the United States*. Princeton, NJ: Princeton University Press.

Kerr, R., Garvin, J., Heaton, N., & Boyle, E. (2006). Emotional intelligence and leadership effectiveness. *Leadership & Organization Development Journal*, *27*(4), 265-279. doi:10.1108/01437730610666028

Kirkland, R. (2014). Artificial intelligence meets the C-suite. *McKinsey Quarterly*. Retrieved from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/artificial-intelligence-meets-the-c-suite#0

Kolbjørnsrud, V., Amico, R., & Thomas, R. J. (2016a). How artificial intelligence will redefine management. *Harvard Business Review*, *11*. Retrieved from https://hbr.org/2016/11/how-artificial-intelligence-will-redefine-management

Kolbjørnsrud, V., Amico, R., & Thomas, R. J. (2016b). The promise of artificial intelligence [Digital Report]. *Accenture*. Retrieved from https://www.accenture.com/t20160516T064136__w__/us-en/_acnmedia/PDF- 19/AI_in_Management_Report.pdf

Kotter, J. P. (1987). *The leadership factor*. New York, NY: Free Press.

Kotter, J. P. (1990). *A force for change: How leadership differs from management*. New York, NY: Free Press.

Kotter, J. P. (1996). *Leading change*. Boston, MA: Harvard Business Review Press.

Kuhnert, K. W., & Lewis, P. (1987). Transactional and transformational leadership: A constructive/developmental analysis. *The Academy of Management Review*, *12*(4), 648-657. doi:10.2307/258070

Laurent, P., Chollet, T., & Herzberg, E. (2015). *Intelligent automation entering the business world*. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/operations/lu-intelligent-automation-business-world.pdf

Ledford, C., Lockwood, N. R., & Williams, S. (2008). *Leadership competencies*. Retrieved from https://www.shrm.org/resourcesandtools/toolsandsamples/toolkits/pages/developingorganizationalleaders.aspx

Lieberson, S., & O'Connor, J. F. (1972). Leadership and organizational performance: A study of large corporations. *American Sociological Review*, *37*(2), 117-130. doi:10.2307/2094020

Loucks, J., MacCaulay, J., Noronha, A., & Wade, M. (2016). *Digital vortex*. Lausanne, Switzerland: International Institute for Management Development.

Lunenburg, F. C. (2010a). Forces for and resistance to organizational change. *National Forum of Educational Administration and Supervision Journal*, *27*(4), 1-10. Retrieved from http://www.nationalforum.com/Electronic%20Journal%20Volumes/Lunenburg,%20Fred%20C.%20Forces%20For%20and%20Resistance%20to%20Change%20NFEASJ%20V27%20N4%202010.pdf

Lunenburg, F. C. (2010b). Communication: The process, barriers, and improving effectiveness. *Schooling*, 1(1), 1-11. Retrieved from https://www.mcgill.ca/engage/files/engage/communication_lunenburg_2010.pdf

Lunenburg, F. C. (2011). Leadership versus management: A key distinction—at least in theory. *International Journal of Management, Business, and Administration, 14*(1), 1-4. Retrieved from https://cs.anu.edu.au/courses/comp3120/local_docs/readings/Lunenburg_LeadershipVersusManagement.pdf

Luthans, F., & Avolio, B. J. (2003). Authentic leadership development. In K. S. Cameron, J. E. Dutton, & R. E. Quinn (Eds.), *Positive organizational scholarship: Foundations of a new discipline* (pp. 151-165). San Francisco, CA: Berret-Koehler.

Luthans, F., & Avolio, B. J. (2009). Inquiry unplugged: Building on Hackman's potential perils of POB. *Journal of Organizational Behavior, 30*(2), 323-328. https://doi.org/10.1002/job.590

Luthans, F., Norman, S., & Hughes, L. (2006). Authentic leadership. In R. Burke, & C. Cooper (Eds.), *Inspiring leaders* (pp.84-104). London, UK: Routlege, Taylor & Francis.

Manyika, J., Chui, M., Madgavkar, A., & Lund, S. (2017). What's now and next in analytics, AI, and automation. *McKinsey Global Institute*. Retrieved from https://www. mckinsey.com/ featured-insights/digital-disruption/whats-now-and-next-in-analytics -ai-and-automation#section%203

Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P.,… Sanghvi, S. (2017). Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages. *McKinsey Global Institute*. Retrieved from https://www.mckinsey.com/featured-insights/future-of-organizations-and-work/jobs-lost-jobs-gained-what-the- future-of-work-will-mean-for-jobs-skills-and-wages

Martinho-Truswell, E. (2018). How AI could help the public sector. *Harvard Business Review*. Retrieved from https://hbr.org/2018/01/how-ai-could-help -the-public-sector

Maxwell, J. C. (1993). *Developing the leader within you*. Nashville, TN: Thomas Nelson.

MBRSG. (2016). The future of public leadership development. *MBRSG*. Retrieved from https://www.mbrsg.ae/getattachment/3c3424d5-e557-4811-94cf- daaab47d3e8f/Policy-%20Council-7-The-Future-of-Public-Leadership

McClelland, D. (1973). Testing for competence rather than intelligence. *American Psychologist, 28*, 1–14. Retrieved from https://www.therapiebreve.be/documents/mcclelland-1973.pdf

McCleskey, J. A. (2014). Situational, transformational, and transactional leadership and leadership development. *Journal of Business Studies Quarterly, 5*(4), 117-130. Retrieved from https://pdfs.semanticscholar.org/f584/807652909f1c90c5a647ebcea142d2260d9a.pdf

Mdletye, M. A., Coetzee, J., & Ukpere, W. I. (2014). Do people's perceptions of change have an influence on the status of change? Lessons from the Department of Correctional Services of South Africa. *Mediterranean Journal of Social Sciences, 5*(4), 32-46. doi: 10.5901/mjss.2014.v5n4p32

Mehr, H. (2017). *Artificial intelligence for citizen services and government* (Rep.). Retrieved from https://ash.harvard.edu/files/ash/files/artificial_intelligence_for_citizen_services.pdf

Mijwel, M. M. (2015). *History of artificial intelligence*. Baghdad, Iraq: University of Baghdad.

Miller, B. (2017). *Automation beyond the physical: AI in the public sector, government technology*. Retrieved from http://www.govtech.com/civic/GTSeptember-Automation-Beyond-the-Physical-AI-in-the-Public-Sector.html

Mokyr, J. (1998). The second industrial revolution, 1870-1914. *Storia dell'economia Mondiale*, 219-245. Retrieved from https://cpb-us-e1.wpmucdn.com/sites.northwestern.edu/dist/3/1222/files/2016/06/The-Second-Industrial-Revolution-1870-1914-Aug-1998-1ubah7s.pdf

Nadler, D. A., & Nadler, M. B. (1998). *Champions of change: How CEOs and their companies are mastering the skills of radical change*. San Francisco, CA: Jossey-Bass.

Nadler, D. A., Shaw, R. B., & Walton, E. A. (1995). *Discontinuous change: Leading organizational transformation*. San Francisco, CA: Jossey-Bass.

Nadler, D. A., & Tushman, M. L. (1990). Beyond the charismatic leader: Leadership and organizational change. *California Management Review, 32*(2), 77-97. doi:10.2307/41166606

Nayar, V. (2013). Three differences between managers and leaders. *Harvard Business Review*. Retrieved from https://hbr.org/2013/08/tests-of-a-leadership-transiti

Ng, A. (2018). *AI transformation playbook: How to lead your company into the AI era*. Retrieved from https://landing.ai/content/uploads/2018/12/AI-Transformation-Playbook-v8.pdf

Northouse, P. G. (1997). *Leadership theory and practice*. Thousand Oaks, CA: Sage.

O'Brien, K. S., & O'Hare, D. (2007). Situational awareness ability and cognitive skills training in a complex real-world task. *Ergonomics, 50*(7), 1064-1091. doi: 10.1080/00140130701276640

O'Reilly, C. A., & Tushman, M. L. (2004). The Ambidextrous Organization. *Harvard Business Review.* Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/15077368

O'Reilly, C. A., & Tushman, M. L. (2013). Organizational ambidexterity: Past, present, and future. *SSRN Electronic Journal, 27*(4), 324-338. doi: 10.2139/ssrn.2285704

Parloff, R. (2016). The AI revolution: Why deep learning is suddenly changing your life. *Fortune*. Retrieved from http://fortune.com/ai-artificial-intelligence-deep-machine-learning/

Perez, D. D. (2017). *Accenture's top strategy tips for employing AI to boost profitability*. Retrieved from https://government.diginomica.com/2017/06/23/accentures-top-strategy-tips-employing-ai-boost-profitability/.

Petrie, N. (2011). Future trends in leadership development [Digital Report]. *Centre for Creative Leadership,* 1-36. Retrieved from https://www.ccl.org/wp-content/uploads/2015/04/futureTrends.pdf

Pullen, W. (1993). Strategic shocks: Managing discontinuous change. *International Journal of Public Sector Management, 6*(1). doi: 10.1108/09513559310023563

Purdy, M., & Daughterty, P. (2017). How AI boosts industry profits and innovation [Digital Report]. *Accenture,* 1-28. Retrieved from https://www.accenture.com/fr-fr/_acnmedia/36DC7F76EAB444CAB6A7F44017CC3997.pdf

PWC. (2017). Will robots really steal our jobs? [Digital Report]. *PWC,* 1-43. Retrieved from https://www.pwc.com/hu/hu/kiadvanyok/assets/pdf/impact_of_automation_on_jobs.pdf

Rao, A.S., & Verweij, G. (2017). Sizing the prize [Digital Report]. *PWC,* 1-29. Retrieved from https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

Reddin, W. J. (1967). 3-D management style theory-typology based on task and relationships orientations. *Training and Development Journal*, *21*(4), 8-17. Retrieved from http://www.reddinconsultants.com/wp-content/uploads/2011/05/3D-Mgmt-Style-Theory.pdf

Renjen, P. (2018). *Industry 4.0: Are you ready?* Retrieved from https://www.deloitte.com/insights/us/en/deloitte-review/issue-22/industry-4-0-technology-manufacturing-revolution.html

Reshamwala, A., Mishra, D., & Pawar, P. (2013). Review on natural language processing. *IRACST—Engineering Science and Technology: An International Journal (ESTIJ), 3*(1), 113-116. Retrieved from https://www.researchgate.net/profile/Alpa_Reshamwala/publication/235788362_review_on_natural_language_processing/links/00463516276f412048000000.p df

Rubin, H. J., & Rubin, I. (2005). *Qualitative interviewing: The art of hearing data*. Thousand Oaks, CA: Sage.

Ryan, K., & Ali, A. (2013). *The new government leader: Mobilizing agile public leadership in disruptive times*. Retrieved from https://www2.deloitte.com/insights/us/en/topics/talent/the-new-government-leader-mobilizing-agile-public-leadership-in- disruptive-times.html

Ryder, A. (2017). Augmentation versus automation: AI's utility in the workplace. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/article/augmentation-versus-automation-ais-utility-in-the-workplace/

Salas, E., Prince, C., Baker, D. P., & Shrestha, L. (1995). Situation awareness in team performance: Implications for measurement and training. *Human Factors*, *37*(1), 123-136. doi: 10.1518/001872095779049595

Sallomi, P. (2015). Artificial intelligence goes mainstream. *The Wall Street Journal*. Retrieved from http://deloitte.wsj.com/cio/2015/07/29/artificial-intelligence-goes-mainstream/

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, cognition and personality*, *9*(3), 185-211. doi: 10.2190/DUGG-P24E-52WK-6CDG

Schank, R. C., & Slade, S. B. (1991). *The future of artificial intelligence: Learning from experience*. https://doi.org/10.1080/08839519108927919

Schatsky, D., Muraskin, C., & Gurumurthy, R. (2015). Cognitive technologies. *Deloitte Review, 16*. Retrieved from https://www2.deloitte.com/insights/us/en/deloitte-review/issue-16/cognitive-technologies-business-applications.html

Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. New York, NY: Harper & Brothers.

Schwab, K. (2016). *The fourth industrial revolution*. New York, NY: World Economic Forum.

Segars, A. H. (2018). Seven technologies remaking the world. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/projects/seven-technologies-remaking-the-world/

Senior, B. (1997). *Organisational change*. London, UK: Pitman.

Society for Human Resource Management. (2012). *SHRM Competency Model (Report).* Retrieved from SHRM website: https://www.shrm.org/Learning AndCareer/competency-model/Documents/Full%20Competency%20Model% 2011 %202_10%20%202014.pdf

Solow, R. M. (1956). A Contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65-94. Retrieved from https://www.jstor.org/stable/pdf/1884513.pdf?refreqid=excelsior%3A2dbe474d6458afb8 71cee3607bfd9bdb

Stanford University. (2016). *Artificial intelligence and life in 2030*. Report of the 2015-2016 Study Panel. Retrieved from https://ai100.stanford.edu/2016-report.

Stogdill, R. M. (1974). *Handbook of leadership: A survey of theory and research*. New York, NY: Free Press.

Sydänmaanlakka, P. (2003). *Intelligent leadership and leadership competencies. Developing a leadership framework for intelligent organizations* (Doctoral dissertation). Retrieved from http://lib.tkk.fi/Diss/2003/isbn9512263602/

Szarlan, J., Singha, S., & Brown, S. W. (2010). *Striving for excellence: A manual for goal achievement*. Upper Saddle River, NJ: Pearson Education.

Teece, D. J. (2017). Dynamic capabilities and (digital) platform lifecycles. In J. Furman, A. Gawer, B. S. Silverman, & S. Stern (Eds.), *Entrepreneurship, innovation, and platforms* (pp. 211-225). West Yorkshire, England: Emerald.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Thomas, R. J., Fuchs, R., & Silverstone, Y. (2016). A machine in the C-suite [Digital Report]. *Accenture*, 1-9. Retrieved from https://www.accenture.com/t00010101T000000Z__w__/br-pt/_acnmedia/PDF-13/Accenture-Strategy-WotF-Machine-CSuite.pdf

Tidd, J., Bessant, J., & Pavitt, K. (1997). *Managing innovation: Integrating technological, market and organization change*. West Sussex, UK: John Wiley & Sons.

Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, *59*(236), 433-460. Retrieved from http://phil415.pbworks.com/f/TuringComputing.pdf

Turner, J. R., & Müller, R. (2005). The project manager's leadership style as a success factor on projects: A literature review. *Project Management Institute*. Retrieved from https://s3.amazonaws.com/academia.edu.documents/30842969/refw_135._Leadership_style_as_a_succes_factor_%28overlap_met_boek%29.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1529325014&Signature=UN3AXg%2FXkz8PJ4H68piaf33%2BevA%3D&response-content- disposition=inline%3B%20filename%3D The_project_manager_s_leadership_style_a.pdf

UAE Centennial 2071. (2018). AREA 2071. Retrieved from https://area2071.ae/

UAE Government Leaders Programme. (2018). *Strategic leaders programme*. Retrieved from https://www.uaeglp.gov.ae/en/categories-programme/7

UAE 2031 (2018). *UAE artificial intelligence strategy*. Retrieved from http://www.uaeai.ae/en/

UAE Vision 2021. (2018). *UAE vision*. Retrieved from https://www.vision2021.ae/en/uae-vision

UNIDO. (2002). *UNIDO Competencies*. Retrieved from http://www.unido.org

Uzohue, C. E., Yaya, J. A., & Akintayo, O. A. (2016). A review of leadership theories, principles, styles, and their relevance to management of health science libraries in Nigeria. *Journal of Educational Leadership and Policy*, *1*(1), 17-26. Retrieved from http://www.aiscience.org/journal/jelp

Van Linden, J. A., & Fertman, C. I. (1998). *Youth leadership: A guide to understanding leadership development in adolescents*. San Francisco, CA: Jossey-Bass.

Van Velsor, E., Turregano, C., Adams, B., & Fleenor, J. (2016). Creating tomorrow's government leaders [Digital Report]. *Center for Creative Leadership,* 1-28. Retrieved from https://www.ccl.org/wp-content/uploads/2016/09/creating-government-leaders-and-addressing-challenges-center-for-creative-leadership.pdf

Wade, M. R., Tarling, A., & Neubauer, R. (2017) *Redefining leadership for a digital age (Report)*. Retrieved from https://www.imd.org/dbt/reports/redefining-leadership/

Wallace, M., & Weese, W. J. (1995). Leadership, organizational culture, and job satisfaction in Canadian YMCA organizations. *Journal of Sport Management, 9*(2), 182-193. Retrieved from http://docshare01.docshare.tips/files/4020/40207029.pdf

Weber, M. (1947). *The theory of social and economic organization*. New York, NY: Free Press.

Wilson, H., Daugherty, P. R., & Morini-Bianzino, N. (2017). The jobs that artificial intelligence will create. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/article/will-ai-create-as-many-jobs-as-it-eliminates/

Wisskirchen, G., Thibault Biacabe, B., Bormann, U., Muntz, A., Niehaus, G., Jiménez Soler, G., & von Brauchitsch, B. (2017). *Artificial intelligence and robotics and their impact on the workplace* (Rep.). Retrieved from www.file:///Users/jc16119339/Downloads/AI-and-Robotics-IBA-GEI-April-2017.pdf

World Economic Forum. (2016, January). *Executive summary: The future of jobs and skills*. Cologny/Geneva, Switzerland.

Yammarino, F. J., & Bass, B. M. (1990). Long term forecasting of transformational leadership and its effects among naval officers: Some preliminary findings. In K. E. Clark & M. B. Clark (Eds.), *Measures of leadership* (pp. 151-169). West Orange, NJ: Leadership Library of America.

Yammarino, F. J., Dionne, S. D., Schriesheim, C. A., & Dansereau, F. (2008). Authentic leadership and positive organizational behavior: A meso, multi-level perspective. *The Leadership Quarterly, 19*(6), 693-707. Retrieved from https://www.sciencedirect.com/science/article/pii/S1048984308001288

Yeakey, G. W. (2002). Situational leadership. *Military Review*, *82*, 72-82. Retrieved from https://www.tib.eu/en/search/id/BLSE%3ARN109406648/Situational-Leadership/

Yukl, G. A. (1981). *Leadership in organizations*. Englewood Cliffs, NJ: Prentice-Hall.

Yukl, G. A. (2010). Early contingency theories of effective leadership. In A. Bryman, D. Collinson, K. Grint, B. Jackson, & M. Uhl-Bien (Eds.), *The Sage handbook of leadership* (pp. 298-299). Thousand Oaks, CA: SAGE Publications, Inc.

Yukl, G. A. (2011). Contingency theories of effective leadership. In A. Bryman, D. Collinson, K. Grint, B. Jackson, & M. Uhl-Bien (Eds.), *The Sage handbook of leadership* (pp. 286-298). Thousand Oaks, CA: Sage.

Zaleznik, A. (1977). Managers and leaders: Are they different? *Harvard Business Review*, *55*(3), 67-78. Retrieved from https://www.ncjrs.gov/App/abstractdb/AbstractDBDetails.aspx?id=143254

APPENDIX A

Copyright Permissions

Mackenzie Wise 7:08 AM (8 hours ago)

to me

Hello Ahmed,

You have permission to use the figure in your dissertation. Should you choose to later publish you dissertation publicly in a magazine or book, please reach out again to discuss copyright.

Best wishes,

Mackenzie Wise
Manager, Content Distribution and Support
MIT Sloan Management Review
617 253 7170
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Till Leopold <Till.Leopold@weforum.org> Apr 17, 2019, 3:31 AM

to me

Hi Ahmed,

For a doctoral dissertation, this is no problem at all. Permission granted :)

Best wishes,

Till Alexander Leopold
Centre for the New Economy and Society
World Economic Forum
www.weforum.org

Tim Cannon (Harvard Business Publishing)
May 25, 11:05 AM EDT

Dear Ahmed Almarzooqi,

Thank you for your email and we appreciate your checking with us. Please note that as long as the HBR material is only being used to fulfill the class assignment in the pursuit of your degree, permission would be granted at no charge as long as the material is fully cited/

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APPENDIX B

Mixed Methods Plan

Main RQ: In the perception of individuals currently associated with UAE government, what key factors could contribute to effective leadership in the UAE's future Artificial Intelligence (AI)-driven government?			
Sub-RQs	Data Source	Measurement	Analysis Methods
1. How will AI redefine leadership roles in the UAE government?	Survey	Survey Question (SQ) #1: Of the following list of potential benefits of adopting AI-based technologies, which do you perceive apply to the UAE government? SQ #2: Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will redefine leadership roles? SQ #4: For each of the following leadership roles, indicate the level of importance for the UAE's future AI-driven government success.	Descriptive statistics
	Semi-Structured Interview	Interview Question (IQ) #1: I'm interested in knowing more about how you perceive the adoption of AI-based technologies will redefine leadership roles in UAE's Government. Can you share some general thoughts about this with me? IQ #2: Do you think the adoption of AI will create new leadership roles and will change or eliminate some existing leadership roles? If so, can you tell me why?	Thematic analysis (open coding and axial coding)
2. How will AI-based technologies help UAE government leaders become more efficient and productive?	Survey	SQ #5: In what ways can UAE government leaders improve their efficiency and productivity with the utilization of AI-based technologies?	Descriptive statistics
	Semi-Structured Interview	IQ #3: What AI-based technologies are leaders currently using in UAE government and in what specific ways are they improving leaders efficiency and productivity? IQ #4: If you could design a new AI-based technology that would further enhance the efficiency and productivity of leaders in UAE government, what would be its purpose and how would it function?	Thematic analysis (open coding and axial coding)

Sub-RQs	Data Source	Measurement	Analysis Methods
3. What are the critical competencies of UAE government leaders required for the success of the UAE's future AI-driven government?	Survey	SQ #3: Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will require leaders to develop new competencies? SQ #6: For each of the following leadership soft competencies, indicate the level of importance for the UAE's future AI-driven government success. SQ #7: For each of the following leadership hard competencies, indicate the level of importance for the UAE's future AI-driven government success. SQ #8: Are leadership soft competencies or leadership hard competencies more important to the UAE's future AI-driven government success? SQ #9: What level of AI-technical knowledge do leaders require to be effective in the UAE's future AI-driven government?	Descriptive statistics
	Semi-Structured Interview	IQ #5: What are the AI-related critical skills leaders should develop in order to effectively utilize/interact with those AI-based technologies?	Thematic analysis (open coding and axial coding)
4. What steps should be taken to identify and prepare the government leaders who will be needed in the UAE's AI-driven government?	Survey	SQ #10: What is the most important step UAE government should consider when developing effective leaders for the UAE's future AI-driven government? SQ #11: Do you think traditional leadership programs are sufficient for developing the leaders that will be needed in UAE's future AI-driven government?	Descriptive statistics
	Semi-Structured Interview	IQ #6: How can potential leaders be identified who can meet the future needs of the UAE's AI-driven government and UAE's Centennial Plan 2071?	Thematic analysis (open coding and axial coding)
		IQ #7: What can be done to improve current leadership development programs to prepare leaders of today and leaders of tomorrow to serve in the UAE's future AI-driven government?	Thematic analysis (open coding and axial coding)

APPENDIX C

IRB Approval

PEPPERDINE

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

NOTICE OF APPROVAL FOR HUMAN RESEARCH

Date: November 14, 2018

Protocol Investigator Name: Ahmed Almarzooqi

Protocol #: 18-09-865

Project Title: PERCEPTIONS: EFFECTIVE LEADERS IN UNITED ARAB EMIRATES (UAE) ARTIFICIAL INTELLIGENCE (AI) - DRIVEN GOVERNMENT

School: Graduate School of Education and Psychology

Dear Ahmed Almarzooqi:

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

Page: 1

APPENDIX D

Survey and Interview Consent Form

PEPPERDINE UNIVERSITY

(Graduate School of Education and Psychology)

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH ACTIVITIES

PERCEPTIONS: Effective Leaders in UAE's Future Artificial Intelligence (AI)-Driven Government

You are invited to participate in a research study conducted by Ahmed Almarzooqi, under the supervision of dissertation chair, John "Jack" McManus, Ph.D. at the Pepperdine University, because you are (a) Associated with UAE government (currently working in UAE government and/or sponsored by UAE government to continue your graduate studies) (b) have sufficient knowledge in Artificial Intelligence (AI) in which you have pursued academic work that is AI-related and/ or have received some degree of training/courses in Artificial Intelligence (AI). 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. Please take as much time as you need to read this document.

PURPOSE OF THE STUDY

UAE government has recently launched its Strategy for Artificial Intelligence (AI), which aims to transition the government to become an AI-driven by adopting various AI-based technologies to boost its overall performance. However, research has recently shown that the adoption of Artificial Intelligence-based technologies in organizations will reshape the nature of work in organizations (Kolbjørnsrud et al., 2016a). AI will alter the roles and competencies of the workforce. Which, in turn will redefine the requirements of effective leadership that is considered as one of the greatest success factors to achieve visions plans and strategies in organizations.

Hence, the purpose of this research is to study effective leaders in the UAE's future Artificial Intelligence (AI)-driven government by ascertaining the perceptions of different individuals that are currently associated with UAE government and have sufficient knowledge in Artificial Intelligence (AI). The study will particularly determine the critical leadership competencies required to achieve the vision of becoming a highly successful technology-oriented government. In addition, the study will explore how adopting AI-based technologies can redefine leadership roles as well as the steps required to develop effective leaders for the UAE's future AI-driven government.

STUDY PROCEDURES

If you agree to voluntarily to take part in this study, you will be asked to complete an online survey, which is anticipated to take between 10-15 minutes. The time to complete the survey is based on if you need to gather additional information to complete it. The electronic survey includes 11 forced-choice questions that primarily ask for your perception about how the adoption of various Artificial Intelligence (AI)-based technologies in UAE government will redefine roles of leaders, critical competencies of leaders, as well as the steps required by UAE government to develop the most competent leaders that will contribute in the success of UAE's future AI-driven government.

At the end of the survey you will be asked if you are interested in participating in a follow-up interview [by phone, any telecommunications application, or in person]. The 30-45 minutes follow-up audio-recorded interview will include 8 questions to obtain more in-depth insights of the topic. Additionally, you will be asked to provide your contact information such as your phone number or email address. If you choose to voluntarily participate in the interview, you will be contacted by the researcher to discusses further details about the interview.

POTENTIAL RISKS AND DISCOMFORTS

Potential risks and discomforts associated with participation in this study include: breach of confidentiality, lack of interest or boredom, and fatigue from sitting for a long period. The researcher will distribute a web-based electronic survey in which securing data that includes identifiable information may not be fully guaranteed. Data collected online may be hacked or leaked by electronic hackers/users, despite having the choice to prevent any identifiable information such as email address and IP addresses. However, Survey Monkey platform has multiple layers of security that will tremendously aid in securing participants identifiable information to remain confidential. In terms of the second phase of the study, which involves a follow-up audio-recorded interview, risk of breach of confidentiality is minimized as a pseudonym will be used, and all sorts of identifiable information will be completely removed from the transcribed interviews.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

There is no direct benefit to participants; however, there are potential societal benefits such as an increase of the level of understanding on the impact of the adoption of Artificial Intelligence on UAE government. In particular, the outcomes of this study may benefit various federal as well as local governmental entities to redesign their leadership frameworks to develop competent leaders, who are capable of leading in complex working environments. In addition, the research findings may stimulate the development of innovative methods of leadership development that could be further implemented to contribute in the success of UAEs future Artificial Intelligence (AI)-Driven Government

CONFIDENTIALITY

Your survey answers will be sent to a link at SurveyMonkey.com where data will be stored in a password protected electronic format. Survey Monkey does not collect identifying information such as your name, email address, or IP address. Therefore, your responses will remain confidential. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study. However, as mentioned above you will be asked at the end of the survey if you are interested in participating in a follow-up interview [by phone, any telecommunications application, or in person]. If you choose to voluntarily participate in the follow-up interview, you will be asked to provide contact information such as your name, phone number or email address. However, no names or identifying information would be included in any publications or presentations based on these data, and your responses to this survey will remain confidential. All documents collected for this study will be stored on a password – protected computer in the researcher place of residence for four years, and will be completely destroyed after four years.

PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights, or remedies because of your participation in this research study.

Once you complete the online survey, you will have the opportunity to volunteer to participate in follow-up audio-recorded interviews. If you agree to participate in a 30-45 minutes interview, you will be asked to provide your contact information in order to be contacted by the researcher. The interview questions will be sent to those volunteering in advance for review, and you have the right to refuse to participate in the follow-up interviews.

Please note that not everyone that volunteers will be contacted for a follow-up interview, as these interviews will be limited to 6-10 participants. If the number of volunteer participants exceed the number of interviews required for

this study, your further participation in the interview portion of this study many be terminated by this researcher/investigator without regard to your participant consent.

ALTERNATIVES TO FULL PARTICIPATION

The alternative to participation in the study is not participating. Your relationship with your employer, professional associations and others will not be affected whether you participate or not in this study.

EMERGENCY CARE AND COMPENSATION FOR INJURY

If you are injured as a direct result of research procedures you will receive medical treatment; however, you or your insurance will be responsible for the cost. Pepperdine University does not provide any monetary compensation for injury.

INVESTIGATOR'S CONTACT INFORMATION

I understand that the investigator is willing to answer any inquiries I may have concerning the research herein described. I understand that I may contact Ahmed Almarzooqi, Doctoral Candidate and researcher/investigator at: ahmed.almarzooqi@peperdine.edu or faculty supervisor, John "Jack" McManus, Ph.D. at jack.mcmanus@pepperdine.edu if I have any other questions or concerns about this research.

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

Please select your choice below. You may print a copy of this consent form for your records. Clicking on the "Agree" button indicates that

- You have read the above information
- You voluntarily agree to participate
- You understand that you may end your participation at end time, for any reason without penalty.

☐ Agree to Participate

☐ Disagree to Participate

If you would like documentation of your participation in this research you may print a copy of this form.

APPENDIX E

Survey Questionnaire

* 1. Of the following list of potential benefits of adopting AI-based technologies, which do you perceive apply to the UAE government? (Check all that apply.)

- [ ] Enhances the quality of public services
- [ ] Creates new public services
- [ ] Optimizes internal business processes
- [ ] Increases customer satisfaction
- [ ] Frees up employees time so they can engage in more innovative and creative activities
- [ ] Reduces governmental operating costs
- [ ] Improves decision making

* 2. Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will redefine leadership roles?

- ( ) Strongly agree
- ( ) Disagree
- ( ) Agree
- ( ) Strongly disagree
- ( ) Neither agree nor disagree

* 3. Do you agree/disagree with the premise that the adoption of AI-technologies in the UAE government will require leaders to develop new competencies?

- ( ) Strongly agree
- ( ) Disagree
- ( ) Agree
- ( ) Strongly disagree
- ( ) Neither agree nor disagree

* 4. For each of the following leadership roles, indicate the level of importance for the UAE's future AI-driven government success.

	Very Important	important	Somewhat Important	Not Important
Directing, motivating, and coaching employees	○	○	○	○
Solving Problems and collaborating	○	○	○	○
Building trust within employees in the organization	○	○	○	○
Ensures the organization goes digital, however, remains human	○	○	○	○
Spend time on developing strategies	○	○	○	○
Foster a culture of innovation in the workplace	○	○	○	○
Monitor AI strategy in the organization	○	○	○	○
Manage AI-based systems in the organization	○	○	○	○

* 5. In what ways can UAE government leaders improve their efficiency and productivity with the utilization of AI-based technologies? (Check all that apply.)

- ☐ Employ AI-based technologies to help them make better decisions
- ☐ Take advantage of AI-based technologies capability in prediction to assist them with solving complex problems
- ☐ Utilize AI-based technologies to assist them with routine tasks such as administrative and managerial tasks
- ☐ Use AI-based technologies as their personal assistance to help them with tasks as schedule meeting and sending/responding to official letters
- ☐ None of the above

* 6. For each of the following soft competencies, indicate the level of importance for leaders to have/develop in order to contribute in the success of the UAE's future AI-driven government.

	Very Important	Important	Somewhat Important	Not Important
Social Networking	○	○	○	○
Relationship management	○	○	○	○
Motivational Inspiration	○	○	○	○
Adaptability and Flexibility	○	○	○	○
Willingness to learn	○	○	○	○
Judgement	○	○	○	○
Teamwork and collaboration	○	○	○	○
Ability to lead Change	○	○	○	○
Developing and Coaching Others	○	○	○	○
Emotional engagement	○	○	○	○

* 7. For each of the following hard competencies, indicate the level of importance for leaders to have/develop in order to contribute in the success of the UAE's future AI-driven government.

	Very Important	Important	Somewhat Important	Not Important
Project Management	○	○	○	○
AI-Technical knowledge	○	○	○	○
Critical thinking and planning	○	○	○	○
Innovative thinking	○	○	○	○
Domain expertise	○	○	○	○
Data analysis and interpretation	○	○	○	○
Strategy Development	○	○	○	○
Administrative and managerial skills	○	○	○	○
Computer programming	○	○	○	○
Research skills	○	○	○	○

* 8. Are soft competencies or hard competencies more important to effective leaders in the UAE's future AI-driven government?

- ◯ Soft Competencies are more important to effective leaders in UAE AI-Driven Government
- ◯ Both soft and hard competencies are equally important to effective leaders in UAE AI-Driven Government
- ◯ Hard Competencies are more important to effective leaders in UAE AI-Driven Government

* 9. What level of AI-technical knowledge do leaders require to be effective in the UAE's future AI-driven government?

- ◯ Very Deep AI-technical knowledge (e.g., has thorough understanding in machine learning algorithms and software programming
- ◯ Deep AI-technical knowledge (e. g., has sufficient understanding of how AI-based technologies operate and is capable of interacting with AI-based technologies)
- ◯ Moderate AI-technical knowledge (e.g., has general understanding of AI-based technologies and their roles in organizations)
- ◯ AI-technical Knowledge is not important to leaders

* 10. What is the most important step UAE government should consider when developing effective leaders for the UAE's future AI-driven government? (Select one)

- ◯ Identify potential leaders in different governmental sectors
- ◯ Re-skill current leaders
- ◯ Promote younger people into leadership positions faster
- ◯ Redesign leadership frameworks that align with the needs of the UAE AI-driven government
- ◯ Intensify leadership development programs

* 11. Do you think traditional leadership programs are sufficient for developing the leaders that will be needed in the UAE's future AI-driven government?

- ◯ Yes, traditional leadership programs are sufficient for developing the needed leaders in UAE's future AI-driven government
- ◯ Leadership programs only need a small amount of modification (e.g., adding one or two specific AI-related leadership/management courses)
- ◯ No, numerous innovative ways are required to develop the needed leaders in UAEs future AI-driven government

APPENDIX F

Interview Questions

1) I'm interested in knowing more about how you perceive the adoption of AI-based technologies will redefine leadership roles in UAE's Government. Can you share some general thoughts about this with me?

2) Do you think the adoption of AI will create new leadership roles and will change or eliminate some existing leadership roles? If so, can you tell me why?

3) Can you think of new leadership roles that will need to be created? If so, how would you describe these new roles?

4) What AI-based technologies are leaders currently using in UAE government and in what specific ways are they improving leaders efficiency and productivity?

5) If you could design a new AI-based technology that would further enhance the efficiency and productivity of leaders in UAE government, what would be its purpose and how would it function?

6) How can potential leaders be identified who can meet the future needs of the UAE's AI-driven government and UAE's Centennial Plan 2071?

7) What can be done to improve current leadership development programs to prepare leaders of today and leaders of tomorrow to serve in the UAE's future AI-driven government?