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Culture of Control and its Relationship to Successful Large Scale Agile Transformations

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Abstract

This quantitative study focuses on how an organization's culture with a predisposition towards control may influence the degree of success of a large-scale agile transformation change initiative. In today's highly volatile and uncertain business environment, organizations must exercise agility to survive and thrive against their competition. Implementing an agile framework at large-scale across an organization can help increase an organization's overall agility. However, transforming an organization to using agile frameworks is a complex and lengthy organizational change initiative. It requires the shift of a command-and-control culture to one that embraces change and empowerment. Not only is culture difficult to change, but culture also appears as one of several top challenges when executing large-scale agile transformation initiatives.

From a sample of n=143 experienced persons with large-scale agile transformation initiatives in the United States, companies classified with either low control and high control cultures at the start of their agile transformation did achieve some level of success. Hypothesis one was supported in that companies with low control cultures at the start of their transformation had significantly higher success achieving their transformation goals over high control cultures. Hypothesis two, however, was not supported; no significant relationship was found in the strength of a culture at the start of its agile transformation and the degree of large-scale agile transformation success. A low reliability (Cronbach's alpha 0.0456) for the instrument used to evaluate H2 may have contributed to its non-support. With culture a complex, multifaceted construct in agile transformations, recommendations for future studies are provided.

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Chapter 1: Introduction

Today's business environment is fraught with more levels of uncertainty and complexity than has ever been encountered, leading to lack of predictability that can impact how an organization takes in work, executes work, and releases work product to its customers (Kakar, 2017). Agility, or the ability to sense and adapt to internal or external stimuli, is essential for organizations to successfully navigate perpetual change in the marketplace (PMI, 2017; Rimita, Hoon, & Levasseur, 2020). While over 90% of executives view agility and collaboration as essential for success, less than 10% of those leaders consider their organizations to be currently highly agile (Denning, 2018).

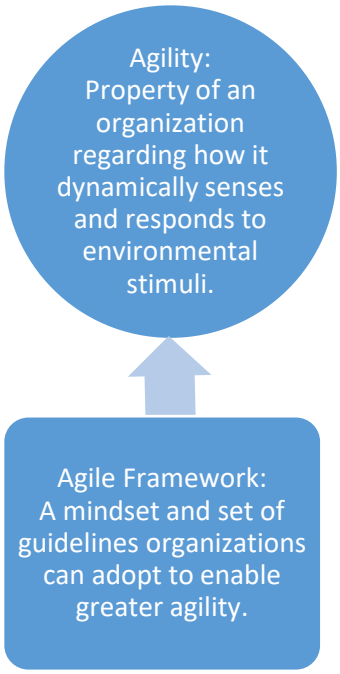
Organizations may choose to implement agile frameworks to increase their agility (PMI, 2017; Scrum Alliance, 2018). Reference Figure 1, *Relationship Between Agile and Agility*, on the next page for a visual representation of the relationship between agile frameworks and agility. An agile transformation initiative can be described as a long-term change initiative to introduce and apply agile frameworks such as the Scaled Agile Framework, Scrum of Scrums, Large Scale Scrum, or Disciplined Agile Delivery across an organization (Kalenda, Hyna, & Rossi, 2018). Agile transformations often impact multiple aspects of a company, such as its structure, processes, technology, and people, which can require a shift in its culture (Brosseau, Ebrahim, Handscomb, & Thaker, 2019).

One of the top impediments for implementing agile on a large-scale (i.e. across an organization, and not just for a few isolated teams) is "organizational culture at odds with agile values" (VersionOne, 2020, p. 14). To be more aligned with agile's values, traditional organizations would need to shift away from a command-and-control culture

to a culture that embraces change (Holbeche, Rademakers, Scheepstra, & Stokes, 2019; PMI, 2017) and leadership that influences and encourages employees (versus being directive) in a fail-fast learning environment (Scrum Alliance, 2018).

Figure 1

Relationship Between Agile and Agility



Note. Reference Chapter Two, *Literature Review*, for a more comprehensive summary of definitions in the literature for agility and agile.

Because an agile transformation impacts all aspects of an organization's culture (Sidky, 2017), it could be that organizations with a predominant control-based culture at the outset of an agile transformation might have a more difficult time adopting agile practices and principles, such as self-management and self-organization (Kalenda et al., 2018), than those organizations with a culture that innately embraces flexibility and individuality. Further, organizations with a strong culture are those with employees who

are intrinsically self-motivated by their environment while organizations with a weak culture are those with as employees who must be told what do to from management above (Serrat, 2017). As such, strong culture organizations where self-motivation is predominant (Serrat, 2017) aligns with the self-management principles required of operating in an agile environment (Kalenda et al., 2018). This study focuses on if culture of an organization at the beginning of an agile transformation (i.e. the level of control in its culture as well as the strength/weakness of culture) could influence an organization's success in attaining its transformation goals.

Problem Significance Background

Businesses operate today under a high degree of volatility, uncertainty, complexity, and ambiguity (VUCA) that rapidly drives diverse and intense change for organizations (Rimita et al., 2020). In uncertain business environments in which there are many sudden changes, it is imperative for organizations to possess the capability to operate with agility to not only survive, but to succeed (Anca-Ioana, 2019). Half of the companies on the Fortune 500 are at risk of closing their doors over the next ten years due to an exponential rise in disruptive changes and surprise competitors (Pulakos, Kantrowitz, & Schneider, 2019). To stay ahead of the competition, organizations must quickly generate new knowledge, innovate, and create and execute new strategies (Pulakos et al., 2019; Zitkiene & Deksnys, 2018). Given today's turbulent business environment (Padmaja, 2019), complexity theory, which is based in concepts of "emergence, self-organization, feedback, and chaos" (Turner & Baker, 2019, p. 11), may align well with the need to increase organizational agility via agile frameworks to ensure organizational survival.

An agile transformation is an ongoing and dynamic effort to increase an organization's agility by emphasizing engagement and collaboration, refining and enhancing processes, and enriching culture so that the organization may more rapidly adapt in quickly changing environments (PMI, 2017). An agile transformation goes beyond simply implementing agile practices or agile frameworks at only the team level (Denning, 2018; Dumitriu, Mesnita, & Radu, 2019). An agile transformation, fully executed, can impact an entire organization over time, including all levels of an organization (i.e. from top management to middle management to teams) (Denning, 2018). Further, achieving organizational agility cannot be viewed as a static, end-state condition, but should instead be considered a continuous journey that takes time (Sidky, 2017).

Agile transformations require the whole organization to change, including its mindset and organizational culture (Ebert & Paasivaara, 2017). Several examples of these changes include shifting a business model from a static build-it-and-they-will-come model to dynamic and continuous delivery based in feedback, shift from functional silos of expertise to sharing of core competencies, and large infrequent product releases to smaller more frequent incremental releases (p. 99). Unfortunately, the success rate of culture change initiatives is low, at 19%, meaning only approximately one in five culture change initiatives are successful (Gibbons, 2015). Culture is a "deep phenomenon" (Schein, 1986, p. 30) often embedded throughout an entire organization in how it thinks and what it does (Dale Carnegie Research Institute, 2017)

To be more aligned with agile's values and principles based in self-organization and self-management, traditional organizations would need to transition from a culture of

command-and-control culture to a culture that embraces change (PMI, 2017) and leadership that influences and encourages (versus directing) employees in an environment where learning quickly, even by failure, is pervasive (Scrum Alliance, 2018). Because management directly impacts how culture is established in organizations especially during organizational change (Andriukaitiene et al, 2018), management must learn how to operate and lead under a fundamentally new paradigm as part of an agile transformation initiative requiring new skills, behaviors, and mindset throughout an organization (Brosseau et al., 2019; Holbeche et al., 2019).

With a transition to new skills in an agile transformation, there may be feelings of loss at all levels of an organization in a variety of factors such as loss in reputation, power, standing, and compensation, to name a few (Freedman, 2016). Prospect theory asserts that people make choices, especially when there is risk and limited amount of information, based upon the framing of their perceptions (Adriaenssen & Johannessen, 2016). With prospect theory based in fear of losing something already gained (p. 84), prospect theory may provide insights into resistance to change, which is also another top challenge for large-scale agile adoption (Dikert et al., 2016; Kalenda et al., 2018; VersionOne, 2020). Because resistance will be encountered for any major change initiative in large organizations (Denning, 2018), resistance must be addressed. For an organization to adopt sustainable agility, the culture must be transformed which requires changing several elements of an organization's ecosystem, such as its leadership mindset, strategy, processes, structures, and people (Sidky, 2017).

Organizations who have taken the steps to implement agile frameworks across their enterprise have seen improvements in operational performance of 30% to 50%,

employee engagement increased by 20 to 30 points (using net promoter scores), customer satisfaction gains of 10 to 30 points (using net promoter scores), leading to an improvement of overall financial performance of 20% to 30% (Aghina et al., 2020). However, the track record for organizations to successfully scale agile to an enterprise level has been met with little success, often attributed to barriers in culture (Holbeche et al., 2019).

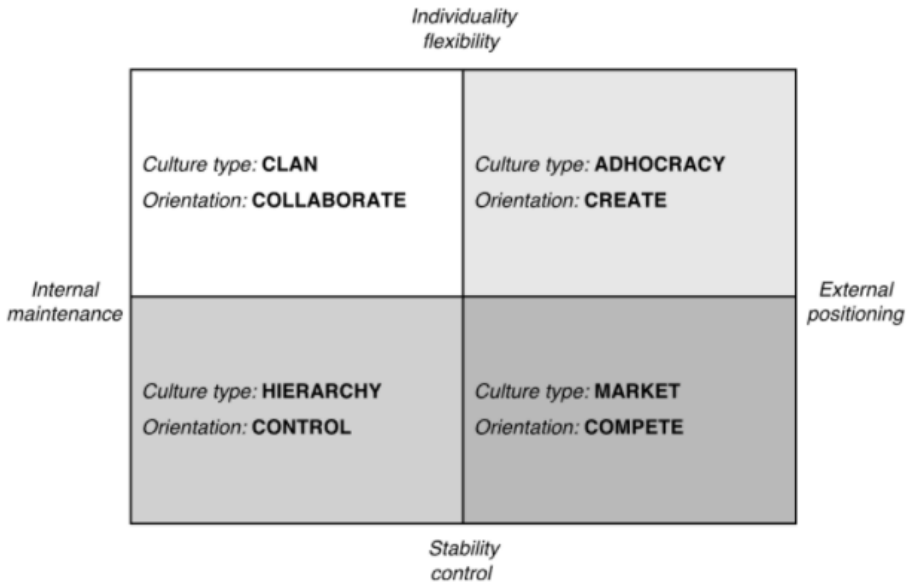
An organization's culture may be described as "the way we do things around here", often as a reflection of "shared assumptions, norms, routines, values, and behaviors that have evolved over time" (Holbeche et al., 2019, p. 128). Maseko (2017) states culture influences the orientation of employees behaviors from written or verbal rules, which could be tangible or intangible. Schein (1990) describes culture in terms of three levels, visible artifacts, espoused values, and unseen basic underlying assumptions. Not only can culture be source of competitive advantage for organizations (Serrat, 2017), but also can act as a generator or barrier to generating value (Dawson, 2010). Overall, organizational culture can influence its performance, dictating an organization's level of success and overall survival (Nikpour, 2017).

One model of organizational culture is the Competing Values Framework (CVF), which describes culture along two orthogonal axes (Cameron & Quinn, 2011), as seen in Figure 2. The first axis represents the exertion of control, from an emphasis in stability and order at one end of the spectrum to flexibility and discretion to adjust to dynamic changes at the other end. The second axis depicts orientation or viewpoint of the organization, from an internal focus (i.e. harmony and integration within the organization) to an external focus (i.e. high competition and differentiation). The

intersection of the two axes forms four culture types: hierarchy, clan, market, and adhocracy. Figure 2 depicts organizations with a predominant culture type of hierarchy and market have a higher degree of control than organizations with a clan or adhocracy culture.

Figure 2

The Competing Values Framework Four Quadrants



Note. From "Figure 1.2 Core dimensions of the Competing Values Framework" by K. Cameron, R. Quinn, J. Degraff, & A. Thakor, 2014, *Competing Values Leadership* (2nd ed.), p. 8. Copyright by Edward Elgar Publishing Limited.

The CVF model could be of particular interest for those organizations adopting agile frameworks, especially for the vertical axis that represents level of control. With agile frameworks embracing self-organization (Pace, 2019) and self-governance (Rigby et al., 2018), it is proposed that organizations who tend to empower and embrace

flexibility and discretion could therefore more closely align with agile values and principles rather than organizations who tend to exhibit a top-down driven, command-and-control environment. As such, organizations with a predisposition towards a culture of flexibility and individualism could potentially attain their agile transformation goals with greater success than organizations with a predisposition to a controlling culture.

In addition, when there is alignment around a culture, a convergence around a shared purpose develops, enabling an organization to thrive (Groysberg et al., 2018). A culture may be described as strong when employees who are highly aligned with their organization's culture intrinsically respond to environmental stimuli (Serrat, 2017). Conversely, a culture may be described as weak when there is a low level of employee alignment with organizational culture, and employee action requires control and direction via top-down orders (Serrat, 2017). A strong culture tends to align with agile at large-scale, since agile teams require less command-and-control direction and embrace self-governance (Rigby, Sutherland, & Noble, 2018). Organizations with a strong culture have seen twenty to thirty percent higher results over organizations with a weak culture (Andriukaitiene et al., 2018).

Problem Statement

The volatile, uncertain, complex, and ambiguous (i.e. VUCA) business environment has required organizations to approach doing business differently (Rimita et al., 2019). 94% of companies surveyed stated that agility was critical for their organization's success, however only six percent stated they were highly agile today (Walsh & Volini, 2017). A more recent study states that only 18% of leaders specifically

had the capabilities necessary to navigate in the current VUCA business environment (Rimita et al., 2019).

Agile transformations can be considered as long term organizational change initiatives (Kalenda et al., 2018). Unfortunately, not only do change initiatives tend to be unsuccessful, but they also can have a deep and traumatic impact on employees (De Klerk, 2019). Failure rates of change initiatives (i.e., not meeting their goals) range from 70% (Kotter, 2007) to up to 93% (Heckelman, 2017), resulting in losses such as reduced competitive advantage, loss of money spent on the initiative, lower employee engagement, drop in productivity, and attrition (Heckelman, 2017). Transformations into high performing organizations could be considered as risky endeavors (de Waal, 2018).

Several challenges that often appear in the literature for large-scale agile transformations include generalized resistance to change, lack of investment (e.g., training, coaching, shifting workload, etc.), difficulties in understanding and applying agile concepts, multi-team coordination difficulties, how to interpret and apply agile practices in management, and how to gather requirements in agile (Dikert et al., 2016). Table 3 in the next chapter provides more insights in challenges to adopting agile across the enterprise.

One recurring theme, however, that prevalently appears in the literature regarding challenges of implementing agile at a large-scale is an organization's culture (Business Agility Institute, 2019; Dikert et al., 2016; Dumitriu et al., 2018, Holbeche et al., 2019; Uludag et al., 2018; VersionOne, 2020). Building a culture based in agility is more art than science requiring several shifts, such as in leadership mindset, where and how identification and execution of strategy rests hierarchically, and increased collaboration -

all of which requires organizations to execute a transformation process (Holbeche et al., 2019).

Several authors have stated there are few scholarly studies that show how organizations adapt to using agile from a large-scale perspective (Dikert et al., 2016; Dumitriu et al., 2019; Ebert & Paasivaara, 2017; Morgan, 2018). While many types of organizations have adopted the use of agile methods, it is unclear of the conditions and environments in which agile works well (Dumitriu et al., 2019). Further, there are no proven methods for the success of large-scale agile transformations (Morgan, 2018). While Klunder et al. (2018) proposed an "agile transformation hamburger" model that encompasses multiple aspects of a transformation approach based upon a literature review of 85 agile transformation papers (including 19 papers specific to large-scale transformations), the authors state their model is untested (p. 14). The authors further assert that it is essential for a company to adopt an agile culture for the agile transformation to be successful (p. 12). Within the context of business transformation, a lack of understanding of cultural change implications and challenges can not only provide obstacles to the change, but also limits the ability to leverage opportunities as well (Muller, Obwegeser, Glud, & Johildarson, 2019). As such, this study only focuses on the several elements of culture (e.g., level of control in the organization's culture and if the culture is strong or weak) at the outset of organizational transformations and how it may influence success of attaining an organization's transformation goals.

Purpose of the Study

The success rate of organizational transformations is low (de Waal, 2018). Agile transformations require a shift away from command and control culture (PMI, 2017).

Further, culture listed as one of the top challenges for agile transformation success (VersionOne, 2020). Aghina et al. (2020) assert that the starting point of an organization's culture as it enters into a transformation for greater agility has an impact on how much agility an organization can achieve; however, no data is offered to support this assertion. The objective of this study is to investigate how the level of control in an organization's culture at the outset of an agile transformation can impact the success of an organization reaching its transformation goals.

To shift a culture in an agile transformation, change needs to happen at two levels: by the organization and by an individual (Sidky, 2017). Consequently, this study investigates a culture of control and large-scale agile transformation success from two perspectives.

First, from an organizational perspective, this study considers the level of control of an organization's predominant culture as measured by the CVF at the start of an agile transformation, and how that might influence the ability for organizations to more successfully achieve their agile transformation objectives. Agile transformations typically require organizations to switch from a command and control culture to a culture that embraces change (PMI, 2017). With culture deeply embedded within organizations, changing culture incites massive levels of anxiety to a point where the mere discussion of ideas of changing culture is avoided (Schein, 1986). With a culture of control purported as the most common corporate culture in the world (Charron, 2011), and the need for self-organization and self-governance versus command-and-control needed to operate in an agile organization (Rigby et al., 2018), this study investigates if a controlling culture could contribute to the low success rates of agile transformations. The more information

known before an organization begins an agile transformation initiative, including its culture, the better it may be prepared when embarking on a major change initiative such as a transformation, thereby enabling greater chances of success (Muller et al., 2019).

Secondly, from the perspective of an individual, this study also explores how individuals' predispositions for motivation might impact agile transformation success. A culture is said to be strong when the employees are self-motivated to take action on environmental stimuli and said to be weak if motivation comes externally via top-down directives (Serrat, 2017). With agile practices embracing self-organization and self-management (Kalenda et al., 2018), an agile mindset appears to closely align with a strong culture. This study investigates if those in a strong culture at the outset of an agile transformation might attain their transformation goals more successfully than those in a weak culture.

Research Questions & Hypotheses

When performing an agile transformation, it is essential to change the mindset and therefore the culture of an organization for a greater chance of successfully transitioning to agile approaches (Ebert & Paasivaara, 2017). The research questions for this study focus on the level of control of an organization's culture and its relationship to the success of agile transformations.

The first research question revolves around the concept that organizations need to transition from a top-down driven, command-and-control culture (Denning, 2018) to one that embraces self-organization and self-management (Kalenda et al., 2018). While the literature describes the culture transformation needed from a visionary end-state perspective, Aghina et al. (2020) assert that the gains of greater enterprise agility depends

on an organization's respective starting line for agility. However, the authors fall short of quantifying or backing up their assertion of success attaining agile transformation goals and the starting line for agility in their report. Further, Aghina et al. (2020) do not specifically discuss culture, but instead list five components that make up an environment more conducive for greater organizational agility.

It is postulated in this study that organizations who tend to empower and embrace flexibility and individualized discretion more closely align with agile values and principles rather than organizations who tend to exhibit a top-down driven, command-and-control environment. As such, organizations with a predisposition towards a culture of individualism and flexibility might potentially attain their agile transformation goals with greater success than organizations with a predisposition to a controlling culture. Therefore, research question one (RQ1) becomes:

RQ1: Do organizations with a low controlling culture at the outset of an agile transformation have greater success with achieving their transformation goals than organizations with a high controlling culture?

Research question one will be explored via the Competing Values Framework by Cameron and Quinn (2011), where culture can be described along two intersecting axes; one of the axes in their model relates to the degree of control an organization's culture exhibits. Organizations with greater levels of control (e.g. hierarchy or market cultures) tend to be focused on stability and order versus organizations with lower levels of control (e.g. clan or adhocracy cultures) focusing on flexibility and discretion (Cameron & Quinn, 2011). Given two sets of cultures, one set of low control and another of higher control, the hypothesis one (H1) is:

H1: Organizations exhibiting a culture of lower control at the start of an agile transformation achieve their agile transformation goals with greater success than organizations exhibiting a culture of high control.

The corresponding null (H1o) and alternate (H1a) hypotheses for hypothesis one (H1) are:

H1o: There is no significant difference in organizations attaining their agile transformation goals between organizations with a culture of lower control at the start of an agile transformation and organizations with a culture of higher control at the start of an agile transformation.

H1a:

There is a significant difference in organizations attaining their agile transformation goals between organizations with a culture of lower control at the start of an agile transformation and organizations with a culture of higher control at the start of an agile transformation.

The second research question revolves around strong and weak organizational cultures. With agile values and principles based in self-organization and self-management (Kalenda et al., 2018), it is postulated that those cultures that are classified as strong (e.g., individuals are intrinsically self-motivated to address stimuli from their environment) are more dispositioned to adopting and executing with an agile mindset versus those classified as weak (e.g., individuals motivated via directives from above) cultures. Consequently, it is conjectured that organizations with a strong culture may have greater amounts of success attaining their agile transformation goals over those organizations

with a weak culture. Consequently, research question two (RQ2) and the corresponding hypothesis two (H2) are:

RQ2: Does the strength of an organization's culture at the start of an agile transformation influence how well the organization achieves their transformation goals?

H2: There is a significant relationship between the strength of a culture at the start of an agile transformation and the amount of success the organization attains its agile transformation goals.

The corresponding null (H2o) and alternate (H2a) hypotheses for hypothesis two are:

H2o: There is no significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

H2a: There is a significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

Significance of the Study

With agility being essential to survive and thrive in today's volatile, uncertain, complex, and ambiguous (VUCA) environment, organizations must find a way to increase their ability to adjust to the ever-changing demands and challenges (Business Agility Institute, 2019). Due to the newness of many large-scale agile transformation initiatives, there are a limited number of studies that focus upon how an organization adapts to using agile across the enterprise (Aghina et al., 2020; Dumitriu et al., 2019; Ebert & Paasivaara, 2017). Morgan (2018) states that more academic research is needed

in large-scale agile transformations, as many purported proposals to address barriers to adoption are “best educated guesses” (p. 21.)

Further, organizations in industry who are either embarking on an agile transformation or are in the midst of a failing (or challenged) transformation that is not yielding anticipated benefits could also benefit from this study. By gaining further insights into the predisposition of an organization’s culture at the outset of the transformation, the leadership team could potentially set better plans in motion to address cultural gaps at their organization as they transition to using agile frameworks, potentially generating higher success of attaining their respective transformation goals.

Definition of Terms

The following definitions may be helpful for the reader of this dissertation.

Agile: “is a mindset based on a set of key values and principles designed to better enable collaborative work and deliver continuous value through a ‘people-first’ orientation” (PMI, 2017, p. 2)

Agile Framework: A set of processes and practices, such as Scrum, Kanban, or Extreme Programming, that follow in the conventions of the agile values and principles, to enable agile to be executed at an organization (Agile Alliance, 2020)

Agility: “often referred to as organizational agility—is the capability to quickly sense and adapt to external and internal changes to deliver relevant results in a productive and cost-effective manner” (PMI, 2017, p. 2)

Agile Transformation: “is an ongoing, dynamic effort to develop an organization’s ability to adapt rapidly within a fast-changing environment and achieve

maximum business value by engaging people, improving processes, and enhancing culture" (PMI, 2017, p. 2)

Agile Manifesto: often considered the core values of agile, is a set of four statements originally targeted towards better software development by having a higher preference towards individuals and interactions, working software, customer collaboration, and responding to change.

Large-Scale Agile Transformation Initiative: A change program to introduce agile to an organization that impacts at a minimum either six teams or 50 persons (Dikert et al., 2016).

VUCA: Acronym to describe the global business environment as being volatile, uncertain, complex, and ambiguous (Bennett & Lemoine, 2014).

Assumptions, Limitations, and Delimitations

For this study, it is assumed that there is enough valid response to the questionnaire to offer insights into the level of control in culture and its relationship with agile transformation success. Further, it is assumed that qualified respondents to the survey in this study are truthful and answer honestly. This is another assumption that any conclusions to this study could be not only helpful to fill in some gaps in the academic literature regarding large-scale agile transformations (Morgan, 2018), but also provide insights into organizations who are either embarking on a large-scale agile transformation initiative or are not getting the results desired in their current efforts.

There are several limitations to this study. First, with many factors that can influence the outcome of a large-scale agile transformation (Dikert et al., 2016; Dumitriu et al., 2019), it is unlikely to isolate direct causation conclusions from this study on just

one factor, culture, alone. By understanding any statistically significant differences of success in achieving agile transformation goals between low and high controlling cultures at the outset of an agile transformation, this study can contribute a piece of information towards the academic literature and industry practitioners.

Secondly, this study is focused on large-scale implementations of agile frameworks as opposed to implementing agile for a team. The introduction of agile at scale (i.e., beyond teams) requires collaboration, coordination, and communication at levels beyond teams and across multiple organizational units, which introduces a new set of challenges (Dikert et al., 2016). With limited academic research in large-scale agile transformations (Morgan, 2018), this study is limited to large-scale agile transformations.

Next, this study will only focus on for-profit organizations with respondents in the United States. Extending conclusions beyond this data pool (i.e., to non-profit organizations, public/governmental bodies, and/or outside of the United States) are not recommended without further study. Additionally, as will be described in the participant recruitment strategy section (reference Table 6, *Summary of Participant Recruitment Strategy*), the convenience sampling technique of chain referral (also known as snowballing) will be used, which could potentially introduce bias in this study, since the initial set of respondents will be known by the researcher.

Lastly, with this study having a quantitative design in which inferences from a sample can be made to a population, there is no additional insights or explanations that could be afforded via a mixed methods and/or qualitative study design.

Summary

Organizations in today's world that can better adapt to the rapidly changing environment are better enabled to not only survive, but thrive (Business Agility Institute, 2019). While shifting to greater agility across an entire organization offers many challenges (p. 3), several benefits have been realized such as increased revenue, market share, and brand recognition, faster turnaround with higher quality, improved customer relationships, and higher employee engagement (p. 4).

To increase agility, organizations may choose to implement an agile framework (Scrum Alliance, 2018). One of the top challenges associated with implementing agile at a large-scale across an organization includes organizational culture being at odds with agile values (Version One, 2020). With agile transformations requiring a shift from command and control cultures (PMI, 2017), this study concentrates on the culture at the outset of an agile transformation, specifically related to a culture of control, and the success of organizations attaining their agile transformation goals.

Chapter 2: Literature Review

Introduction

This literature review is divided into several topical areas. The first topical area describes the theoretical constructs of this study, which is a fusion of complexity theory and prospect theory. The second topical area provides an overview of the literature on agility, the environment for agility in an organization, how agile plays a role in agility, and challenges with large-scale agile transformations. The third topical area summarizes perspectives of culture in organizations, including the definitions of culture and how culture impacts an organization's performance. The Competing Values Framework by Cameron and Quinn (2011) is also summarized, describing the characteristics of four different culture types, providing the foundation for classifying an organization's predominant culture utilized in this study.

Theoretical Constructs

There are two theoretical constructs melded together in this study: complexity theory and prospect theory. Complexity theory is based in concepts of "emergence, self-organization, feedback, and chaos" (Turner & Baker, 2019, p. 11). Given today's turbulent business environment full of volatility, uncertainty, complexity, and ambiguity (Padmaja, 2019), the theme of dynamism and uncertainty can be associated with complexity theory (Turner & Baker, 2019), agility (Anca-Ioana, 2019), and agile (Dönmez & Grote, 2018). On the other hand, prospect theory argues the energy for resisting change (and maintaining the status quo) outweighs the energy one might expend to attain something new (even though it has higher potential than the status quo) and that choices are made on the basis of what one might lose or gain when it comes to a change

(Adriaenssen & Johannessen, 2016). With agile transformations requiring organizational change over a long period of time (Kalenda et al., 2018), agile transformation initiatives are subsequently often met with resistance that must be addressed if the transition is to be successful (Denning, 2018).

Complexity Theory

Today's modern business environment is embroiled in volatility, uncertainty, complexity, and ambiguity (VUCA), where the intensity and dynamics of change impacts organizations at a yet-unseen pace (Rimita et al., 2020). Complexity theory is based in concepts of "emergence, self-organization, feedback, and chaos" (Turner & Baker, 2019, p. 11). Not only does complexity theory take a systems view (i.e., looking at the whole), but also asserts future states are unpredictable and follows a dynamic, non-linear path (p. 11). Owen et al. (2006) assert that agile project management, which is rooted in the discovery of emergent business needs, experimentation, and manager as facilitators, evolves from complexity theory, in that agility requires thriving in unpredictability.

Complexity theory was born in the late 1980s as mix between chaos theory and network theory (Lowell, 2016). Traditional linear models of organizational social systems were viewed as too simplistic for operating in a turbulent environment (p. 152). Instead, spontaneous self-organization across a system (not just a team) is required to more adequately address unpredictable challenges (p. 153). Similarly, agility and agile frameworks embrace sensing and responding to dynamic environments for organizations to maximize business value (PMI, 2017). Anca-Ioana (2019) argues that it is necessary for organizations to exercise agility to not only survive but succeed in uncertain and rapidly changing environments. So, the chaos theory component of complexity theory

(i.e. working in unpredictability) described by Lowell (2016) aligns with the need to operate in an unpredictable environment in agility (Denning, 2020; PMI, 2017) or agile (Rigby, Elk, & Berez, 2020). Further, agile frameworks require networks of teams to work effectively together in uncertainty (Denning, 2019; Rigby, Sutherland, & Noble, 2018), which aligns with the network theory (i.e., considering the system operating as a holistic entity) contribution into complexity theory.

Prospect Theory

In addition to complexity theory, prospect theory may come into play as well in agile transformations especially when it comes to organizational change. An agile transformation requires shifting an organization's culture (Broseau et al., 2019; Denning, 2019; Dikert et al., 2016; Sidky, 2017). However, one of the top challenges for organizations to adopt agile at a large-scale agile is due to the conflict of their organization's status quo culture with agile values (VersionOne, 2020). Gibbons (2015) summarizes Smith (2002), in that the median success rate of change initiatives focused on shifting culture is 19%; in other words, four out of five culture change initiatives fail. Even organizations who tend to display greater levels of flexibility can display resistance to change (Dikert et al., 2016).

Prospect theory has been widely associated with the field of economics and making choices (with an over-weighted preference to avoid loss of the status quo) under conditions of risk (Shleifer, 2012). However, Adrieanessen and Johannessen (2016) argue that prospect theory may also explain resistance to organizational change.

In more detail, prospect theory, established by Kahneman and Tversky in 1979 (Shleifer, 2012), asserts participation in change is resisted for as long as possible because

all the gains that have been achieved in a current position are put at risk due to the change (Adriaenssen & Johannessen, 2016). Subsequently, there is a fear of the loss of rights, positions, and other items of perceived value that have been already gained (p. 85). Furthermore, loss is thought to be biologically processed in the same part of the brain as threats (Shleifer, 2012).

For an organization to adopt sustainable agility, the culture must be transformed, which requires changing several elements of an organization's ecosystem, such as its leadership mindset, strategy, processes, structures, and people (Sidky, 2017). With agile transformations introducing change, it is not that people resist the change, but in the discordance between risk and loss involved with the change in comparison to the status quo of stability and personal rewards (Freedman, 2016).

As an example, middle managers can have the perception that under agile they can lose an element of command-and-control or may be left out of roles altogether when working in an agile framework, leading to resistance and, ultimately, transformation failure (Dikert et al., 2016). Transitioning to agile requires a shift from command-and-control (PMI, 2017), thereby introducing a potential for feelings of loss. So, the concept of loss in agile transformations (Dikert et al., 2016; PMI, 2017) appears to parallel with the loss concepts (and preservation of status quo) aspects of prospect theory (Adriaenssen & Johannessen, 2016).

While prospect theory describes aversion due to loss, prospect theory also states that there is a desire for winning as well, especially when there is perception that gains or wins can be obtained (Adriaenssen & Johannessen, 2016). As such, the positive upside to taking a risk by those involved in an agile transformation may also align with the

upside concepts of prospect theory as well. For instance, Dikert et al. (2016) describe how a commitment to change and support from executive leadership and management teams can address the challenge of overcoming resistance to change and can be seen as a success factor for greater large-scale agile adoption. The top three benefits of adopting agile include accelerated delivery of software, enhanced abilities to manage changing priorities, and increased productivity (VersionOne, 2020). Prospect theory provides the possibilities of an upside (Adriaenssen & Johannessen, 2016) as well as agile having multiple ways of improving an organization (e.g., accelerated delivery, adapting priorities more dynamically, increase productivity) (VersonOne, 2020). However, employees will likely tend to expend more energy on retaining the status quo (even if suboptimal) versus in the gaining of new positions (Adriaenssen & Johannessen, 2016).

Literature Review Summation

This section provides a synthesis of the literature in two topical areas. The first topical area provides a historical context of agility and agile, including the relationship between the two, along with agile transformations. The second topical area focuses on organizational culture, providing a historical survey of culture in organizations and how culture plays a role in agile transformations.

Agility, Agile, and Agile Transformation Initiatives

In uncertain business environments where there are many sudden changes, it is imperative for organizations to possess the capability to operate with agility to not only survive, but succeed (Anca-Ioana, 2019). While there is not a common definition of organizational agility in the literature, agility is required for organizations to compete effectively within their respective field (p. 335). To increase the agility across the

enterprise, organizations may choose to employ agile approaches (Rigby et al., 2018) through an episodic change process referred to as a large-scale agile transformation (also known as an agile transformation) (Fuchs & Hess, 2018).

Timeline of Agility and Agile

While there is no consensus on the definition of the term agility (p. 15), PMI (2017) defines agility as "the capability to quickly sense and adapt to external and internal changes to deliver results in a productive and cost-effective manner" (p. 9). Teece (2016) suggests that the concept of agility can be traced to the 1930s in which economist Stigler described the need for organizations to have greater flexibility in uncertainty. Some of the first conceptual notions related to agility in the United States can be traced back to the early 1990s, when there were concerns about US manufacturing losing its global competitiveness due to lack of timely response in a volatile marketplace (van Oosterhout, 2010).

The term agile was coined later, in 2001, as part of the creation of the Agile Manifesto, focused on software development (Hohl et al., 2018). PMI (2017) defines agile as "a mind-set based on a set of key values and principles designed to better enable collaborative work and deliver continuous value through a 'people-first' orientation" (p. 9). With agility proceeding agile from a timeline perspective, the synthesis from the literature regarding agility is presented first followed by agile.

Agility

Today's organizations are continuously encountering change (Zitkiene & Deksnys, 2018), requiring them to successfully navigate highly turbulent environments full of volatility, uncertainty, and complexity (Felipe, Roldan, & Leal-Rodriguez, 2017)

especially if they want to thrive, not just merely survive (Anca-Ioana, 2019). Bennett and Lemoine (2014) summarize the acronym VUCA as: (1) volatility, unexpected or unstable challenges of unknown duration, (2) uncertainty, when an event has known causes and effects, but impact is unknown, (3) complexity, when there are many interconnected constituent parts and variables, and (4) ambiguity, when there are unknown unknowns, with completely unclear causal relationships.

Kocu (2018) states that any system must be as agile as demanded by today's volatile environment if they are to be effective. It is estimated that approximately half of companies on the Fortune 500 list are at risk of closing their doors over the next ten years due to an exponential rise in disruptive changes and surprise competitors (Pulakos et al., 2019). As such, organizations must quickly generate new knowledge, innovate, and evaluate and execute new strategies to stay ahead of the competition (Pulakos et al., 2019, Zitkiene & Deksnys, 2018).

Agility Definitions. Defining agility can be challenging, in that organizational agility is a multifaceted, multi-dimensional concept documented in the literature from many different viewpoints (Zitkiene & Deksnys, 2018).

One theme regarding agility is in an organization's ability to sense and respond. Kocu (2018) states agility is "the ability to rapidly and thoughtfully respond to changing conditions" (p. 60). Similarly, Felipe, Roldan, and Leal-Rodriguez (2017) describe organizational agility as the capability to dynamically address crises and changing environments to sustain competitive advantage by effectively and efficiently sensing and responding to environmental change. PMI (2017) describes agility as organizations that can quickly "sense and adapt to external and internal changes to deliver relevant results in

a productive and cost-effective manner" (p. 2). Lastly, the Scrum Alliance (2018) states agility is "a property of an organization to sense and respond to market changes and continuously deliver value to customers" (p. 6). The common thread with these authors is that they describe agility as a capability of an organization to not only detect changes, but also state action must take place based upon those changes detected.

Pulakos, Kantrowitz, and Schneider (2019) state that agility requires both proactive and reactive components, with reactive behaviors described as resilience. Nejatian and Zarei (2013) describe agility from characteristics of organizational attributes (e.g., responsiveness, competencies, flexibility, and quickness) or organizational enablers (e.g., tools/metrics, team structure, engineering practices, information systems, rapid prototyping tools, and e-Commerce). Similarly, Aghina et al. (2020) describe agility as a balance between structural stability (via standard operating procedures), cultural stability (presence of a shared sense of purpose, direction, and values), and dynamic capabilities (ability to sense and respond strategy and team setup to fast-changing conditions).

Goldman, Nagel, and Preiss (1995), some of the earliest authors of modern agility, describe agility from a customer viewpoint. The authors approach agility and customers via two perspectives: (1) for companies, who possess capabilities in competitive environments to operate profitably plagued with persistent and unpredictable changes in customer opportunities, and (2) for individuals, who possess capabilities to contribute to a company's bottom line with constant shifts of technological and human resources resulting from unpredictable customer-driven demands. Overall, agility enables profit generation both in and from a turbulent and competitive environment (p. 3).

Other authors describe agility from a strategic perspective. Doz and Kosonen (2010) describe strategic agility from three contexts: (1) strategic sensitivity, the ability to sense and anticipate the future, (2) leadership unity, how top management collaboratively leads changes in strategy, and (3) resource fluidity, the ability to reassign existing company employees to perform new roles. Queiroz, Tallon, Sharma, and Coltman (2018) describe the importance of strategically shifting resources in response to dynamic changes in the marketplace to improve firm performance. Arokodare, Asikhia, and Makinde (2019) summarize strategic agility as an organization's ability to continuously and sufficiently alter and modify its strategic direction due to changes in a highly volatile and uncertain environment.

Another perspective with agility comes through the lens of innovation. Lungu (2018) describes strategic agility as a means for companies to use innovation to increase their competitive advantage in worldwide markets. Teece, Petreraf, and Leih (2016) state that one of the two components to agility is an organization's capabilities to be innovative in dynamic markets (with the other component related to restructure resources quickly) to create and protect value to internal and external circumstances. Aghina et al. (2020) assert that agility enables organizations to speed up how decisions are made and products are developed, shortening the time between the genesis of a product idea concept and when it is released to market.

While there are several perspectives of agility and what it means for an organization, there is a main theme regarding the role agility plays in an organization's ability to gain a competitive edge by taking advantage of opportunities presented by the environment or by adapting to change (Anca-Ioana, 2019). Organizations must ultimately

decide upon the lens at which to achieve agility in order to achieve their strategic goals so that they are more poised to withstand market turbulence with greater effectiveness (Kettunen & Laanti, 2008). Some of those lenses include agility from a customer (Goldman et al., 1995), strategy (Arokodare et al., 2019; Queiroz et al., 2018) , or innovation perspective (Aghina et al., 2020; Lungu, 2018).

There are cautions, however, of attempting to achieve agility for agility sake. Luna et al. (2020) state that while agility is focused on reacting to environmental changes more quickly that the rate of change, organizations must also be aware of generating waste along the way, which could impact the value delivered to the intended stakeholders. Teece et al. (2016) state that agility comes at a cost of efficiency, and that agility does not always translate to creation or preservation of value, especially if strategy is missing. Zitkiene and Deksnys (2018) echo Teece et al. (2016) in that organizational agility will not provide value on its own merits for a company, especially if the costs to attain greater agility outweigh the gains of exhibiting agility.

Measuring Agility. Agility has a link with organizational performance (Queiroz, et al., 2018), which should be one reason why organizations should be interested in increasing to the highest levels of agility (Lungu, 2018). In one study, 82% of the respondents indicated that agility was very or extremely important for an organization's success and competitiveness (Scrum Alliance, 2018). In another study by Deloitte, 94% of companies surveyed stated that agility was critical for their organization's success, however only six percent stated they were highly agile today (Walsh & Volini, 2017).

Because organizational agility informs the competitive actions of firms, the degree by which organizations operate with agility can be a forerunning indicator of firm

performance (Felipe et al., 2017). Organizations that tend to self-report high agility-resilience abilities have been shown to have 150% higher returns on investment and 500% greater returns on equity than those with low agility-resilience abilities (Pulakos et al., 2019).

While **s**ystems should operate with agility if they are to be effective in operating in today's volatile environment, there is not a widely accepted model for measuring agility (Kocu, 2018). This can make it challenging to select a model to evaluate agility (p. 64).

While Yauch (2011) concurs that agility metrics are difficult to define, since the definition of agility itself is complex and vague, there are metrics for consideration. Some measurements of agility can come in the form of business processes, such as product development or software development. Pulakos et al. (2019) state that since agility requires both proactive and reactive components, financial performance-tracking metrics (e.g., return on equity, return on investment, and return on sales) could be used to validate investment in agility. However, these metrics should be used for feedback and course-correction, which would lead to higher agility, increased resilience, and increased competitive success (p. 309). Nejatian and Zarei (2013) argue a balanced scorecard approach could be used to measure agility, which contains both financial and non-financial perspectives.

Measuring Agile. While Kocu (2018) states there is no agility measurement model that is widely accepted, leadership teams need to define and show the impact of an agile transformation on agility, otherwise risk premature cancellation of a transformation before benefits could be realized (Sidky, 2017). Table 1 summarizes the reasons why

organizations adopt agile frameworks for the past three years of VersionOne's *Annual State of Agility Report*. As seen in Table 1, the top six reasons for adopting agile have been consistently in the top six for the past three years.

Table 1

Reasons for Adopting Agile from Past Three Years of the Annual State of Agile Reports

Agile Adoption	14th Annual State of Agile Report (VersionOne, 2020)	13th Annual State of Agile Report (VersionOne, 2019)	12th Annual State of Agile Report (VersionOne, 2018)
1. Accelerate software delivery	71%	74%	75%
2. Enhance ability to manage changing priorities	63%	62%	64%
3. Increase productivity	51%	51%	55%
4. Improve business/IT alignment	47%	50%	49%
5. Enhance software quality	42%	43%	46%
6. Enhance delivery predictability	39%	43%	46%
7. Reduce project risk	37%	28%	37%
8. Improve project visibility	36%	42%	42%
9. Improve team morale	31%	34%	28%
10. Reduce project cost	26%	41%	24%
11. Improve engineering discipline	23%	23%	25%
12. Better manage distributed teams	21%	19%	17%
13. Increase software maintainability	18%	21%	18%

Note. The values shown indicate the percent of respondents in each survey that selected that response. Respondents were permitted to select more than one benefit.

Sidky (2017) recommends a measurement system be put in place for agile transformations to show the progress, impact, and alignment of culture with a transformation. However, as seen in Table 1, *Reasons for Adopting Agile from Past Three Years of the Annual State of Agile Reports,* changing culture does not directly appear in the top reasons for adopting agile.

Similar to Pulakos et al. (2019), regardless of the measures used, Gravett and Caldwell (2016) recommend using a small number of simple metrics that meet the SMART (specific, measurable, achievable, relevant, and time based) criteria, so that leadership can be well informed to take actions such as make better decisions on strategy and direction of the company, provide focus, and drive performance.

Agile

As described in the previous section, organizational agility tends to refer to how quickly an organization adapts to change or capitalizes on opportunities in a rapidly shifting environment to gain a competitive advantage (Anca-Ioana, 2019). To increase agility, an organization may choose to implement an agile framework (Aghina et al., 2020; Denning, 2018; Scrum Alliance, 2018). However, there are multiple definitions of agile. The Agile Alliance (2020) defines agile as "the ability to create and respond to change in order to succeed in an uncertain and turbulent environment" (p. 1). PMI (2017) describes agile as a mindset, rooted in values and principles, to enable collaboration and continuous delivery of value by emphasizing people first. Furthermore, the Scrum Alliance (2018) states agile is the way in which an organization approaches application of a mindset of values and principles defined in the Agile Manifesto. Regardless of the

definition of agile, the use of an agile approach tends to disrupt an organization's business model, culture, hierarchy, and operations (Denning, 2018; Freedman, 2016).

Origins of Agile. The origins of agile approaches can be traced back to the 1930s, when Walter Shewhart applied the Plan-Do-Study-Act (PDSA) approach to iteratively and incrementally improve products and services at Bell Labs (Rigby, Sutherland, & Takeuchi, 2016). Demming, Shewhart's mentee, applied PDSA in Japan, most notably at Toyota, where it became known as the Toyota Production System, the precursor to lean manufacturing and the focus on elimination of waste (p. 3).

As modern industry shifted from manufacturing to higher innovation initiatives, a non-linear approach was needed to execute projects (PMI, 2017). The approaches to managing projects in the twentieth century no longer worked in the twenty-first century, where market conditions continuously shift (Ordysinski, 2013).

In 1986, Takeuchi and Nonaka published in Harvard Business Review their study of manufacturers who more successfully released innovative products more quickly than their competitors using a team-oriented approach, much like in rugby where team members collaboratively pass a ball back and forth to advance down a field. This contradicted with the prevalent traditional waterfall approach found in manufacturing, in which projects follow a serialized, sequential plan, completing one step entirely before beginning a next step, in a predictive manner (PMI, 2017).

Sutherland and Schwaber took the concepts of Takeuchi and Nonaka, applied them to software development, eventually creating what is now known as Scrum (Rigby et al., 2016). Scrum, the world's most used agile framework, is based in the concept of empirical process control, where everything (i.e., the product and processes used to make

the product) is made transparent so that current state can be inspected, and, if needed, adapted (Ordysinski, 2013). Scrum requires increments of potentially shippable products at the end of every timebox (e.g,. a non-changing, rigid timeframe of one month or less) (p. 79). One benefit to Scrum is that it highlights the effectiveness of an organization's product management and development practices so that improvements can be made (p. 79). Other frameworks and approaches to software development were evolving beyond the traditional waterfall approach, including Adaptive Software Development, Crystal, Dynamic Systems Development Methodology (DSDM), and Extreme Programming (XP), just to name a few, as summarized in Table 2.

Table 2

Summary of Selected Agile-Based Frameworks

Framework	Originated	Summary
Adaptive Software Development	Highsmith (first published 2000)	Utilizes collaboration in an adaptive culture where uncertainty and change are expected to be the status quo. Is a lightweight framework built upon only a few guidelines emphasizing speculation, collaboration, and learning.
Crystal	Cockburn (1990s)	Is a set of software development methodologies that are assigned to different color codes. Because projects vary (in terms of outputs and circumstances to create outputs), the processes utilized and required behaviors will also vary. Based on the needs of the project, only those practices deemed necessary will be selected for use.
Dynamic Systems Development Methodology (DSDM)	DSDM Consortium (first published 1995)	A seven phase project management framework intended for dynamic, non-predictable projects. Focused on time-boxes and iterative development. Mainly developed and utilized outside of the United States.

Framework	Originated	Summary
Extreme Programming (XP)	Beck (first published in 2000)	A set of practices focused more specifically on software development in teams.
Kanban	Anderson (first published 2004)	Applied Kanban from manufacturing (origins to Toyota Production System in 1940s) to software development, focusing on flow, bottleneck resolution, and visual controls.
Lean Software Development	Mary and Tom Poppendieck (first published 2003)	First credited to applying Toyota Production System notions of lean (focusing on elimination of waste and benefits resulting therein) to software development
Scrum	Sutherland and Schwaber (mid 1990s)	Based on concepts introduced by Takeuchi and Nonaka in 1987, products are developed in small increments by small teams in short, fixed time intervals (one month or less) called sprints. The framework has multiple fixed timepoints within sprints to inspect and adapt both the product and the process used to create the product.

Note. All items except Kanban and Lean adapted from "Back to the future: origins and directions of the 'Agile Manifesto'– views of the originators," by P. Hohl et al., 2018, Journal of Software Engineering Research and Development, p. 12-14. Kanban adapted from "Kanban based information management in organization," by T. Ordysinski, *Studia i Materialy Polskiego Stowarzyszenia Zarzadzania Wiedza / Studies & Proceedings Polish Association for Knowledge Management*, p. 76–85. Lean adapted from "Lean software development: A tutorial," by M. Poppendieck & M. Cusumano, 2012, *IEEE Software*, p. 26-32.

In February 2001, 17 thought leaders in the software development space created the Agile Manifesto, which consists of four value-based statements that were originally intended for the development of software solutions (Hohl et al., 2018). The Agile Manifesto (Beck et al., 2001) states the following:

> We are uncovering better ways of developing software by doing it and helping others do it. Through this work, we have come to value:
>
> - Individuals and interactions over process and tools
> - Working software over comprehensive documentation
> - Customer collaboration over contract negotiation
> - Responding to change over following a plan.
>
> That is, while there is value in the items to the right, we value the items on the left more. (p. 1)

The creators of the Agile Manifesto focused on two main themes: to reduce bureaucracy and to emphasize delivering items of high value (Hohl et al., 2018). As such, the Agile Manifesto places greater emphasis in interactions, creating working solutions, collaboration, and the need to reacting to change; the Agile Manifesto does not mention methodologies nor prescribes specific practices. The intent of the Agile Manifesto is to emphasize the behaviors of *being* agile, which involves change at the individual, team, and organizational levels, versus *doing* agile, which emphasizes following some rituals without changing anything of significance in the company (Hohl et al., 2018).

Several years after the creation of the Agile Manifesto, two other approaches have been incorporated into generally accepted agile frameworks, Kanban and Lean (Rigby et al., 2016). Kanban has its roots in the manufacturing sector and can be traced back to the 1940s with the Toyota Production System (TPS) (Ordysinski, 2013). Kanban, a Japanese term, can be translated as a visual signal (Ordysinski, 2013). Kanban is intended to control flow through a system, speeding up or slowing down, where work is pulled into various steps of the production process as capacity and demands from customer allows

(p. 77). Kanban was introduced in the early 2000s as an alternative to Scrum for software development (Rigby et al., 2016), often seen as less restrictive than Scrum (Ordysinski, 2013). Lean Product Development, while introduced in 1985 by MIT as an extension of the TPS made popular in the 1940s, gained popularity for software development by Mary and Tom Poppendieck in 2003 (Poppendieck & Cusumano, 2012). Lean software development focuses on optimizing the whole system, eliminating waste and building quality into the product, while delivering quickly with high employee engagement and a constant focus on improvement (p. 28).

Overall, many of the approaches and drivers of agile frameworks overlap (Poppendieck & Cusumano, 2012). As such, agile can be seen as an umbrella term that incorporates many different frameworks, often with similar goals of streamlining (i.e. minimizing bureaucracy) the iterative and incremental delivery of products by sensing and responding to shifting environments in a non-sequential, non-waterfall approach (p. 27). By valuing people and collaboration around practical solutions and rapid delivery, agile frameworks enable organizations to excel in dynamic environments (Martin, 2017). Selecting and customizing an appropriate agile approach is seen as one of the top success factors in adopting agile at organizations (Dikert et al., 2016).

Benefits Seen from Agile Framework Implementation. Several studies have documented the benefits of organizations transitioning to the use of Agile frameworks. One recent study revealed successful agile transformations yielded a 30% to 50% improvement in operational performance, a 20 to 30 point improvement in employee satisfaction, a 10 to 30 point improvement in customer satisfaction, all leading to a 20% to 30% improvement in financial performance (Aghina et al., 2020). The top five benefits

from Scrum Alliance (2018) include faster time to market, faster innovation, improved non-financial results, improved employee morale, and ability to attract/hire top talent. The top five benefits from VersionOne (2019) include ability to manage changing priorities, project visibility, better alignment between the business and information technology, team morale, and delivery speed/time to market. In a literature review of non-software Agile framework implementations, the top five reported benefits include better collaboration in the team, increased customer interaction, increased productivity and speed, increased flexibility and coping with change, and better understanding of goals, tasks, and requirements (Gustavsson, 2016). Lastly, the Standish Group's chaos study found that for IT projects, organizations that tend to use agile approaches have a 60% greater chance of success over non-agile projects, with waterfall projects three times more likely to fail than agile projects (Rigby, Elk, & Berez, 2020b).

However, there have been some disadvantages noted to the implementation of agile frameworks. For instance, a foundational tenet that appears in several agile frameworks is the expectation for teams to self-organize (e.g., self-assign and self-manage their own work) and be 100% allocated to a single project, which can conflict with the traditional command-and-control style of management (Pace, 2019). Also, organizations that implement only a portion of an agile framework, versus the entire respective framework, have generated higher levels of chaos, and correspondingly, stress (p. 58). Furthermore, there is potential for there to be cost overruns and failures due to constant rework, since in agile, changes in requirements are permitted, even late in the overall process when creating a product (p. 58).

Agile Transformation Initiatives

Organizations can choose to use agile frameworks to help them excel in dynamic environments (Martin, 2017). In order to embrace agility, many organizations must first undergo a transformation (Brosseau et al., 2019). An agile transformation, however, is more than simply implementing agile practices or agile framework(s) (Korhonen, 2013). A fully-executed agile transformation initiative can impact an entire organization (i.e., multiple departments) at all hierarchical levels (i.e., executive management, middle management, and team members) (Denning, 2018).

There are multiple definitions of an agile transformation. Brosseau et al. (2019) proposes that agile transformations require a shift from traditional operating models (i.e., static and siloed structures and hierarchies, with decisions flowing top-down) to an agile operating model, where speed and adaptability is combined with stability and efficiency throughout every facet of an organization. Korhonen (2013) states an agile transformation changes the entire manner and mindset in which the workforce holistically operates, often taking years to implement. Denning (2018) describes an agile transformation as a never-ending journey to replace the traditional top-down, hierarchical, command-and-control management approach with a new way of thinking both within and beyond an organization, requiring more than just new processes or organizational structures. Overall, a theme in the literature is that agile transformations go beyond implementation of a methodology – there is a fundamental shift in how organizations need to think and holistically operate (Brosseau et al., 2018; Denning, 2018; Korhonen, 2013).

Large-Scale Agile Transformations. Agile frameworks originally focused on smaller projects where there was only a single agile team required (Dikert et al., 2016), with each agile team generally recommended to have between five and nine participants (Kalenda et al., 2018). There does not, however, appear to be a consensus in the literature in the definition of what is meant by a large-scale agile transformation (Kalenda et al., 2018). Fuchs and Hess (2018) state that large-scale agile has four possible interpretations, including: 1) using agile at large firms, 2) using agile for large projects or on large teams, 3) using agile in a multi-team setting, and 4) using agile across a firm holistically.

Kalenda et al. (2018) suggest that the term large-scale could be interpreted by the number of agile teams. One definition of large-scale projects refers to involving two to nine teams, with ten or greater teams referred to as very large-scale (p. 3). Large Scale Scrum (LeSS) can be described in two frameworks, one framework (i.e .LeSS) described as involving eight teams or less and another framework (i.e. LeSS Huge) involving more than eight teams (Larman & Vodde, 2020). Dikert et al. (2016) define large-scale software development organizations as those with 50 people or more, made of at least six teams (p. 88). The Scaled Agile Framework (SAFe) describes agile release trains in terms of multiple teams of 50 to 125 persons total that plan, commit, work, and deliver together within a value stream (Scaled Agile Inc., 2020). Lastly, Rigby et al. (2018) describe agile at scale in terms of dozens to hundreds of teams throughout an entire organization.

Challenges Implementing Agile at Large-Scale. Agile transformations are inherently complex endeavors, influenced by a multitude of factors (Dikert et al., 2016; Dumitriu et al., 2019; Uludag et al., 2018). When scaling agile beyond single teams, to larger scale projects and/or at larger organizations, a set of additional inter-team

challenges arise (Dikert et al., 2016). Table 3 summarizes challenges noted in several studies regarding the implementation of agile at large-scale.

Table 3

Summary of Challenges for Large-Scale Agile Adoption from Selected Studies

Author	Summary of Top Challenges for Agile Adoption
Dikert et al., 2016	1. Difficulty implementing agile (misunderstandings, reversion, poor guidance from literature, etc.) 2. Integrating with non-development (i.e., non-agile) functions 3. Resistance to change 4. Challenges with requirements (including planning) 5. Hierarchical management and organizational boundaries
Kalenda et al., 2018	1. Resistance to change 2. Distributed environment 3. Quality assurance issues 4. Integration with non-Agile parts of organization 5. Lack of commitment and teamwork 6. Too much pressure and workload 7. Lack of knowledge, coaching, and training 8. Requirements management hierarchy 9. Measuring progress
Uludag et al., 2018	1. Coordinating multiple agile teams that work on the same project 2. Integration issues and dependencies with other subsystems and teams 3. Coordinating geographically distributed teams 4. Facilitating shared content and knowledge 5. Managing technical debts 6. Dealing with incorrect practices of agile development 7. Dealing with doubts in people about changes
VersionOne, 2020	1. General organization resistance to change 2. Not enough leadership participation 3. Inconsistent processes and practices across teams 4. Organizational culture at odds with agile values 5. Inadequate management support and sponsorship

While there are many organizations using agile methods, the conditions and environments in which agile works well is unclear (Dumitriu et al., 2019). It is not unusual for firms to declare premature victory with agile, necessitating several years later to launch another agile transformation effort (Denning, 2019).

While many different themes regarding challenges to transformation success exist in the literature as shown in Table 3, one of the top recurring barriers (or challenges) attributed to adopting agile include an organizational culture not aligned with agile values and principles (Business Agility Institute, 2019; Freedman, 2016; VersionOne, 2020). For an organization to adopt sustainable agility, the culture must be transformed which requires changing several elements of an organization's ecosystem, such as its leadership mindset, strategy, processes, structures, and people (Sidky, 2017).

Organizational Culture

While a wide breadth and depth of descriptions and perspectives of organizational culture can be found in the literature, one general theme of culture revolves around how organizational values are expressed through a combination of artifacts, customs, and patterns of observed behavior (Hogan & Coote, 2014). Culture can be considered a psychological phenomenon (Ostroff et al., 2012) that guides interactions of individuals and groups, both between each other as well as with other outside parties (Serrat, 2017). Regardless of the size of an organization, leading firms tend to exhibit a distinct culture that affects their performance and effectiveness over the long term (Cameron & Quinn, 2011).

It is common for there to be a lack of awareness of organizational culture until it is either challenged, experienced (as a new culture), or made explicit via a model or

framework (Cameron & Quinn, 2011). The key to for sustainable agility is to shift culture (Sidky, 2017). However, culture is often attributed as one of the top challenges for agile transformation success (Dikert et al., 2016; VersionOne, 2020). This section covers various perspectives of organizational culture found in the literature, with an emphasis in the Competing Values Framework which is used to classify an organization's predominant culture in this study.

Perspectives of Organizational Culture

One of the earliest mentions of organizational culture has been credited to Elliott Jaques in his 1951 publication *The Changing Culture of a Factory* which details his experiences observing behaviors of a British manufacturer of metal bearings (Jaques, 1951). Jacques proposes that a factory's culture could be defined as how it traditionally thinks and executes work by generally all its members, with new employees needing to accept this way of working if they are to be successful (p. 251).

Schein (1990) states that culture may be defined in the context of six characteristics, including: (1) possessing basic assumptions that arise via patterns in an organization, (2) may be "invented, discovered, or developed by a given group" (p. 111), (3) is a coping mechanism to external and internal factors, (4) has been present long enough and has history of success, making culture perceived as valid, (5) is indoctrinated to those new to an organization or group, and (6) is considered the right way to address challenges that arise. Overall, Schein argues that culture complex, shared amongst members of a constituent group, and is the result of shared learning (Schein & Schein, 2017).

Schein (1990) asserts that the six characteristics can manifest in three distinct levels. The first level, observable artifacts, are visible structures and processes of organizations, which are easily viewable yet sometimes difficult to understand (Ghinea & Bratianu, 2012). The second level, espoused values, are the publicly-facing values and principles that a group alleges it attains (Schein & Schein, 2017). Often set by senior leadership (Bourne, Jenkins, & Parry, 2019), espoused values are consciously articulated and set the desired foundational philosophical view when organizations experience challenges and uncertainty (Schein & Schein, 2017). However, Bourne et al. (2019) assert that actual values practiced may vary from the espoused values, causing churn. The third level, basic underlying assumptions, are the least visible (Hogan & Coote, 2014), driving and guiding the behaviors exhibited (Alvesson & Sveningson, 2008). Basic underlying assumptions are often set by the founders and are often repeatedly validated over time (Schein, 1990), cementing a group's identity and acceptable behaviors (Schein & Schein, 2017). Deviations from basic underlying assumptions often yields a combination of anxiety and defensive behaviors (Osteroff, Kinicki, & Muhammad, 2012).

Similar to Schein, Johnson (1992) argues from the perspective of management and culture, in that managers hold core assumptions and beliefs which are learned over time and specific to their organization. Johnson (1992) describes culture as an integrated web of components that constitute a paradigm consisting of six factors, including control systems, organizational structures, power structures, rituals and routines, stories and myths, and symbols. The commonly held assumptions that drive an organization's

paradigm therefore impact its environment from a managerial perspective, including managerial styles, the nature of its leaders, and operational routines (p. 29).

Schneider (1995) introduced four types (or structures) of organizational culture that shows a turn towards a humanistic view. The first structure, control, is rooted in the military, where power and dominance (lack of choice) is valued, emphasizing procedure, systems, and predictability, eschewing vulnerability, and using objective data (not emotion) to make decisions. The second structure, collaboration, is derived from the concept of family and the need for positive relationships, partnerships, and commitment for whole organizations to resolve challenges together. The third structure, competence, emerged from educational institutions where scientific thinking, knowledge, and technical capabilities drives the success of products or services equal to none in the marketplace. The final structure, cultivation, arose from religious organizations where ethics and faith intrinsically motivate people to accomplish something greater than they are, continually developing the self. While organizations may have a predominant structure, organizations can exhibit elements of the other three structures.

Flamholtz (2001) also explored a model of organizational culture, not from a broad viewpoint, but at a single durable goods company with twenty comparable divisions. For this company, organizational culture was distilled down into five general dimensions, including: (1) relationships with customers, (2) the value of the employees, (3) continuous improvement and performance standards, (4) teamwork and communication, and (5) being good corporate citizens to the communities in which they operate. A decade later, Flamholz and Randle (2011) stated that culture contains the

dimensions of both change and innovation. Companies that embodied these facets of culture tend to have greater short term and long term success (p. 34).

Dawson (2010) describes organizational culture as a combination of both a personality as well as a set of capabilities. From a culture as a personality perspective, this refers to the style and climate of an organization, which can be unique and a distinguishing characteristic for a company (p. 14). Based in the works of Schein, Dawson (2010) describes characteristics of a culture as personality as its shared beliefs, attitudes, and behaviors it exhibits (p. 14), which can often be somewhat subjective (p. 15). By contrast, from a culture as capabilities perspective, the emphasis shifts towards the organization's lasting competencies (p. 14). An organization's capabilities tend to be more visible and more easily measured as compared to culture as personality (p. 15). However, both culture as personality and culture as capabilities must be present in organizations and addressed, especially in times of change (p. 15).

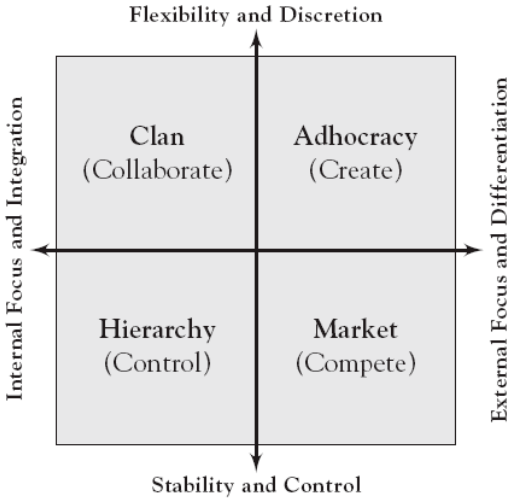
The Competing Values Framework. Another model, the Competing Values Framework (CVF), provides insights into four different values that forms an organization's underlying cultures which impacts how it effectively operates, from required leadership and management competencies to approaches to change (Cameron, 2009). The CVF has been recognized widely as a framework that addresses the dynamic and multidimensional characteristics of organizational culture (Kim & Chang, 2019).

There are two orthogonal continua that define the CVF, with opposite characteristics that appear along each respective continuum, representing competing values (Cameron, 2009). For instance, the first dimension deals with a spectrum of control. One end of the spectrum is an organization that emphasizes flexibility,

individualism, and dynamism to the other end that focuses on stability and order. The second dimension describes how an organization orients itself, whether it looks internally by focusing on collaboration and unity or externally by emphasizing competition, differentiation, and rivalry. The two dimensions together form a quadrant, with each portion of the quadrant emphasizing a combination of control with orientation, as shown in Figure 3. While companies will typically contain properties of all four quadrants, they will likely have one predominant culture.

Figure 3

The Competing Values Framework



Note. Reprinted from *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework* (3rd ed., Chapter 3, Figure 3.1). K.S. Cameron & R.E. Quinn, 2011. Jossey-Bass. Copyright 2011 by John Wiley & Sons, Inc.

Cultures Emphasizing Stability and Control. Diving into the details of each quadrant, the hierarchy (or control) culture is based in the works of the early twentieth century, where the emphasis in characteristics such as rules, specialization, and hierarchy

increased the efficiency and reliability of outputs in stable industries of the time, such as large corporations (like General Motors or McDonalds) or government agencies (Cameron & Quinn, 2011). Much of the management literature through the 1960s focused on bureaucracies and hierarchical control to ensure stability and efficient production of goods and service (Chapter 3). Several characteristics included emphasizing clear decision-making authority, standardization of rules and procedures, and mechanisms for accountability (Chapter 3).

The market (or compete) culture arose in the 1960s when organizations needed to integrate with other organizations, often niches or specialists in a certain field, to keep their competitive advantage (Cameron & Quinn, 2011). Market cultures emphasize winning with success measured by market share, penetration, and being viewed as market leader (Chapter 3). As such, market cultures tend to have leadership that are demanding and aggressively pursuing profits, often resulting in a hostile environment (Chapter 3).

Cultures Emphasizing Flexibility and Discretion. The clan (or collaborative) culture was derived in the late 1960s and early 1970s via observation of Japanese firms where shared values, cohesiveness, and a sense of "we" versus "I" created a sense of family (Cameron & Quinn, 2011). Semi-autonomous teams, empowerment, and employee development are seen as a benefit to increase participation, commitment, and loyalty (Chapter 3). By emphasizing values, beliefs, and common goals, organizations were thought to be able to better navigate rapidly changing environments operating in uncertainty (Chapter 3).

The adhocracy (or creating) culture came as the information age took greater foothold, where the hyper-turbulent markets of the twenty-first century conflicted with

long-standing approaches of the twentieth century (Cameron & Quinn, 2011). Emphasis in entrepreneurship, creativity, and innovation in order to adapt to is seen as the driver for profitability (Chapter 3). Power is distributed and temporary, flowing freely and constructed only to solve a particular challenge, then disbanded and reinstated in another form or area to the next issue (Chapter 3). Industries, such as aerospace, software development, filmmaking, and think-tank consulting are often associated with adhocracy (Chapter 3).

Agile Frameworks and the CVF Model. When it comes to the implementation and adoption of agile frameworks, agile frameworks emphasize empowerment and flexibility via self-organization (Pace, 2019) and self-governance (Rigby et al., 2018). The two cultures from the CVF that align with flexibility and change are the clan culture and adhocracy culture (Ranjeeth, 2018). Karvonen, Sharp, and Barroca (2018) purport that based upon their review of literature of CVF in agile software development, the adhocracy culture most closely aligns with agility. Correspondingly, the two cultures from the CVF that have strong control and order are hierarchy culture and market culture (Ranjeeth, 2018).

Organizational Culture and Organizational Performance

Culture could be seen as a mechanism by which employees view themselves with respect to their organization, including how they interact with each other and their customers on a multitude of factors such as their problem-solving and making strategic decisions (Dale Carnegie Research Institute, 2017). Serrat (2017) states that culture is "the premiere competitive advantage of high-performance organizations" (p. 355). As such, Dawson (2010) argues that value creation for an organization is driven by culture,

acting as either an accelerator or barrier to producing value, and can provide the basis for strategic advantage that is not easily imitated. So, an organization's performance can be associated with its survival and overall success (Nikpour, 2017).

Several authors have asserted that an organization's culture impacts their performance (Kim & Chang, 2019; Nikpour, 2017; Paracha, Mahmood, Saboor, & Malik, 2019). For instance, in a study by Flamholtz (2001) of a single company with twenty different divisions, it was found that divisions with greater adherence to the desired company culture generated higher profits (as measure by earnings before income taxes) than those that had lower adherence. Dale Carnegie Research Institute's (2017) survey of 760 corporate leaders revealed for those that self-reported their cultures as excellent also had higher financial return than expected. Flamholtz & Randle (2011) determined in a case study that 46% of a company's earnings before income tax could be explained by a company's culture and how well the employees buy-in to that culture. So, it appears from the literature as if there is a relationship between culture and financial performance.

However, organizational performance extends beyond financial performance. Nikpour (2017) asserts that organizational performance is the amalgamation of all accomplishments from all departments (or businesses) in an organization. Kim and Chang (2019) state that financial performance is attained via a result of intangible efforts, such as employee learning and growth and customer relationships. Dale Carnegie Research Institute (2017) also stated that organizations who indicated high culture self-assessment scores have greater employee engagement than those with lower culture self-assessment scores. Ultimately, culture has the capability to release an immense force

towards a collective purpose which cultivates an organization's capacity to excel (Groysberg et al., 2018).

Strong and Weak Organizational Culture. The culture of an organization can take two forms, either strong or weak (Maseko, 2017). An organizational culture may be considered as strong when employees who are well aligned to it inherently respond to environmental stimuli versus by relying on administrative orders to take action (Serrat, 2017). Cultures are also strong when a set of values and beliefs are both held and adhered to widely (Maseko, 2017). An organization with a strong corporate culture is essential to win in a highly competitive marketplace (Dale Carnegie Research Institute, 2017). For instance, organizations with a strong culture tend to attain 20-30% higher business results than organizations with a weak culture (Andriukaitiene et al., 2018). However, the strength of an organization's culture must be weighed with respect to the environment where that organization competes (Dale Carnegie Research Institute, 2017).

Comparatively, organizational culture may be considered weak when there is little alignment between the employees and culture, where administrative orders are required to exercise control (Serrat, 2017). Personal principles, norms, and values tend to drive the actions and behaviors of individuals in weak cultures, generating a more volatile culture (Maseko, 2017). With a heavy reliance on rules and regulations for employee behavior in weak cultures (p. 2), administrative orders are required to employ control (Serrat, 2017). Maseko (2017) asserts that weak organizational cultures are less successful than strong organizational cultures, in that employees in weak cultures tend to have less connection, and therefore less motivation, to organizational goals. The Dale Carnegie Research

Institute (2017) goes further by asserting a weak culture could be an indicator of likely failure in a highly competitive marketplace.

Culture is Learned and Reinforced Over Time

Culture results from learning from experiences over long periods of time, often under the influence of the interactions and sense-making of leadership and the employees of an organization (Ostroff et al., 2012). Szczepańska and Kosiorek (2017) assert an organization can generate its culture via two sources: external influences and internal influences. From an external view, an organization's culture can depend on not only its national culture, but the social and cultural environment of the industry in which it operates (p. 461). Furthermore, an organization's culture is often the reflection of the values and beliefs of the company's founder (p 462). An organization's culture tends to reflect how its founder executed against their initial assumptions and theories, and how the employees have learned as a group through their own experiences (Schein, 1983). As such, culture is derived from shared learning and is a shared product by a group (Schein & Schein, 2017).

To understand an organization's culture, it is necessary to comprehend how learning happens in an organization, over what period of time the learning occurred, and the role the leadership played in that learning (Schein & Schein, 2017). As time progresses, culture impacts how work is accomplished, from elements such as its organizational structure, identification and execution of strategy, and the systems by which work is accomplished (Schein, 1986). The behaviors and attitudes of individuals can be not only influenced by the greater group (Ostroff et al., 2012), but of the management team as well (Szczepańska & Kosiorek, 2017). Overall, culture is self-

reinforced between the individuals and the organization, being shaped and supported from unconsciously shared underlying assumptions (Ostroff et al., 2012).

Agile and Culture

With an organization's culture suggested to be linked with an organization's agility (Felipe et al., 2017), agile adoptions often necessitate changing the culture of an entire organization (Dikert, et al., 2016; Sidky, 2017). VersionOne (2019) states the top impediment for agile adoption across an organization is the misalignment between the organization and operating under agile values. Similarly, the Scrum Alliance (2018) states that the number one factor that holds back transformations is "organizational design and culture make it difficult" (p. 26). Korhonen (2013) also states that culture is one of the top three reasons for successful agile transformations. Organizations that tend to self-report greater agility state that culture is an asset while organizations that self-reported low agility stated culture is an obstacle (Scrum Alliance, 2018).

But what makes culture a factor that can hold back an organization from a successful agile transformation? First, implementing agile practices goes beyond individual teams or silos, often requiring a holistic systems-thinking perspective (i.e., spread across an organization) (Denning, 2019; Dikert et al., 2016). Because an agile transformation transcends implementing agile practices on teams, it changes the way the organization fundamentally accomplishes their work (Korhonen, 2013). Frustration often builds between the teams who are using agile frameworks and the other parts of the organization who have not transitioned to agile and are still working under a more traditional higher bureaucracy (Denning, 2019; Dikert et al., 2016).

With agile approaches emphasizing collaboration, pragmatic problem solving, and quick evolutionary change based upon feedback (Martin, 2017), an organization's mindset in how they approach work may be altered in an agile transformation (Denning, 2019; Korhonen, 2013), which can an impact their culture (Dikert et al., 2016). As seen in Table 3, several studies reveal challenges in large-scale agile adoption related to collaboration. Some highlights of collaboration related challenges include integrating agile and traditionally non-agile functions together (Dikert et al., 2016), working in a distributed environment and sharing knowledge across teams (Kalenda et al., 2018; Uludag et al., 2018), or inconsistencies with implemented agile practices across teams (Uludag et al., 2018; VersionOne, 2020).

Secondly, agile transformations shift power towards the people who do the work, which can impact culture as well. The traditional top-down approach up through the twentieth century focused on command-and-control bureaucratic tactics and reward systems based on individuals, with the goal to make money (Denning, 2019). However, at the turn of the twenty first century, a post-bureaucratic approach evolved to address dynamic shifts in the environment (p. 3) Emphasis turned towards employee enablement, continuous innovation, and customer satisfaction where making money was a result of how it achieved the work, and not the driving goal (p. 3).

In an agile organization, teams are self-governing and self-managing, which is different from chain-of-command bureaucracies (Rigby et al., 2018). The intent is for leadership to point the teams in the direction of where innovation is required, and let the teams work directly with customers so that the people closest to creating the solutions are working with the internal or external stakeholders who desire the solutions. (p. 91).

Considering the Competing Values Framework, the hierarchy and market cultures align more with stability and control while the clan and adhocracy cultures align with flexibility and individuality (Cameron et al., 2014). So, the clan and adhocracy cultures, with less control and stability, might align better with the flexibility purported by agile frameworks (Ranjeeth, 2018). Changing from a traditional, top-down driven organization to operating within an agile framework that is based in shared leadership and self-organization involves altering the mindset of the people in the organization (Dikert et al., 2016; Kalenda et al., 2018), and ultimately their organizational culture.

Summary

With many definitions to agility (Zitkienne & Deksnys, 2018), agility could be considered as an organization's ability to sense and respond to rapidly fluctuating conditions (Kocu, 2018) for competitive advantage (Filipe et al., 2017) or to deliver results (PMI, 2017). While organizations are implementing agile frameworks as a vehicle to attain greater agility (Denning, 2018), there are many agile frameworks to choose from, as summarized in Table 2. An agile transformation is a large-scale organizational change initiative to implement agile frameworks across entire firms or in large multi-team settings (Fuchs & Hess, 2018) so that an organization may increase their agility to succeed in a turbulent, fast-changing, and ambiguous environment (Denning, 2018). Organizations that implement agile frameworks across the enterprise have seen improvements in operational performance, customer satisfaction, employee engagement, and financial performance (Aghina et al., 2020).

Introducing agile at large-scale comes with challenges (Dikert et al., 2016; VersionOne, 2020), such as resistance to change (Dikert et al., 2016; Fourie & de Vries,

2017; VersionOne, 2020), coordinating across teams (Dikert et al., 2016; Uludag et al., 2018), integrating non-agile and agile functions (Dikert et al., 2016; Kalenda et al. 2018), challenges with management (Dikert et al. 2016; Uludag et al, 2018; VersionOne, 2020), and lack of knowledge in agile (Dikert et al., 2016; Kalenda et al. 2018), to name just a few. One challenge that appears on many lists is the need to shift culture when adopting agile at scale (Denning, 2018; Scrum Alliance, 2018; VersionOne, 2020). Shifting culture could come in the form of increased collaboration and need for holistic organizational systems thinking (Denning, 2019; Dikert et al., 2016) or shifting away from top-down, command-and-control bureaucracies (Dikert et al., 2016; Kalenda et al., 2018; Rigby et al., 2018). Overall, in an agile transformation, the entire organization needs to change, not just the teams performing work, as it often involves simultaneous parallel shifts in processes, roles, and tools (Ebert & Passivaara, 2017).

Organizational culture is a multi-faceted construct with many interpretations and models. Corporate culture is very powerful in that it runs deep, embedding itself in every facet of an organization, from how it thinks to actions it takes (Dale Carnegie Research Institute, 2017) and can have an influence on organizational performance (Nikpour, 2017; Serrat, 2017). Culture can provide consistency for an organization and its members, enable order and structure, drives communication patterns, establishes and enforces power, and management practices (Schneider, 1995).

Cultural transformation becomes especially challenging, in that success often builds a natural resistance to change (Dale Carnegie Research Institute, 2017, p. 3). Agile transformations often introduce culture shift (Business Agility Institute, 2019; Sidkey,

2017). Culture is also cited as one of the top reasons for challenges to adopting agile frameworks (Scrum Alliance, 2018; VersionOne, 2020).

The Competing Values Framework (Cameron & Quinn, 2011) describes culture along two orthogonal axes, with level of control for one axis and internal vs external focus on the other axis, yielding a model with four culture types. As depicted in Figure 2, the hierarchy culture and market culture classifications from the CVF model are more aligned with greater control. Further, the clan and adhocracy cultures align with individuality and flexibility (Cameron & Quinn, 2011), as does an agile culture that emphasizes self-organization (Pace, 2019) and self-governance (Rigby et al., 2018).

Further, an organization's culture may be considered as strong or weak (Maseko, 2017). A strong culture is present when employees are intrinsically self-motivated to act while a weak culture is marked by employee action driven by administrative orders (Serrat, 2017). Organizations are likely to encounter challenges in avoiding obstacles without an understanding of culture and cultural challenges in organizational change initiatives (Muller et al., 2019).

Chapter 3: Methodology

Introduction

The purpose of this study is to investigate the level of control of an organization's culture at the outset of a large-scale agile transformation on the success of achieving their agile transformation goals. This quantitative study measured elements of control and culture from two perspectives. First, the Organizational Culture Assessment Instrument (OCAI) from the Competing Values Framework (CVF) from Cameron and Quinn (2011) was used to classify an organization's culture at the start of a transformation into two categories: higher control (e.g., hierarchy or market culture) and lower control (e.g., clan and adhocracy cultures). Second, based in work from Serrat (2017) and Andriukaitiene et al. (2018), the strength of a culture (i.e., strong vs. weak cultures) was established on a continuum using a composite score. Each perspective of culture at the outset of an organization's agile transformation was then analyzed against the level of success the organization attained of its agile transformation goals. In terms of the study population, this study focused on for-profit companies primarily based in the United States who have undergone a large-scale agile transformation in the past five years.

Research Design

To explore the research questions in this study, a quantitative study design was used. Quantitative studies involve collecting numerical data to explain a phenomenon (Sukamolson, 2007) often via statistical analysis and statistical interpretation (Creswell, 2014). Not only can quantitative research be used to quantify the opinions, attitudes, and behaviors of a population from a sample, but also to segment and compare various groups (Sukamolson, 2007). Quantitative research requires objectivity, structured procedures,

and a formal instrument for data collection, especially since an inference to a population could be made from a sample from that population (Queiros, Faria, & Almeida, 2017).

Survey research, a form of a quantitative study design, typically employs the use of questionnaires to provide a "numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell, 2014, p. 13). Several benefits of survey research include the ability to highly represent a population via a sample from that population, low costs associated with surveys when comparing to other methods, and a reduction of researcher subjectivity (Queiros et al., 2017). However, the reliability of a survey's data highly depends on the structure of the survey and how accurately the respondents provide their answers (p. 381).

By comparison, a qualitative study was not used in this research. Qualitative research aims to gain deep understanding of a problem, often requiring investigation and interpretation beyond numbers to explain the intricacies of social relations (Queiros et al., 2017). Qualitative research uses open-ended questions to gain insights into a respondent's experiences, perceptions, and behaviors, in an effort to explain behaviors that are a challenge to quantify (Tenny, Brannan, Brannan, & Sharts-Hopko, 2020). Qualitative research can be used to generate hypotheses, answering the hows and whys of a particular phenomenon (p. 1).

Population of Study

The population for this study included organizations that have participated in a large-scale agile transformation in the past five years. Aligning with Dikert et al. (2016), a large-scale agile implementation was defined as an organization using an agile framework, such as Scrum or Kanban, by 50 or more persons or by six or more teams.

In addition, only for-profit organizations were included in this study, with non-profits and government (or public) agencies excluded. For-profit institutions often have challenges and strategic motivations dissimilar to non-profits (Zhu, Wang, & Bart, 2016) and decision-making practices dissimilar to government-run (i.e. public) agencies (Nutt, 2006). For instance, for-profit businesses aim to earn income for its founders and employees while non-profits are organizations driven by purpose for the public good, with no person owning shares or fiduciary interest in its properties (Fritz, 2019). Similarly, private for-profit organizations sell products or services to consumers to generate shareholder wealth while tax-supported government agencies focus on services and needs for a public purpose, requiring a difference in accountability and practices exercised by management teams (Nutt, 2006). Furthermore, to limit any impact of a nation's general culture influence on the study, only organizations with their primary business units located in the United States were included.

Finally, because agile transformations can be complex initiatives to execute (Dikert et al., 2016), only those with direct experience in an agile transformation of at least one year were eligible to participate. Plohl and Musil (2018) describe the Dunning-Kruger effect as when an inexperienced or incompetent person might not only generate incorrect conclusions and make poor decisions with respect to their domain, but they also lack the insights to realize they've reached wrong conclusions. Similarly, Musaji, Schulze, and Castro (2020) assert decision makers have limited abilities to "distill information and exercise judgement" when they have a low level of experience (p. 210). However, learning from small samples or limited exposure, while difficult, can help accelerate a learner through the initial learning curve (p. 209). Oakes (2012) asserts that

while it is challenging to determine how much time it takes to become fully proficient in a new role, his survey stated that 75% of respondents felt it takes between one and two years. The guidance from Oakes (2012) aligns with this researcher's experience in leading large-scale agile transformation initiatives, in that one year of experience is sufficient for most to have enough context and understanding of the goals and terminology of agile transformations so that more accurate and meaningful data can be collected and analyzed. The qualification criteria for the research participants is summarized in Table 4.

Table 4

Participant Qualification Criteria

Criteria	Rationale
The respondent must work at a for-profit company, either publicly or privately owned.	Non-profit organizations and government agencies have challenges, strategic motivators, and decision-making processes dissimilar to for-profit organizations (Zhu, Wang, & Bart, 2016)
The respondent must work at a company in a location within the United States.	Reduces the potential for variation in national culture if multiple countries were allowed to participate in this study. The company may be an international corporation, but the respondent must be located in the United States.
The respondent must have at least one year experience as a participant or leading an agile transformation initiative in the past five years.	One year experience is long enough to understand the terminology and context of agile transformation. Five years is suggested as long enough for agile transformation change to arise yet short enough where distortion of details over time may reduce accuracy of data used to infer results.
The respondent must work at a company that executed a large-scale agile transformation.	Culture shift and results from a large-scale organizational change such as an agile transformation initiative takes time and involves multiple teams across many parts of an organization.

Sampling plan

Randomized sampling is the preferred approach to enable results to be generalized to a population (Creswell, 2014). However, recent trends of challenges in randomly collecting data from a population (e.g., declining response rates, increased costs of survey administration, societal behavioral changes in responding to surveys, and technology changes) have been noted (Couper, 2017).

To increase the likelihood of recruiting respondents that meet the study criteria (e.g., participants in large-scale agile transformations with at least one year of experience in a transformation in the past five years in a for-profit company in the United States), this researcher used his network of experts in the agile consulting industry to identify and recruit participants for the study. Couper (2017) asserts that nonprobability approaches to collect data from hidden populations can be accomplished via a chain referral technique, where a few selected respondents known to the researcher can use their corresponding social networks to further recruit respondents.

An open-access survey was also used to collect data. Potential respondents were identified in LinkedIn by using a combination of factors, such as profiles that included titles (such as Agile Coach, Agile Transformation Manager, Enterprise Agile Coach, to name a few), job experience that indicated minimum duration of experience (i.e, at least one year in the past five years), and possession of credentials with scaling agile, such as SAFe (Scaled Agile Framework), LeSS (Large Scale Scrum), S@S (Scrum@Scale), DAD (Disciplined Agile Delivery). Postings were also placed in several LinkedIn groups, such as Agile Transformation and Organizational Change, Agile Coaching,

Disciplined Agile, Scaled Agile Framework, and Scaling Agile. Refer to Table 4 for a list of qualifying criteria for participation in this study.

Through a combination of the chain referral technique and open-access survey, bias could be reduced through a wider pool of respondents that the researcher does not personally know versus the invitation to respondents by this researcher alone. Regardless of the identification of respondents, only those who meet the criteria listed in Table 4, the Participant Qualification Criteria, were eligible to participate in this study. Table 6 in the Data Collection Plan and Procedures section provides more information regarding recruitment of participants.

Sample size determination

From a sampling size perspective, two studies provide insight into the minimum data pool requirements for this study. In one study related to organizational agility and large-scale agile transformation initiatives, the authors included data from 22 organizations in six sectors; the authors also noted there a limited number of full-scale, enterprise-wide agile transformations performed in industry today (Aghina et al., 2020). From Dikert et al. (2016), the authors included case studies from 42 software development companies to come to their conclusions of large-scale agile transformation patterns. As such, the target for this study for the minimum number of companies to include was at least 30 companies, which is an approximate average of the two studies.

From a minimum of 30 companies, there were also a minimum total number of valid samples required for collection. Using Green's (1991) rule-of-thumb to calculate sample size on a medium effect is done using the formula: $n > 104 +$ predictors (Wilson

Van Voorhis & Morgan, 2007). With up to two predictors (for two independent variables), $n > 104 + 2$, or a minimum of 106 samples.

When a study has a low sample size, there can be reproducibility problems along with increased potential of false positives or negatives (Jenkins & Quintana-Ascencio, 2020). To ensure a more solid analysis for this study, an additional 65% higher samples over the minimum, or 175 samples, was set at the target sample size. This target number of samples aligns with a study by Felipe et al. (2017), where they compared organizational culture using the Competing Values Framework and organizational agility for companies in only the innovation sector in Spain with a sample size of $n = 172$ and a study by Lenberg et al. (2019) to investigate CVF and values in agile development approaches in Sweden with a sample size of $n = 184$.

Measurement and Instrumentation

A web-based electronic questionnaire was utilized as the data collection instrument in this study. Internet-based surveys are an efficient and cost-effective means for academic researchers to collect data (Leiner, 2019). The questionnaire was constructed using a combination of an existing validated instrument and customized questions to fill any gaps as needed to address the research questions, as detailed below.

To determine qualification for participation in this study, a set of three custom qualification questions was posed to the respondent. The three questions will align with the respondent qualification criteria specified above in Table 4. All answers to these three questions had to be answered in the affirmative for a respondent to qualify to participate in this study.

To determine the culture of an organization, the Organizational Culture Assessment Instrument (OCAI) from Cameron and Quinn (2011) was utilized. As detailed in Appendix B, the OCAI assesses culture in six dimensions, including: an organization's dominant culture characteristic, leadership style, employee management approach, the glue that holds the organization together, strategic emphasis, and how the organization assesses success (Cameron & Quinn, 2011). The OCAI requires answers to six questions (one question per culture dimension) with a whole number numerical value response on a scale of zero to 100, dividing the 100 points across four alternatives (each alternative represents one of the four types of organizational cultures) for each question.

To measure if a culture is strong or weak, four custom questions using a seven point Likert scale (strongly disagree to strongly agree) were posed. Boone and Boone (2012) assert that certain statistical analyses such as ANOVA and regression may be done by establishing a composite value from four or more Likert scale questions. While the questions in this section are customized to this survey, they are based in the work of Serrat (2017) and Andriukaitiene et al. (2018).

To determine the degree by which goals were attained by the agile transformation, 11 customized questions were authored by the researcher. The first nine questions were based upon the top nine most frequent responses to why organizations chose to adopt agile practices in *14th Annual State of Agile Report* by VersionOne (2020). The top nine response categories were used in this study (those with a response value of 30% or higher in the VersionOne (2020) report). There are nine questions, asking to what degree did they achieve the goal of each agile adoption category (such as to accelerate product delivery or to enhance ability to manage changing priorities) on a seven point Likert scale

(significantly much worse, moderately worse, a little worse, same/no change, a little better, moderately better, and significantly much better) as a result of their agile transformation initiative. While the respondents were presented with nine agile adoption categories, it is likely that not all nine categories applied to their transformation. So, the respondent were presented with an additional selection choice of "this category did not apply to our transformation."

To ensure that at least some measure of success of agile transformation could be obtained (in the case that the respondent did not choose any of the reasons in the prior nine category questions), two more custom questions were presented to the respondents regarding how much they agree with two statements regarding the success of their agile transformation. One statement is in relation to the success of their immediate department/division and the other statement to their entire holistic organization's success. A seven point Likert scale was used to measure the respondent's agreement with both statements (strongly disagree, moderately disagree, slightly disagree, neutral, slightly agree, moderately agree, strongly agree).

Finally, six custom demographics questions completed the survey, including if the transformation is still in progress, the length of time of the transformation, the industry in which the company operates, size of company, role of respondent, and an optional question for the name of the company (to show how many different companies contributed to the study). These questions generally align with the demographics collected as part of the Business Agility Institute (2019) study. Overall, there are 31 questions in the questionnaire, which are summarized in Table 5 and can be found in detail in Appendix A.

Table 5

Overview of Study Questionnaire

Question Category (# Questions)	Rationale	Based Upon
Qualification (3 questions)	Ensured the participant qualifies as a member of the population for this study	Table 4 – population profile as listed in this study
Culture: (6 from OCAI, 4 custom)	Established the culture profile of the respondent's organization (OCAI) as well as if the organization has a strong or weak culture (4 custom questions)	OCAI is based on Cameron & Quinn (2011); strong and weak culture questions based on work by Serrat (2017) and Andriukaitiene et al. (2018)
Agile Transformation Outcomes (11 custom questions)	Identified the degree by which a company achieved their agile transformation goals	The *14th Annual State of Agile Report* by VersionOne (2020), the top reasons why companies choose to adopt agile.
Demographics (6 custom questions)	Gained understanding of the profile of respondents	*The business agility report: Raising the B.A.R.* by the Business Agility Institute (2019)

Reliability and validity

The quality of a quantitative study using a survey design can be impacted by the research instrument utilized (Sukamolson, 2007). As such, several steps were employed to ensure sufficient reliability and validity for the questionnaire. Reliability is the degree that a measure is consistent, with responses approximately the same upon multiple executions of the test (Heale & Twycross, 2015). Validity relates to whether the concept tested is accurately measured (p. 66).

The questionnaire used in this study was comprised of a combination of an existing instrument with a long history of usage (and high reliability and validity) and

custom questions. The OCAI has been used since the 1990s in scholarly research over thousands of organizations (Cameron & Quinn, 2011), as well as in a recent study by Felipe et al. (2017) that investigated the relationship of organizational culture with organizational agility for innovation companies in Spain. The other questions in this questionnaire were custom, authored by the researcher, and had not yet been used in a scholarly setting. As such, the questionnaire utilized for this study had to be evaluated for both reliability and validity.

To establish validity of the entire instrument (i.e., the OCAI plus the custom questions specific to this study), several steps were taken. Both face validity and content validity should be established if there is to be confidence in the inferences made from the instrument utilized (Hardesty & Beardon, 2004). Face validity can be defined as the degree by which "a measure reflects what it is intended to measure" (p. 99). In a literature review by Hardesty and Beardon (2004), the numbers of experts used to establish face validity ranged from three persons to 52, with six out of the 39 constructs analyzed utilizing a panel of three experts to establish face validity. Content validity, which is established by judgements of domain experts, can be described as ensuring that the items in the questionnaire adequately reflect the concepts in the domain of interest (Mohajan, 2017). If a set of measures is considered to have content validity, then it can be assumed that there is also face validity (p. 16). As such, it was targeted to have at least three other agile transformation experts review and provide written feedback on this study's instrument for content and face validity. As detailed later in this document, a total of four experts provided their written insights and can be found in Appendix E. Finally, a pilot run of the instrument was performed. To establish reliability, a common measure, such as

Cronbach's alpha, was used to ensure the internal consistency of the online questionnaire (Heale & Twycross, 2015).

Data collection plans and procedures

Due to the anticipated limited population for this study, to recruit participants in the study, two techniques were used. First, using the chain referral technique (also known as snowball sampling), an invitation to participate was provided to a list of known professional colleagues to this researcher, specialists in agile transformation, to recruit participants in the study. Note, with the potential for bias to appear in the study, please refer to the next section, Bias, on approaches to minimize bias. The next set of potential respondents came from the network of the professional colleagues identified in step one above (e.g., *their* network). This set of participants not only expanded the potential number of respondents, but also put a separation between this researcher and the potential respondents, thereby potentially reducing bias while increasing the likelihood of recruiting qualified participants.

The second technique for recruiting respondents was general postings in this researcher's LinkedIn feed as well as LinkedIn User Groups focused on topics such as agile, agile at scale, and agile transformation. Additionally, several professional societies (e.g., non-profit organizations) such as the Scrum Alliance and other regional chapters of non-profit Agile professional societies such as Agile Austin, Mile High Agile (Greater Denver area), and Agile New England (Greater Boston area), provided links to this study to their membership. Table 6, *Summary of Participant Recruitment Strategy*, summarizes both how and the sequence in which the participants were recruited for this study. Recall,

in all respondents must meet the qualification criteria listed in Table 1 in order to participate.

Table 6

Summary of Participant Recruitment Strategy

Participants	Description	Reach-out Approach
1. Agile Consulting Partners	Network of personally known experts in the agile consulting industry to forward invitation to their known clients and potential respondents	Email or LinkedIn message; attach language to use for recruiting participants
2. Network of Agile Consulting Partners	Using the chain referral approach, these persons are also agile consulting experts not known by the researcher but known to those identified in step one.	Persons in step one reach out to their networks using prescribed invitation to participate in this study listed in step one.
3. LinkedIn	Using open-access approach, posting with a call to action (i.e., invitation to participate) on researcher's LinkedIn feed and in selected LinkedIn User Groups	Short post (approximately 2 sentences) on LinkedIn with link to the questionnaire landing page, which details study purpose and participant criteria.
4. Professional Societies	Using open-access approach, distribute invitation via social media distribution channels of prominent non-profit Agile related organizations such as the Scrum Alliance and regional Agile associations.	Short post (approximately 2 sentences) for associations to post on their social media channels with link to the questionnaire landing page, which details study purpose and participant criteria.

Bias

Bias can be regarded as an influence that can distort a study's results (Galdas, 2017). For instance, survey-based research may offer a false sense of objectivity (Onwuegbuzie & Leech, 2005). Even though the data itself and its corresponding analysis may be objective, the instrument itself may have subjectivity built in (p. 377). As such,

the questions themselves in this study's survey could have been constructed with unintentional bias. Bias in the questionnaire was reduced as described in the validity section above, in which four agile transformation experts with research experience reviewed the questionnaire prior to study execution.

Data analysis plans and procedures

Data collected in this study was in both numerical and text format upon its collection in the electronic survey instrument. The OCAI had all numerical data collected. All data collected for Likert type responses were translated into numerical format for analysis in the statistical packages as described in Appendix D. Finally, names of companies optionally provided remained as-is and remained confidential only to the researcher; the intent of collecting company names was to only ensure at least 30 different companies were represented in the sample.

Data Integrity and Data Cleanup

With raw data gathered by the SurveyMonkey electronic survey tool, these data were subsequently imported into Excel for data cleanup and translation into coded values as needed. Any missing data was identified in Excel. When analyzing data, missing data is one of the largest problems (Tabachnick & Fidell, 2019). Excel was used due to researcher preference and ease of visually inspecting data for completeness. Data from respondents that are incomplete (defined as having more than 5% of data missing for required questions) were not be used, assuming the minimum number of data points have been gathered. More than 5% missing data could indicate issues in the data collection process (Tabachnick & Fidell, 2019). High rates of incomplete or missing data could potentially indicate poor survey design, poor survey execution, poor survey

communications, and/or a variety of other impediments that are preventing survey completion.

As data was collected, the data was monitored several times a week to ensure that (1) there was not a high amount of incomplete or missing data, and (2) data was being collected at a fast enough rate to meet sample size requirements within the data collection time frame of the study. To monitor the data, the researcher downloaded the data from the electronic survey tool into Excel as described above to visually inspect for unusual data patterns. Leiner (2019) states that a major drawback from internet surveys is the ease in which invalid responses may be provided by a respondent (e.g. answers that appear in a defined pattern such as all high, all low, or crisscrossing/alternating values). As described in the respondent profile section later in this document, only one respondent answered "neutral" to every single question; this is an example of an unusual data pattern, and subsequently, this data point was excluded from the final data set.

Tabachnick and Fidell (2019) also stress the importance of proofreading data, to ensure proper subsequent statistical analysis and inference of statistical outputs. It is recommended for data to be screened to ensure values are within expected ranges, and that the calculated means and standard deviations are plausible. SurveyMonkey has functionality embedded that ensures that, for example, a numeric response between a minimum and maximum value was entered (e.g., not left blank, not a negative number, or a value greater than expected); this feature was especially helpful for the organizational culture questions related to the OCAI instrument where values must be zero to 100, and that the sum of the numbers for each question must add up to a value of 100.

SurveyMonkey also has the capability to specify which questions are required or are optional; this feature was used to ensure that all the required questions were answered.

Any data that was altered as part of the cleanup (such as entering a zero for a blank numeric response, converting Likert-type responses to a pre-determined coded numerical value, or spell correcting typographical errors from a respondent-provided company name) or responses rejected from use in the study analysis (such as an incomplete survey where more than 5% of data is missing) were tracked and made available to the dissertation study chair to ensure ethical data practices with regard to data manipulation were followed.

Analysis of Data

This study employed several types of statistical analysis and mathematical computations. First, simple descriptive statistics of the respondents' demographics information were generated (company size, length of time of agile transformation, industry type, respondent roles, and number of companies represented). Secondly, the OCAI instrument prescribes how to score responses to establish a company's culture profile (Cameron & Quinn, 2011). As detailed in Appendix B, each of the six questions has four answer selections that relate to a culture type (e.g., "A" answers relate to the clan culture, "B" answers for adhocracy culture, "C" answers for market culture, and "D" answers for hierarchy culture). To establish a culture profile, four values were calculated, one for each answer type (e.g., A, B, C, or D) by summing the appropriate corresponding six values for that answer type from the six questions and dividing by six. The highest value calculated indicated the predominant culture. If the average highest value was calculated for answers A (clan) or B (adhocracy), the response was categorized as a low

control culture. If the highest value was calculated for answer C (market) or D (hierarchy), the response was categorized as a high control culture.

Next, several composite scores were established to aid in the evaluation of the hypotheses in this study. A composite score, used in many types of analyses, is a derived value by combining various individual component scores such as self-reported values to obtain a single value to represent a particular construct (Kelley & Pornprasertmanit, 2016). For strong and weak cultures, a composite score was created by translating the Likert responses from the four survey questions to a numerical value, then finding the average of the four numerical responses. The higher the average, the stronger the culture.

For the successful attainment of agile transformation goals, a composite score was created by translating the applicable Likert responses from eleven survey questions related to attaining agile transformation goals into a numerical value, then taking an average of the responses provided by the respondent. The higher the average, the greater the success of an agile transformation.

When interpreting Likert scale data, there appears to be no universal agreement on how to design, construct, or analyze Likert data (Mirahmadizadeh, Delam, Seif, & Bahrami, 2018). Allan and Seaman (2007) argue that Likert scale survey data should only be considered as ordinal data and should never be used for parametric analysis. However, other authors argue that ordinal data from Likert scale survey questions may be used for parametric analysis by grouping several Likert responses together to create a mean score (Sullivan & Artino, 2013) or composite value (Boone & Boone, 2012). Tullis and Albert (2013) recommend, though, that when averages are calculated using Likert scale data,

that the researcher also inspect a distribution plot as well, especially if a composite result shows a neutral response, to see if subgroups at either ends of the rating scale are present.

To evaluate the hypotheses in this study, a combination of a t test and regression analysis methods were intended to be employed. A t test analysis can be used to determine if there are statistically significant differences between means of groups of responses (Ott & Longnecker, 2016). A regression model enables a researcher to determine to what degree a relationship between an independent (explanatory) variable and a dependent (response) variable may exist, and to see which explanatory variables may have an effect on a response (p. 555). In a regression model, the coefficient of determination (r-squared) can be used to determine how well a model can predict a response knowing an explanatory variable (p. 590). With r-squared a number between zero and one, the closer the value to one, the stronger the model is at predicting an outcome (p. 590); r-squared describes the degree of variation that can be explained by the model versus by chance (p. 591).

There are three variables of interest in this study as detailed in Table 7, with two independent variables and one dependent variable. The two independent variables describe aspects of an organization's culture (e.g., an organization's level of control and the culture strength in an organization). The dependent variable is the level of success achieved by the organization for its agile transformation.

Table 7

Summary of Variables Descriptions

Variable {Type}	Description	As measured by
Degree of Control {Independent}	The level of control displayed by an organization in its culture as defined by the Competing Values Framework (CVF) by Cameron and Quinn (2011)	Categorization of an organization's predominant culture as either high control or low control as measured by the Organizational Culture Assessment Instrument (OCAI). A predominant culture of Clan or Adhocracy is considered as low control and culture of Market or Hierarchy is considered high control. See Appendix A, questions 4 through 9.
Culture Strength Index {Independent}	Indicator if culture is strong (intrinsically driven within the individual) or weak (top-down driven)	A composite variable of four custom questions based upon work by Serrat (2017) and Andriukaitiene et al. (2018). See Appendix A, questions 10 through 13.
Agile Transformation Success Index {Dependent}	A self-reported indicator of to what degree the organization achieved their agile transformation goals.	Composite variable measured by custom questions based upon VersionOne (2020). The respondent will be presented with up to nine choices of agile transformation goals plus two overall success questions. See Appendix A, questions 14 through 24.

For hypothesis two (H2), a simple linear regression analysis (including the calculation of the r-square value) was done by plotting the composite agile transformation success index against the composite of culture strength average. Greater details for the analysis of these data are provided in the next chapter, Data Analysis Findings.

Chapter Four: Data Analysis Findings

Introduction

This chapter covers the data analysis to answer the two research questions for this quantitative study on the topic of culture and its influence of large-scale agile transformation success. Research question one relates to an organization's culture of control (classified as either low control or high control) at the start of a large-scale agile transformation and the organization reaching success in achieving its agile transformation goals. Research question two relates to the strength of an organization's culture at the start of a large-scale agile transformation initiative and the organization reaching success in achieving its agile transformation goals. The execution of the instrument used in this study is described first, including how data were collected, cleaned, and coded. Next, the testing of the two hypotheses is provided, along with the testing of assumptions for the statistical analysis executed. Lastly, further insights into these data are provided.

Summary of Research Questions and Hypotheses

Culture has been cited as an inhibitor for large-scale agile adoption (Dikert et al., 2016; Dumitriu et al., 2018, Holbeche et al., 2019; Uludag et al., 2018; VersionOne, 2020). Additionally, Agile methods emphasize self-organization and self-management (Kalenda et al, 2018) over a command-and-control management approach (Denning, 2018). Not only is organizational culture deeply engrained and difficult to change (Schein, 1986), organizational culture and organizational performance are themselves multidimensional phenomenon difficult to define with a single descriptor (Kim & Chang, 2019). Further, there are relatively few studies that specifically address how an organization use agile frameworks at large-scale across an enterprise (Aghina et al., 2020;

Dumitriu et al., 2019; Ebert & Paasivaara, 2017). As such, two research questions investigated in this study revolve around an organization's culture at the beginning of a large-scale agile transformation success and how that may have impacted an organization achieving their goals for that transformation.

Findings

This section describes how the instrument for this study was executed, software used in the data collection and analysis, study response rate and demographics, findings for the two research questions along with how reliability was tested for each question, and further analyses of these data is presented.

Instrument Execution

Upon receiving IRB approval for the study on December 18, 2020, the instrument listed in Appendix A was loaded into SurveyMonkey. A pilot of the survey was run between December 19, 2020 and Jan 10, 2021. A total of 18 volunteers experienced with Agile (coaches and internal company leaders with typically a minimum of 8 years' experience in Agile) known by the researcher participated in the pilot. The intent of the pilot was to gain feedback on the survey primarily in terms of wording and organization of the questions, elapsed time to take the survey, and if the data recorded could be analyzed when it came to the actual study. Based upon feedback from several in the pilot, only minor adjustment to language in the response choices, primarily in the repetitious nature of the responses for questions 14 through 22, was made. Appendix C lists only the changes made for the final survey; all other questions remained as-is per Appendix A.

An initial analysis was also performed in Excel with the pilot data, to ensure that the data could easily be coded and analyzed when it came time to test the hypotheses for

the actual study. Note that no data from the pilot was used in the analysis of the final results for this study. Appendix D summarizes the coding used for the questions where coding was required.

Lastly, four agile experts analyzed the survey for face and content validity while the pilot was being executed. Appendix E shows the feedback provided by the agile experts. All four agile experts agreed that the questions in the instrument satisfied face and content validity.

Data Collection, Data Cleaning, and Software for Analysis

To collect the data, persons were recruited for the study as summarized in Table 6, *Summary of Participant Recruitment Strategy*. First, colleagues of the researcher were initially invited to participate in the study. Second, using the chain referral approach (also known as snowball sampling), this researcher's colleagues were encouraged to reach out to their network to invite qualified participants to take the survey. Third, the researcher used his LinkedIn connections to invite participants to volunteer, focusing on profiles that met the study qualification criteria listed in Table 4, *Participant Qualification Criteria*. Fourth, several Agile-based professional non-profit organizations, such as Scrum Alliance, Agile Austin, Agile Denver, Agile New England, Agile DC, and Women in Agile, to name a few, were contacted to post the invitation to participate in their respective organization Slack Channels.

During the elapsed time period of when the final survey went live on January 11, 2021 to when the survey was closed on February 28, 2021, a total of 304 persons started the survey. Out of this potential pool, 63 persons did not meet at least one of the study qualification criteria listed in Table 4, *Participant Qualification Criteria*, which included:

(1) the respondent must work at a for-profit company, either publicly or privately owned, (2) the respondent must work at a company in a location within the United States, (3) the respondent must have at least one year experience as a participant or leading an agile transformation initiative in the past five years, and (4) the respondent must work at a company that executed a large-scale agile transformation. Participants were required to meet all criteria listed in Table 4 for inclusion in this study. If the participant did not meet all four qualification criteria, SurveyMonkey automatically marked that volunteer's response as disqualified and exited them from the survey before they answered any further questions.

With the survey data being collected in SurveyMonkey, these raw data needed to be cleaned and prepped before analysis could be done. These raw data were exported from SurveyMonkey and imported into Excel in alignment with the procedures described in Chapter 3. The next step was to ensure that surveys were completely filled out for each qualified respondent. As defined in Chapter 3, a survey was considered fully complete only if 5% of fields or less were not answered, meaning at least 95% of the fields had to be filled out. Visual inspection of the data in Excel revealed a further 97 respondents did not fully complete the survey. As such, these 97 responses were excluded from the final analysis. Further inspection of the data revealed that one person answered all neutral or centerline responses, which made it not possible to categorize organizational culture – so this response was rejected.

A final data pool of n=143 surveys were considered to be valid (i.e., the participant met all study qualification criteria and fully completed the required questions). The effective response rate of n=143 valid responses out of 304 submitted is 47%. The

profile for the respondents to the study can be found summarized in Table 8, *Survey Respondents*.

Table 8

Survey Respondents

Category	# of Persons
Total attempted survey	304
Disqualified (not meet participant criteria)	63
Disqualified (all neutral/centerline responses)	1
Incomplete Survey	97
Total Valid Surveys (n)	143
Valid Response Rate	47%

For the valid 143 responses, the next step was to translate the textual responses from selected survey questions into coded responses that would enable analysis. Using the coding assignments detailed in Appendix D, responses from questions 10 through 24 were translated from textual responses into numeric values in Excel (i.e., from, for example, text responses of strongly disagree to strongly agree, on a seven-point Likert scale, to a numeric value from one to seven).

With the numeric values assigned to responses, calculations were done in Excel on the variables that would be used in the hypothesis testing. As described in further detail in Chapter 3 as well as below in the testing of both hypotheses, the classification of a culture of control at the start of an organization's large-scale agile transformation was determined using the Competing Values Framework (CVF) Organizational Culture Assessment Instrument (OCAI) scoring formula (reference Appendix B for formulas). A predominant culture of clan or adhocracy is categorized as low control and culture of

market or hierarchy is categorized high control. Used in the testing of hypothesis one, the Success Index was calculated as the average of all responses from questions 14 through 24. With a scale of one to seven for the Success Index, the higher the Success Index, the greater the organization self-reported attaining their agile transformation success. Used in the testing of hypothesis two, the Culture Strength Index was calculated as the average of all responses from questions 10 through 13. With a scale of one to seven for the Culture Strength Index, the higher the Culture Strength Index, the stronger the organization's culture was at the start of their agile transformation.

Coded data, calculations needed for the analysis, and demographics data were then exported from Excel and imported into SAS for statistical analysis. Details for the calculations in Excel and the SAS analysis are described in more detail below for each research question and hypothesis testing.

Study Demographics

As for the demographic profiles for the n=143 survey respondents used in the analysis for this study, Table 9, *Respondent Role Summary*, summarizes the roles of the persons in this study. The largest self-identified role was of that of an external partner or consultant coach (38.5%), followed by a team member/individual contributor (16.8%). Of those that selected "Other", 15 of the 21 respondents indicated they were an internal Agile coach. While the largest individual self-identified role was external partner or coach, the sum of the remaining identified categories (i.e., the sum of the respondents for team member/individual contributor, manager, executive/senior leadership team, and other) is 81 persons or 56.6% of the respondents.

Table 9

Respondent Role Summary

Category	Number of Persons	% of Respondents
Team member/individual contributor	24	16.8%
Manager	17	11.9%
Executive/senior leadership team	19	13.3%
External partner or consultant/coach	55	38.5%
Other	21	14.7%
I choose not to answer this question	7	4.9%

Note: 15 of the 21 persons who selected Other self-identified as Internal Agile Coaches.

Table 10, *Industry Classification Summary*, summarizes the industries of those who completed the survey. Only the top 7 industries are summarized in Table 10 – all other entries had 4 or less persons per category. The industries with the most respondents include Financial Services & Insurance (31.5%), Technology (21.7%), and Healthcare and Pharmaceuticals (14.0%).

Table 10

Industry Classification Summary

Category	Number of Persons	% of Respondents
Financial Services & Insurance	45	31.5%
Technology	31	21.7%
Healthcare and Pharmaceuticals	20	14.0%
Media/Entertainment & Hospitality	7	4.9%
Professional Services & Consulting	6	4.2%
Industrial/Manufacturing	5	3.5%
Retail	5	3.5%

Table 11, *Size of Company Summary*, provides insights into the sizes of the companies included in this study. As anticipated, the size of the companies for a large-scale agile transformation tended to be on the larger size, with more than 78% of responses for this study including organizations of size 1,001 people and greater. Further, respondents were given the option to provide a company name to ensure a broad representation of companies. For those that did provide a company name, at least 47 unique company entries were recorded, which is above the target of 30 minimum unique companies for this study as noted in Chapter 3.

Table 11

Size of Company Summary

Category	Number of Persons	% of Respondents
50 people or less	4	2.8%
51 to 200 people	5	3.5%
201 to 1000 people	20	14.0%
1,001 to 10,000 people	37	25.9%
More than 10,000 people	75	52.4%
I choose not to answer this question	2	1.4%

Table 12, *Duration of Agile Transformation Efforts*, summarizes the duration for each of the agile transformation efforts included in the study. Each duration is further broken down into if the transformation is still in progress, no longer in progress, or if the respondent selected not to answer this question for that duration. The final column shows the sums of respondents for each of the durations. Further, the final row shows the sums of the respondents for the state of the transformation progress.

Table 12

Duration of Transformation Efforts

Category	Number of Transformation Still In Progress	Number of Transformation No Longer In Progress	Number chose Not to Answer	Sum of Number for each Duration
Less than 1 year	4	1	0	*5*
1 year, up to 2 years	16	5	2	*23*
2 years, up to 3 years	34	10	2	*46*
3 years to 5 years	32	7	4	*43*
More than 5 years	22	3	1	*26*
Sum	*108*	*26*	*9*	*143*

The longest durations of agile transformations indicated by the respondents included 2 years up to 3 years (46 persons or 32.1% of respondents) and 3 years up to 5 years (43 persons or 30.0% of respondents). There are 108 transformations still in progress (75.5% of the respondents). Conversely, 26 stated they were no longer in progress (18.1%) and 9 choose not to answer the question (6.3%).

Main Test Findings to Key Research Questions (Hypotheses)

This section details the testing of the two hypotheses related to the two research questions, including testing of assumptions, details of calculations for the independent and dependent variables, and statistical analyses performed.

Research Question One: Culture of Control and Success

As presented in greater detail in Chapter 1, the first research question and corresponding hypothesis focus on the level of control an organization's culture at the beginning of a large-scale agile transformation and how it may influence the success of achieving their goals of that transformation. Research question one (RQ1) is:

RQ1: Do organizations with a low controlling culture at the outset of an agile transformation have greater success with achieving their transformation goals than organizations with a high controlling culture?

The hypothesis to test RQ1 is:

H1: Organizations exhibiting a culture of lower control at the start of an agile transformation achieve their agile transformation goals with greater success than organizations exhibiting a culture of high control.

The corresponding null (H1o) and alternate (H1a) hypotheses for hypothesis one (H1) are:

H1o: There is no significant difference in organizations attaining their agile transformation goals between organizations with a culture of lower control at the start of an agile transformation and organizations with a culture of higher control at the start of an agile transformation.

H1a: There is a significant difference in organizations attaining their agile transformation goals between organizations with a culture of lower control at the start of an agile transformation and organizations with a culture of higher control at the start of an agile transformation.

To test the hypothesis, the raw data from SurveyMonkey needed to be translated into variables appropriate for analysis for H1: one categorical independent variable (e.g., a categorization of high control culture or low control culture at the start of the large-scale agile transformation) and one continuous dependent variable (e.g., the Agile Transformation Success Index, hereafter called the Success Index).

To determine if a culture would be classified as low control or high control, as described in Chapter 3, the OCAI instrument (Cameron & Quinn, 2011) was used without any alteration for this study (reference Appendix B). As per the OCAI, each respondent answered six questions related to their organization's culture at the start of their agile transformation. Each of the six questions had four responses that the respondents were to spread 100 points across the four responses (i.e. provide numeric values between zero and 100 for all four responses such that the sum of all four responses for that question sum up to 100 points). Each of the four responses map to one of four culture types based on Cameron & Quinn's (2011) Competing Values Framework (CVF) model (e.g. clan, adhocracy, market, and hierarchy cultures). For example, all "A" answers relate to clan culture, "B" answers relate to adhocracy culture, "C" answers relate to market culture, and "D" answers to hierarchy culture (Cameron & Quinn, 2011).

To determine the organization's predominant culture, all the numeric responses for "A" answers across the six questions were averaged together, all the numeric responses for "B" answer averaged together, and so forth for "C" and "D" answers as per the OCAI instrument (Cameron & Quinn, 2011). If the highest average value was for answers A (clan) or B (adhocracy), the response was categorized as a low control culture. If the highest average value was for answers C (market) or D (hierarchy), the response was categorized as a high control culture. As summarized in Table 13, *Organizational Culture Profiles*, 122 respondents classified themselves as high control at the start of their agile transformation, with 66 indicating market culture and 56 indicating hierarchy culture as their predominant culture. 21 respondents classified themselves as low control,

with 14 indicating clan culture and 7 indicating adhocracy culture as their predominant culture.

Table 13

Organizational Culture Profiles

Predominant Culture Type at Start of Transformation	Total	Subtotal
High Control	122	
Market		66
Hierarchy		56
Low Control	21	
Clan		14
Adhocracy		7
Total in Study (n)	143	

To determine the level of success attained from the efforts of their large-scale agile transformation, a series of 11 custom seven-point Likert scale questions were posed (reference questions 14 through 24 in Appendix A; Table 7 describes the composition of the custom questions in more detail). The Likert scale responses were translated into numerical values as per coding scheme detailed in Appendix D, and the average for all responses for questions 14 through 24 was calculated and denoted the Success Index. The lower the Success Index, the less the success observed by the respondent; the higher the Success Index, the higher the success observed by the respondent. As generated by SAS, Table 14 shows the means, standard deviations, minimum value, and maximum value for the two groups coded as a culture of low control or high control at the start of their agile transformation with Figure 4 depicting the histogram of the Success Index.

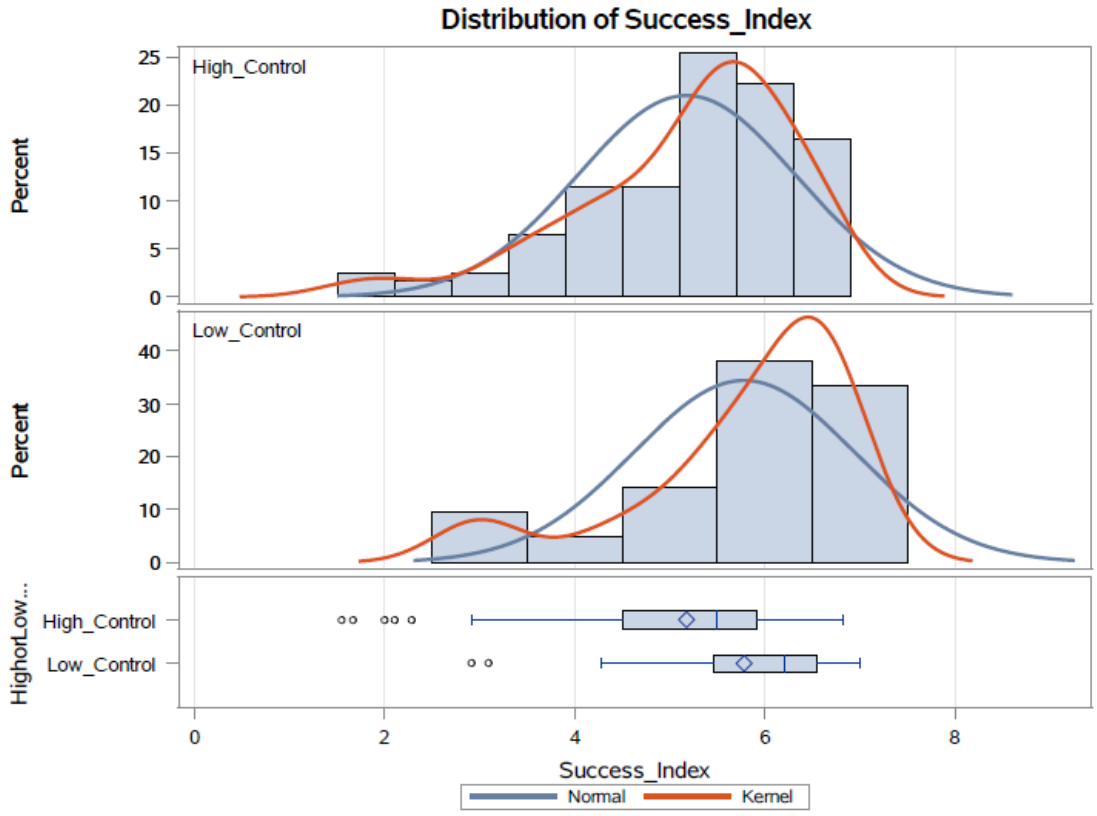
Table 14

Success Index Descriptive Statistics for High and Low Control Cultures

Grouping	N	Mean	Std Dev	Minimum	Maximum	95% CL (Low)	95% CL (High)
High_Control	122	5.1751	1.142	1.5455	6.8182	4.9704	5.3798
Low_Control	21	5.7798	1.1589	2.9091	7	5.2522	6.3073

Figure 4

Histogram of Success Index for High and Low Control Cultures



As seen in Table 14, the mean of the group coded as high control culture had a mean of 5.1751 which is above the neutral point in the seven point Likert scale of 4.0, but less than the mean of the group coded as low control culture of 5.7798. The standard deviations are nearly the same for both groups. Lastly, the minimum of the high control

culture group is 1.5455, which is less than the minimum of the low control culture group of 2.9091, with the maximum values for both groups approximately the same.

As depicted in Figure 4, these data for the Success Index both the high control and low control culture groups do not appear to be normally distributed. There appears to be a skew to the left with the means for both high control and low control above the neutral point of 4 (which is the midpoint between 1 and 7 for this 7-point Likert scale). So, a test for normality was run in SAS with results shown in Table 15 for the Success Index as coded/categorized by high control and low control.

Table 15

Tests for Normality for Success Index

Level of Control	Test of Normality	Statistic		p-Value	
High Control					
	Shapiro-Wilk	W	0.918053	Pr < W	<0.0001
	Kolmogorov-Smirnov	D	0.134554	Pr > D	<0.0100
	Cramer-von Mises	W-Sq	0.471214	Pr > W-Sq	<0.0050
	Anderson-Darling	A-Sq	2.738108	Pr > A-Sq	<0.0050
Low Control					
	Shapiro-Wilk	W	0.829385	Pr < W	0.0019
	Kolmogorov-Smirnov	D	0.195984	Pr > D	0.0344
	Cramer-von Mises	W-Sq	0.207322	Pr > W-Sq	<0.0050
	Anderson-Darling	A-Sq	1.285203	Pr > A-Sq	<0.0050

As shown in Table 15, all four tests for normality (e.g. Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling) as generated by SAS for the coding of the Success Index as either high control culture and low control culture at the start of the agile transformation all have p-values of less than 0.05, which enables the rejection of the hypothesis that these data are normally distributed.

As described in Chapter 3 in the *Data Analysis* section, it was intended to perform a t test for the Success Index (i.e. the dependent variable) against the level of control (coded as a culture of high control or low control) at the start of the agile transformation (i.e. the independent variable). There are several conditions required to run a t test, including: (1) sample independence, (2) spatial correlation, meaning the desire to minimize the time between when sample data is collected, (3) equal population variance, and (4) data normality (Ott & Longnecker, 2016). The Success Index data does not satisfy the fourth condition: data normality, so the t test could not be employed to test hypothesis one.

Another statistical test, the Wilcoxon rank sum test, can be used when there are independent samples with equal population distribution, but those population distributions "may be shifted to the right or the left of the other distribution" (Ott & Longnecker, 2016, p. 315), which is the case for the Success Index data. As seen in Figure 4, *Histogram of Success Index for High and Low Control Cultures,* both the high control and low control culture groupings of Success Index have a similar distribution profile, with the low control culture group shifted further to the right than the high control culture group. Further, Wilcoxon rank sum test may be used when the data are not normally distributed (p. 324), as shown in Figure 4. Lastly, the Wilcoxon rank sum test

has greater power, meaning it has an increased likelihood of identifying a shift in population distributions, when the data are non-normally distributed (p. 324).

To test for equality of population distribution, the Equality of Variances test was run in SAS with results summarized in Table 16.

Table 16

Success Index Equality of Variances Test from SAS

Method	Num DF	Den DF	F Value	Pr > F
Folded F	20	121	1.03	0.8669

The Equality of Variances p-value calculated by SAS is 0.8669 (F value 1.03), meaning that we fail to reject the null hypothesis that the variances between the high control Success Index and low control Success Index data are equal. In other words, there is not a significant difference in the variances, thereby satisfying the required condition of equal variance for the Wilcoxon rank sum test.

The outputs from running the Wilcoxon rank sum test in SAS can be found in Table 17, Wilcoxon Two-Sample Test from SAS, and Figure 5, the box plot diagram.

Table 17

Wilcoxon Rank Sum Test SAS Tabular Output

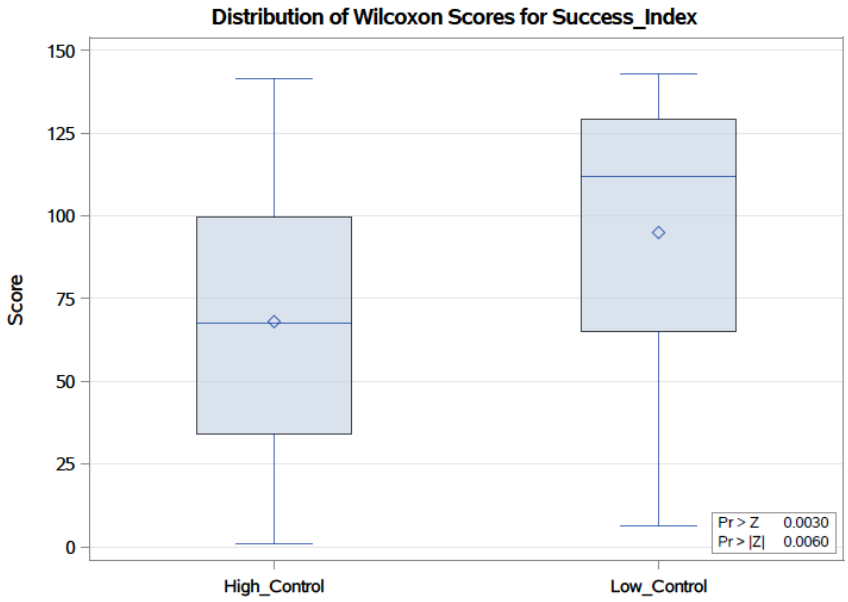
Z	Pr > |Z|
2.75	0.006

Table 17 displays the results from the Wilcoxon two-sample test, showing a p-value for a two-tailed test (e.g., Pr >|Z|) of 0.006 (Z-score of 2.75), which is less than an alpha of

0.05, indicating that the null hypothesis for H1 must be rejected. The group that self-identified as having low control at the start of an agile transformation (with an average Success Index of 5.78, from Table 14) has a statistically significant higher success rate than those who self-identified as having higher control at the start of an agile transformation (average Success Index of 5.18, from Table 14). The box plots shown in Figure 5 also visually depicts the low control has a higher mean Success Index over the low control group. The boxes displayed for both low control and high control groups in Figure 5 represent the interquartile range for each group (between the 25th and 75th percentiles), with the diamond symbol representing the mean for each group and horizontal line in the boxes representing the group median. The interquartile range, means, and medians for the low control group are all greater than the high control group.

Figure 5

Wilcoxon Rank Sum Test Box Plots



Given the results described above and as shown in Table 17, *Wilcoxon Rank Sum Test SAS Tabular Output*, and Figure 5, *Wilcoxon Rank Sum Test Box Plots*, hypothesis one is

supported. Organizations exhibiting a culture of lower control at the start of an agile transformation achieved their agile transformation goals with greater success than organizations exhibiting a culture of high control.

Testing of Assumptions for Statistical Analysis Technique Used for H1

In addition to testing the requirements for the Wilcoxon rank sum test, as shown above in Table 15 (i.e., these data were not normally distributed) and Table 16 (i.e., these data have equal variance), the reliability of the data itself used in the analysis was then verified using Cronbach's alpha, as described below.

Osborne and Banjanovic (2016) state that Cronbach's alpha is the most preferred and general indication of reliability of the sample in how the instrument was used and that Cronbach's alpha is not a measurement of the instrument's reliability itself. The authors further assert samples that are small, biased, or unrepresentative can yield different estimates than large and representative samples, with replication needed to support an instrument's reliability. Osborne and Banjanovic (2016) cite Nunnally & Berstein (1994) stating a Cronbach's alpha calculated as a value of 0.70 indicates adequate reliability while a value of 0.80 reflects good reliability. While Osborne and Banjanovic (2016) assert higher numbers for Cronbach's alpha tend to be more desired, increasing Cronbach's alpha to values past 0.90 (which indicates a 10% error variance in the measurement) tends to lead to diminishing returns. Lastly, the Cronbach's alpha calculation assumes that all components contribute equally, and there is no weighting to the components (Osborne & Banjanovic, 2016). In the calculation of the Success Index for this study, all questions 14 through 24 contributed equally (reference Appendix A for

the complete list of questions in the survey); there was no weighting, thereby satisfying the equal weighting assumption.

So, to test the reliability of the data collected via the study instrument for the components that were used in the generation of the Success Index variable, data from questions 14 through 24 were run through SAS PROC CORR procedure using the ALPHA option. As shown in Table 18, SAS calculated that the raw variables score for Cronbach's alpha is 0.888, which is greater than 0.80 and nearing 0.90, suggesting that these data for testing of H1 have generally good reliability.

Table 18

Cronbach's Alpha Calculation for Success Index Composite Variable

Cronbach Coefficient Alpha, Raw
0.888746

Another output from SAS PROC CORR procedure using the ALPHA option includes a further calculation of Cronbach's alpha based upon removal of an individual variable from the set of items, which is shown in Table 19. Osborne and Banjanovic (2016) assert components with low correlations to the overall data set could be evaluated for removal. With question 20 (Q20) having the lowest correlation of with the total (at a value of 0.432), if Q20 were removed from the Success Index calculation, SAS indicates that the reliability would only increase to 0.889, a difference of 0.001. In alignment with recommendation from Osborne and Banjanovic (2016), since none of the revised estimates of Cronbach's alpha would significantly increase to greater than 0.888 if any

one item were removed, it is recommended to keep all questions from Q14 to Q24 in the Success Index composite variable construct.

Table 19

Cronbach Coefficient Alpha with Deleted Variable for Success Index

Deleted Variable	Correlation with Total	Alpha
Q14	0.650842	0.876613
Q15	0.725103	0.872612
Q16	0.622082	0.878213
Q17	0.558952	0.88189
Q18	0.580323	0.880656
Q19	0.653479	0.876201
Q20	0.432304	0.889351
Q21	0.634773	0.878585
Q22	0.679645	0.874413
Q23_Dept	0.584036	0.881677
Q24_Org	0.638068	0.877502

For the reliability of the OCAI instrument (and the classification of the organization's culture at the start of their agile transformation), multiple authors have indicated OCAI has very high reliability (Cameron and Quinn, 2011). Quinn and Spreitzer (1991) determined for their study of 796 executives that the Cronbach's alpha using OCAI to classify culture ranged from a low of 0.71 for market culture to a high of 0.79 for the adhocracy culture (Cameron & Quinn, 2011). Yeung, Brockbank, and Ulrich (1991) determined for their study of 10,300 executives using the OCAI yielded a

Cronbach's alpha from a low of 0.76 for hierarchy culture to a high of 0.80 for adhocracy culture. Kalliath, Bluedorn, and Gillespie (1999) in their study using the OCAI yielded a Cronbach's alpha from a low of 0.80 for hierarchy culture to a high of 0.90 for the clan culture. Given the guidance from Nunnally & Berstein (1994) as written in Osborne and Banjanovic (2016), the Cronbach alphas from these studies range from 0.71 to 0.90, indicating the OCAI has a reliability of adequate to very high. So, using the OCAI to classify an organization's culture for this study should have sufficient reliability.

Research Question Two: Strength of Culture and Success

As presented in greater detail in Chapter 1, the second research question focuses on the strength of an organization's culture and its relationship with large-scale agile transformation success. The second research question (RQ2) is:

> RQ2: Does the strength of an organization's culture at the start of an agile transformation influence how well the organization achieves their transformation goals?

Hypothesis two (H2) to test RQ2 is:

> H2: There is a significant relationship between the strength of a culture at the start of an agile transformation and the amount of success the organization attains its agile transformation goals.

The corresponding null (H2o) and alternate (H2a) hypotheses for H2 are:

H2o: There is no significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

H2a: There is a significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

To test H2, the raw data from SurveyMonkey was translated into variables appropriate for analysis: one continuous independent variable (e.g. Culture Strength Index) and one continuous dependent variable (e.g. the Agile Transformation Success Index, hereafter called the Success Index).

The Success Index used to test hypothesis one (H1) will be reused in the testing of H2. For further information on the Success Index, please refer to the previous section. To determine the Culture Strength Index, a series of four custom seven-point Likert scale questions were posed (reference questions 10 through 13 in Appendix A) based upon the work by Serrat (2017) and Andriukaitiene et al. (2018). The Likert scale responses were translated into numerical values ranging from one (indicating a weak culture) to seven (indicating a strong culture) as per coding scheme detailed in Appendix D. The average for all responses for questions 10 through 13 was calculated and denoted in SAS as the Culture Strength Index. The lower the Culture Strength Index, the weaker the culture reported by the respondent; the higher the Culture Strength Index, the stronger the culture reported by the respondent.

Figure 6 shows the histogram of the Culture Strength Index values that were calculated as the average of coded questions 10 through 13. A visual inspection of the histogram in Figure 6 reveals a fairly good bell curve, with a peak in the middle and tails at either ends, indicating these data are somewhat normal. Plotting the Success Index against the Culture Strength Index, the output from SAS is displayed in Figure 7.

Figure 6

Histogram of Culture Strength Index

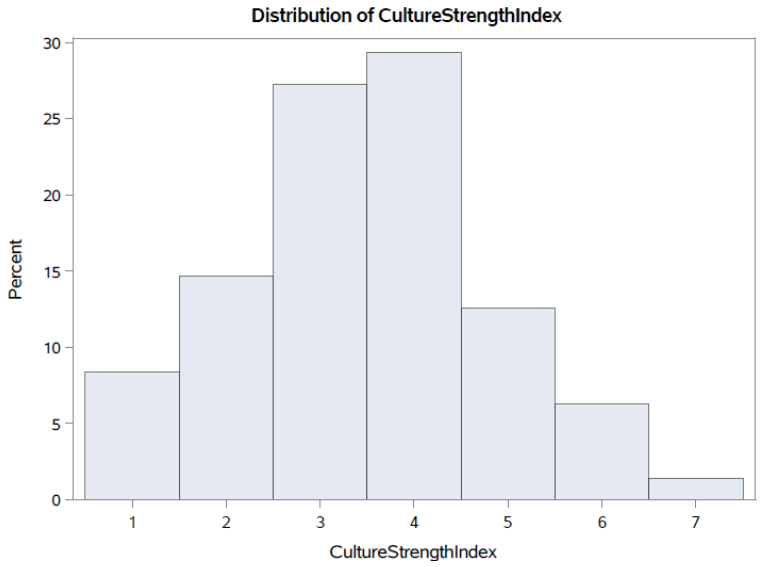
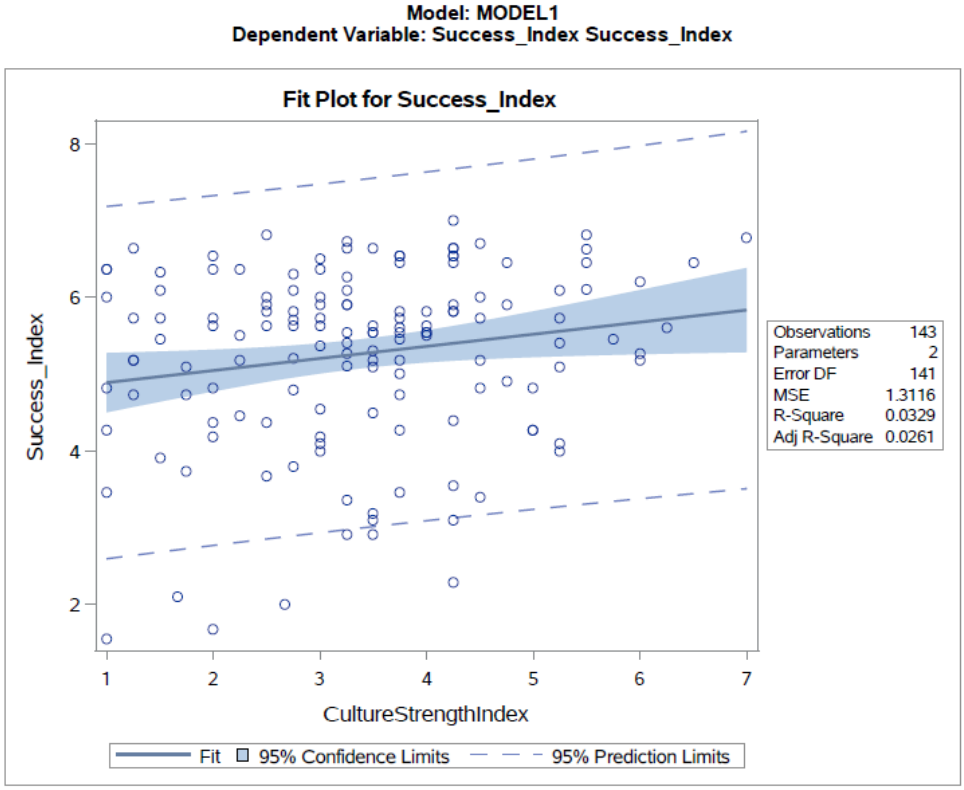


Figure 7

Linear Fit Plot of Success Index to Culture Strength Index



Ott and Longnecker (2016) recommend when evaluating the appropriateness of fit for a linear regression, to first perform a visual inspection of the scatterplot, looking for both outliers and violations of assumptions (such as assumed linearity of a model). Upon visual inspection of the linear regression line in Figure 7, not only are there several outliers, but there is a wide scattering of data points well away from the linear regression line, with an overwhelming majority of points outside the 95% confidence limits.

To further determine the appropriateness of fit for linear regression, correlation can be used as a measure of how strong the linear relation is between the dependent and independent variables (Ott & Longnecker, 2016). It is recommended to interpret correlation in terms of a squared value (p. 590). The coefficient of determination, or r-square, describes how much variation can be explained by a linear regression model (p.591). With an r-square from SAS depicted in Figure 7 as 0.0329, only around 3 percent of the model accounts for variability, leaving 97% of variability in the model unaccounted for.

Ott and Longnecker (2016) further describe the correlation coefficient as the square root of the coefficient of determination (p. 588). A correlation coefficient less than 0.6 is generally considered as a poor trend in a plot (p. 591). Running the Pearson Correlation Coefficient calculation using the SAS PROC CORR procedure with the PEARSON option, the calculated correlation coefficient, as shown in Table 20, is 0.181, which is much less than 0.6.

Table 20

Pearson Correlation Coefficient Calculation from SAS

Pearson Correlation Coefficients, N=143
0.18147

Overall, given the poor fit via visual inspection of Figure 7 along with the low coefficient of determination and correlation coefficient, the linear regression model therefore does not lend support to the second hypothesis. There does not appear to be a significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

Testing of Assumptions for Statistical Analysis Technique Used for H2

Ott and Longnecker (2016) describe four assumptions for regression analysis, including: (1) An assumption that a relationship between variables is linear, such that the sum of errors is zero in the predictive model, (2) equal variance of the errors, (3) errors are independent of each other, and (4) there is a normal distribution of the errors.

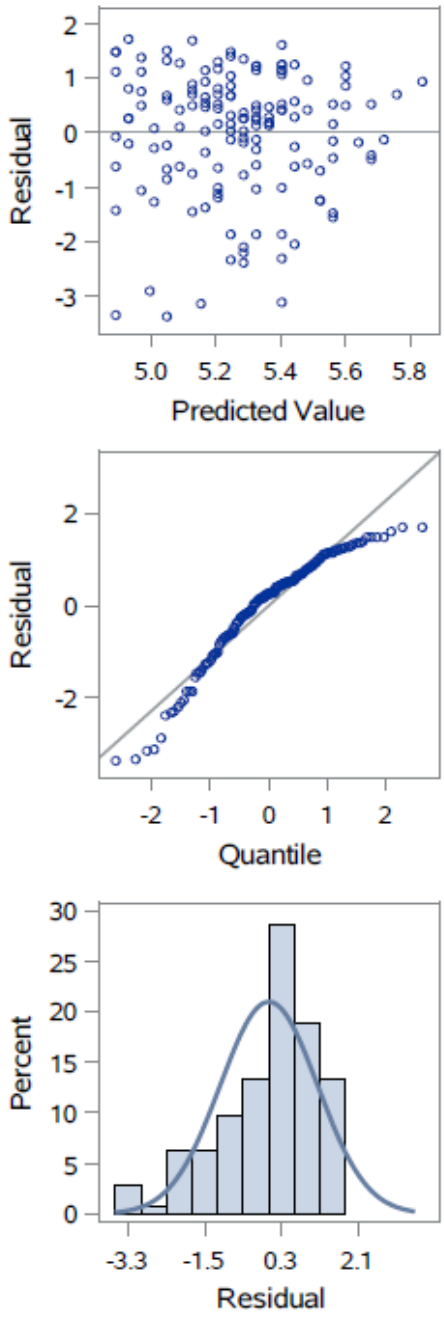
For the first assumption, as detailed in the previous section, the model does not appear to fit well with a linear model. As such, the first test of assumption for the linear regression analysis fails.

For testing the second assumption, it is desired for the residuals (i.e., errors) to be evenly distributed both above and below the zero line from the lowest measure of the independent variable to the highest measure on the residuals plot diagram (Ott & Longnecker, 2016). The Fitness Diagnostics plots in SAS can be used to test the

assumptions of the linear regression model, especially for equal variance of the errors and normality in the distribution of errors (Lee, 2015).

Figure 8

Fitness Diagnostics Plot Tests from SAS for Culture Strength Index



As shown in the uppermost plot in Figure 8 (Residuals against Predicted Value), while the number of residuals appears somewhat even above and below zero, as the predicted value for Culture Strength Index increases, there are fewer and fewer residuals displayed, thereby failing the residuals test.

To gain insights into the normality of the error (test number four for fitness of application), the middle and bottom plots in Figure 8, the Residual against Quantile and the Residual Histogram, should be evaluated (Lee, 2015). For the Residual against Quantile plot, the closer the plots are to the plotted line, the greater the normality (Lee, 2015). The Residual against Quantile plot shows mostly shows the points plotted closely to the line, with some drop off towards the upper quantile, indicating somewhat good normality. The bell curve in the bottom left histogram also generally follows the occurrences of the residuals data, indicating again somewhat good normality of the errors, thereby satisfying the fourth test.

With at least two of the four tests of assumption for linear regression model failing, the reliability of these data were investigated next using Cronbach's alpha (see definitions and descriptions for Cronbach's alpha in previous section). The Culture Strength Index calculated as the average of responses from four custom questions (questions 10 through 13 as described in Appendix A) on a Likert scale from one to seven. With the Cronbach's alpha calculated as 0.456 from SAS, this is well below the 0.7 value for adequate reliability according to Nunnally & Berstein (1994) as cited by Osborne and Banjanovic (2016).

Table 21

Cronbach's Alpha Calculation for Culture Strength Index Composite Variable

Cronbach Coefficient Alpha, Raw
0.456336

However, if questions can be removed from an instrument such that it significantly increases the reliability of the data, then further investigation and re-running of an analysis with a question removed could be warranted (Osborne & Banjanovic, 2016). From Table 22, removal of question 10 would increase the Cronbach's alpha from 0.456 to 0.7299, which is above 0.70.

Table 22

Cronbach Coefficient Alpha with Deleted Variable for Culture Success Index

Deleted Variable	Correlation with Total	Alpha
Q10_ChangeFromTop	-0.132401	0.729937
Q11_AlignedWithCulture	0.498857	0.125827
Q12_ChangeOnOwn	0.323579	0.322523
Q13_CultureAsAsset	0.498796	0.13913

With the linear regression model failing at least two statistical validity tests (i.e. failed assumption of linearity and failed equality of residuals) and a low reliability (Cronbach's alpha of 0.456) in these data in the Culture Strength Index, another analysis was run, except with only the averages of questions 11, 12, and 13 (i.e. question 10 results were thrown out) as a Modified Culture Strength Index.

Revised Analysis for H2: Modified Culture Strength Index

A Modified Culture Strength Index was created next, this time averaging the respondents' answers for questions 11, 12, and 13 together (seen as Q11toQ13Avg in the SAS outputs). Re-computing Cronbach's alpha for the Modified Culture Strength Index reveals that the reliability did increase the value to 0.7229 (reference Table 23), above the recommended value of 0.7 for adequate reliability according to Nunnally and Berstein (1994) as cited by Osborne and Banjanovic (2016).

Table 23

Cronbach's Alpha Calculation for Modified Culture Strength Index Composite Variable

Cronbach Coefficient Alpha, Raw
0.729937

Table 24

Cronbach Coefficient Alpha with Deleted Variable for Culture Success Index

Deleted Variable	Correlation with Total	Alpha
Q11_AlignedWithCulture	0.649190	0.520085
Q12_ChangeOnOwn	0.436932	0.774826
Q13_CultureAsAsset	0.582354	0.607609

While the raw value of Cronbach's alpha is greater than 0.70, it would be unwise to remove any other questions, due to: (1) not having at least four Likert-scale data fields to translate to a continuous variable (Boone & Boone, 2012), and (2) as shown in Table 24,

removing any other questions would not elevate Cronbach's alpha to a significantly higher value (e.g., greater than 0.8 or 0.9).

With a higher Cronbach's alpha, another linear regression analysis was run in SAS, this time with the Success Index plotted against the Modified Culture Strength Index (i.e., Q11toQ13Avg), depicted in Figure 9 and the fitness diagnostic panel of plots in Figure 10.

Figure 9

Linear Fit Plot of Success Index to Modified Culture Strength Index

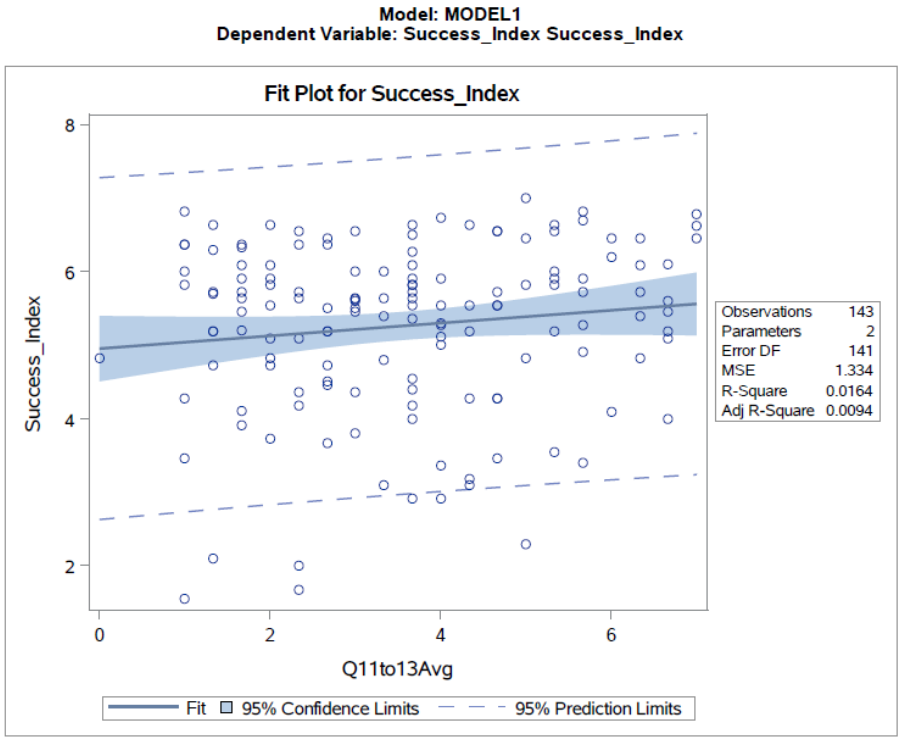
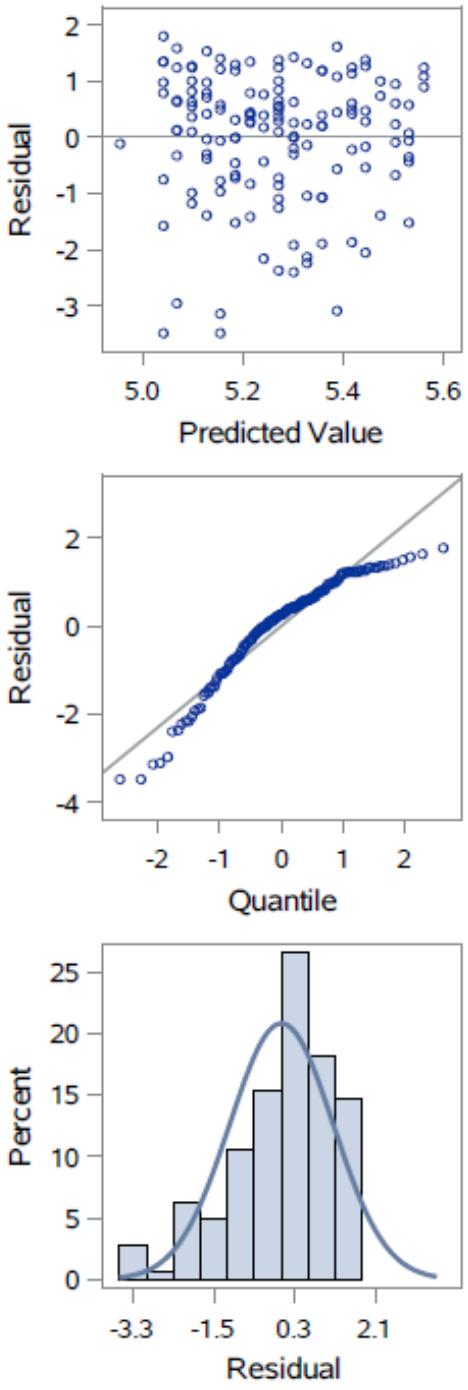


Figure 10

Fitness Diagnostics Plot Tests from SAS for Modified Culture Strength Index



As both Figures 9 and 10 show, there are still problems with the linear regression analysis with the Modified Culture Strength Index. Visual inspection of Figure 9

highlights that there continues to be a wide scattering of data points well away from the linear regression line, with an overwhelming majority of points outside the 95% confidence limits, along with outliers. Inspecting Figure 10, the same issues persist with the Residual versus Predicted Value plot with the Modified Culture Strength Index as the Culture Strength Index (from Figure 8), indicating a continuing issue with violating the equal variance of the errors statistical testing assumption. The normality of the errors also appears to be a little more challenged with the Modified Culture Strength Index (Figure 10) than the Culture Strength Index (Figure 8), as the tail ends of the Residual versus Quartile plot is a bit more away from the line for the Modified Culture Strength Index and the bell curve for the histogram of the residuals is a little more variable for the Modified Culture Strength Index.

With a full linear regression analysis complete for the originally planned Culture Strength Index as well as Modified Culture Strength Index, there is not support for the second hypothesis. However, there could be challenges to the instrument itself that might warrant further investigation before definitive conclusions about culture strength at the start of an agile transformation and large-scale agile transformation success can be made. Refer to the discussion in Chapter 5 for commentary.

Further Analysis Findings

This section provides further statistical analyses of these data to provide more insights into the success of large-scale agile transformation efforts, including: a breakdown of success for each of the four culture classifications as per the Competing Values Framework (CVF) (e.g., clan culture, adhocracy culture, market culture, and hierarchy culture), how someone's role (internal or external to an organization) may

unduly influence how success is viewed, an organization's size and influence on degree of success seen, elapsed time of a transformation and its impact on success, and the investigation of components of Success Index (i.e., questions 14 through 24 as seen in Appendix A).

Culture Type and Agile Transformation Success

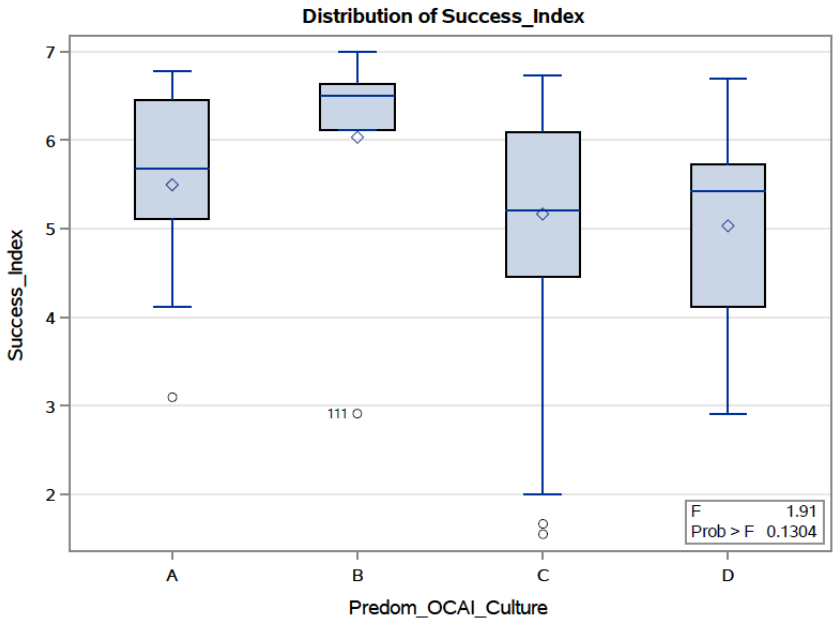
As described in Chapter 3, in this study, only one axis of the CVF model was explored in this study regarding culture: the level of control (i.e., the vertical axis as shown in Figure 3, *The Competing Values Framework*). For testing H1, if the predominant culture type from the OCAI was clan or adhocracy, then the company was categorized as a low control culture; if the predominant culture type was market or hierarchy, then the company was categorized as a high control culture. From the prior analysis, we found support for H1 in that companies with a low control culture at the start of their agile transformation had significantly higher success with their large-scale agile transformation efforts than companies with high control cultures. However, with four possible culture types in the CVF model, this led to the question: are there differences in large-scale agile transformation success between the four different culture types?

A one-way ANOVA analysis can be used to determine if there are statistically significant difference between means of multiple groups (Ott & Longnecker, 2016). As such, the null hypothesis (Ho) for this question is: there is no significant difference in the calculated Success Index between all of the culture types (i.e., the Success Index for the clan culture, adhocracy culture, market culture, and hierarchy culture are statistically equal). The alternate hypothesis (Ha) is: there is a significant difference in the calculated Success Index in at least one of the culture categorizations. A one-way ANOVA analysis

run in SAS using the Success Index as the dependent variable and predominant culture type as the groupings, with the boxplot results shown in Figure 11.

Figure 11

Initial ANOVA Boxplots of Success Index grouped by Culture Type



The preliminary analysis in SAS revealed a p-value of 0.1304, but there were four outliers (one in clan, one in adhocracy, and two in market culture). The four outliers were removed, leaving a sample size of n=139 for this analysis, and the one-way ANOVA analysis was re-run in SAS, with the results shown in Figure 12.

The revised ANOVA analysis for the Success Index by the predominant culture types (e.g., coded as A is clan culture, B is hierarchy culture, C is market culture, and D is hierarchy culture) as depicted in Figure 12 shows a p-value of 0.0013 (F value of 5.56), which is less than an alpha of 0.05. This means we can reject the null hypothesis, and state that at least one of the means is different than the others. Reference Table 25 for the descriptive statistics for the Success Index broken down by predominant culture type.

Figure 12

Revised ANOVA Boxplots of Success Index grouped by Culture Type

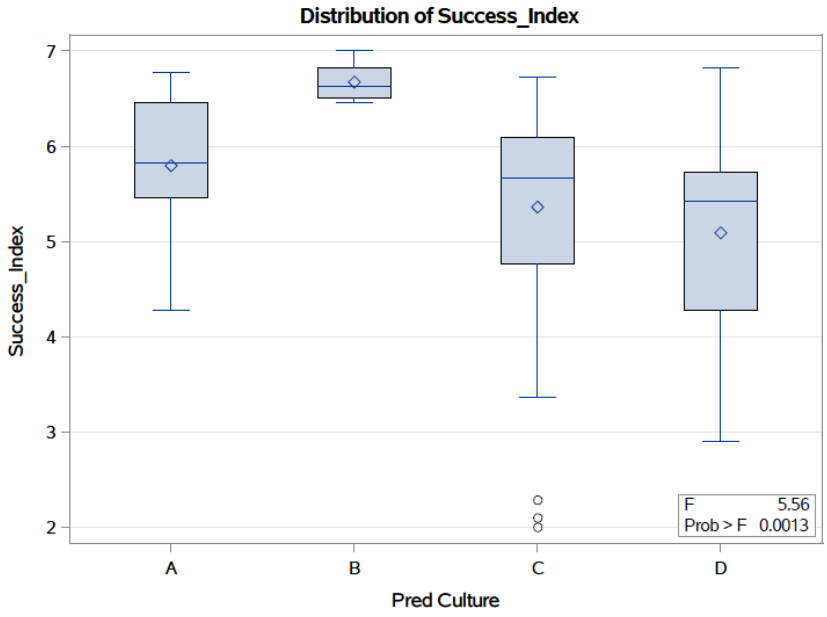


Table 25

Success Index Descriptive Statistics by Predominant Culture Type

Predominant Culture	N	Mean	Std Dev
A (Clan)	13	5.795493	0.730226
B (Adhocracy)	6	6.672348	0.204598
C (Market)	64	5.360746	1.09223
D (Hierarchy)	56	5.090381	0.99605

To determine which mean is significantly different, a post hoc test must be run to determine which of the means is different (Shreve & Holland, 2018). The Least Square Means table from SAS can show the significance of pairwise comparisons of one

component with another (Shreve & Holland, 2018). Reference Table 26 for the Least Square Means for the Predictor of Culture Pr > |t| as determined by SAS.

Table 26

Least Square Means Significance Testing of Success Index Categorized by Predominant Culture Type

Least Squares Means for effect Predominant Culture Pr > |t| for Ho: LSMean(i)=LSMean(j)

	A (Clan)	B (Adhocracy)	C (Market)	D (Hierarchy)
A (Clan)		0.2933	0.4878	0.1081
B (Adhocracy)	0.2933		0.0142	0.002
C (Market)	0.4878	0.0142		0.4583
D (Hierarchy)	0.1081	0.002	0.4583	

Scanning the Least Square Means table for values less than an alpha of 0.05 in Table 26, the relationships between adhocracy culture and market culture (p-value 0.0142) and adhocracy culture and hierarchy culture (p-value 0.0020) are significant (i.e., less than an alpha of 0.05), meaning the success index of adhocracy culture is significantly higher than both market and hierarchy cultures. This indicates that organizations with an adhocracy culture had greater success than both market and hierarchy cultures. However, there is no difference with the clan culture and adhocracy (p-value 0.2933), market (p-value 0.4878), or hierarchy cultures (p-value 0.1081). However, as shown in Table 25, the sample size for both the adhocracy (n=6) and clan

(n=13) cultures is small, especially in comparison the number of samples for market (n=64) and hierarchy (n=56) cultures.

Further, the revised ANOVA output in Figure 12 still shows three outliers in the clan culture. To determine if the outliers in Figure 12 had an influence on the conclusions above, a third ANOVA was run, removing three more outliers from the clan culture (n=61). With the three additional outliers excluded, the p-value was determined to be <0.0001 (F value 7.63), meaning the null hypothesis still needed to be rejected, indicating at least one of the means was different from the others. Upon further examination of Least Square Means for effect Pred Culture table in the third ANOVA run (n=61), the new pairwise p-values were similar to the existing pairwise p-values already shown in Table 26; there were no significant differences. As such, there were no changes in conclusions with the additional three outliers removed (n=61) than when the analysis was run with n=64 data points. See Chapter 5 for further commentary and discussion.

Roles and Views of Agile Transformation Success

The next analysis investigated if there was bias introduced into the sample from the use of external consultants as respondents to the survey. Orr and Orr (2013) state one of the reasons why external consultants are hired is to provide insights into managerial challenges; in other words, consultants are looking for problems to solve. With a predisposition for consultants looking for problems, this led to the question: would responses from external consultants tend to be more negative than internal employee?

The null hypothesis for this question (Ho) is: there is no significant difference between the calculated Success Index for those who identify as external consultants and those who identify as non-external employees. The alternate hypothesis (Ha) is: there is a

significant difference between the calculated Success Index for those who identify as external consultants and those who identify as non-external employees. As shown in Table 9, *Respondent Role Summary*, those who self-identified as "External partner or consultant/coach" were coded as "External". Those who self-identified as "I choose not to answer this question" were coded as "NoAnswer". All others were coded as "Non_External". A one-way ANOVA analysis was then run in SAS using the Success Index as the dependent variable and the coded classification of role as the groupings, with the results shown in Table 27.

Table 27

ANOVA Analysis of Success Index grouped by Role

F Value	Pr > F
0.43	0.6534

With a p-value for this analysis of 0.65 (F value of 0.43), which is greater than an alpha of 0.05, we fail to reject the null hypothesis. There is no significant difference between the calculated Success Index for those who identify as external consultants and those who identify as non-external employees. So, there is likely not bias in the Success Index based upon role for these respondents.

Organization Size and Views of Agile Transformation Success

As described in Chapter 2, *The Literature Review*, there are multiple views of what is meant by a large-scale agile transformation ranging from several teams to thousands of persons impacted (Dikert et al., 2016; Kalenda et al., 2018; Larman & Vodde, 2020; Rigby et al., 2018; Scaled Agile Inc., 2020). Dikert et al. (2016) assert that

there are greater complexities when executing agile at large-scale over agile at smaller scale (i.e. at the team level), which led to the question: would smaller companies tend to have greater success with seeing results from their large-scale agile transformation than larger companies?

The null hypothesis (Ho) is: all the means for the calculated Success Index for all the categorizations of company size are statistically equal. The alternate hypothesis (Ha) is: there is a significant difference in the calculated Success Index in at least one of the categorizations of company size. A one-way ANOVA analysis was then run in SAS using the Success Index as the dependent variable and the company size as the groupings, with the results shown in Table 28.

Table 28

ANOVA Analysis of Success Index grouped by Company Size

F Value	Pr > F
0.98	0.4354

With a p-value for this analysis of 0.4354 (F value of 0.98), which is greater than an alpha of 0.05, so we fail to reject the null hypothesis. As such, there is no significant difference in the calculated Success Index between the group categorization of company size. So, success of attaining large-scale agile transformation success was not influenced by company size.

Time Invested in Agile Transformation and Views of Agile Transformation Success

Kenning et al. (2018) assert that agile transformations can be considered as long term organizational change initiatives. Denning (2018) also opines that an agile

transformation is a never-ending journey. Table 12, *Duration of Transformation Efforts*, shows 43 persons (or 30% of respondents) indicated an agile transformation as 3 years up to 5 years and 26 persons (or 18% of respondents) more than 5 years. With almost half of the respondents involved in an agile transformation for multiple years, this led to the question: does length of time invested in a large-scale agile transformation influence success?

The null hypothesis (Ho) is: all the means for the calculated Success Index for each of the groupings of agile transformation duration are the same. The alternate hypothesis (Ha) is: there is a significant difference in the calculated Success Index in at least one of the groupings of agile transformation duration. A one-way ANOVA analysis was then run in SAS using the Success Index as the dependent variable and the agile transformation duration as the groupings. Two outliers appeared in the initial analysis, which were removed. The ANOVA analysis was run again, with a sample size of n=141, with the results of the analysis shown in Table 29.

Table 29

ANOVA Analysis of Success Index grouped by Agile Transformation Duration

F Value	Pr > F
2.34	0.0586

As shown in Table 29, with a p-value of 0.0586 (F value of 2.34), this is slightly above an alpha of 0.05, meaning we could marginally fail to reject the null hypothesis, stating that there is no difference in success depending on the length of time for a large-scale agile transformation effort. With the p-value so close to 0.05, as a further

investigation, a Least Squares Means pairwise test was run in SAS to see if there was any significance in the Success Index when grouped by duration of the transformation effort. The Least Square Means pairwise test can be seen in Table 30.

Table 30

Least Square Means Significance Testing of Success Index Categorized by Agile Transformation Time

Least Squares Means for effect Transformation Time Pr > |t| for Ho: LSMean(i)=LSMean(j)					
	1 year, up to 2 years	2 years, up to 3 years	3 years, up to 5 years	Less than 1 year	More than 5 years
1 year, up to 2 years		0.3787	0.9352	0.2908	0.9937
2 years, up to 3 years	0.3787		0.7445	0.8168	0.1498
3 years, up to 5 years	0.9352	0.7445		0.4874	0.711
Less than 1 year	0.2908	0.8168	0.4874		0.1807
More than 5 years	0.9937	0.1498	0.711	0.1807	

Inspecting Table 30, none of the pairwise comparisons are less than 0.05. Given the small sample size and outliers still present in the ANOVA analysis, further investigation is warranted. See Chapter 5 for more discussion.

Comparison of the Success Index's Components

The 14th Annual State of Agile Report (VersionOne, 2020) lists the frequency of benefits seen by their respondents from implementing agile at their organizations sorted from highest to lowest. In a similar fashion, the benefits from this study, which also constitute the components of the Success Index, were ranked from highest to lowest average and are shown in Table 31. The component that had the highest average success score is Improve Project Visibility (Q21) and the lowest is Organization-Wide Success (Q24). The component that had the greatest number of respondents stating this component was not applicable to their agile transformation success was to Reduce Project Risk (Q20).

Table 31

Components Used in Success Index Ranked

Factor	Average Score	# Responses – Goal Not Applicable
Improve project visibility	6.04	4
Accelerate product or software delivery	5.55	3
Improve Business/Information Technology alignment	5.54	11
Enhance ability to manage changing priorities	5.54	3
Enhance quality	5.28	7
Reduce project risk	5.20	15
Increase productivity	5.20	2
Enhance delivery predictability	5.18	2
Department Level Success	5.15	N/A
Improve morale	4.94	7
Organization Wide Success	4.52	N/A

An ANOVA analysis was then done for each of the Success Index components, to see if there were statistically significant differences in the averages of the various components. The ANOVA output from SAS can be found in Table 32.

Table 32

ANOVA Analysis of Success Index Components

F Value	Pr > F
9.09	<0.0001

With a p-value for the ANOVA test at <0.0001 (F value of 9.09), which is less than an alpha of 0.05, the null hypothesis that the means of all the components (e.g. questions 14 through 24) are equal is rejected; at least one of the means is statistically different from the others. Since at least one of the means is different than the others, there is a contradiction with the assumption made when creating the Success Index that all components of the Success Index (i.e., questions 14 through 24) contributed equally to the Success Index.

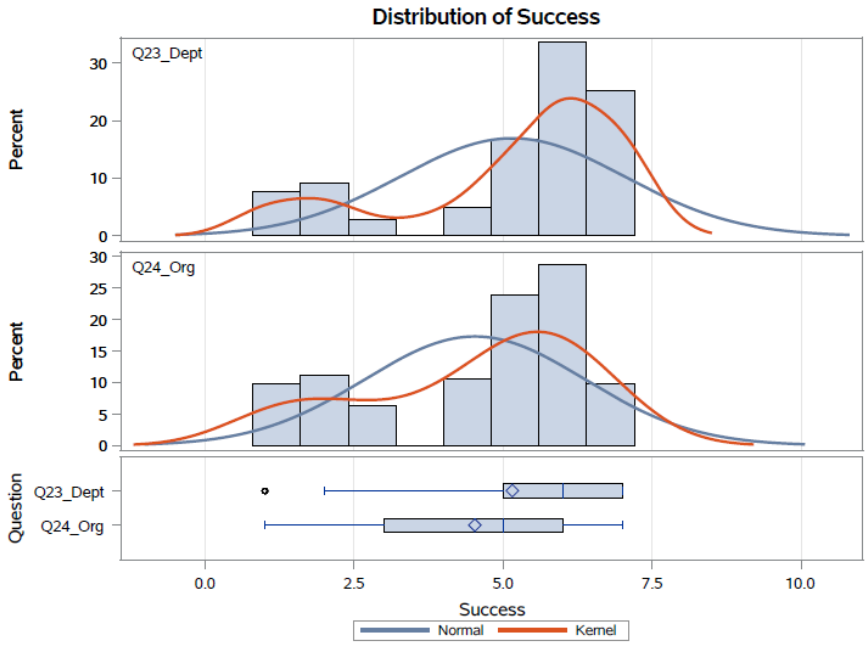
To investigate which components had greatest correlation to the Success Index, Table 19, *Cronbach Coefficient Alpha with Deleted Variable for Success Index*, was examined. The variable with the highest correlation (0.73) was Enhanced ability to manage changing priorities (Q15). The component with the lowest correlation (0.43) was Reduce project risk. All other components had correlations ranging from 0.56 to 0.68.

Finally, with the average scores for Department-level success (Q23) and Organization-wide success (Q24) components both near the bottom of the ranked list

shown in Table 31, further analysis into these two data sets was performed. First, as seen in Figure 13, the distribution of responses for each component had two peaks.

Figure 13

Histogram for Department and Organization Success Scores



From Figure 13, for both the Department level and Organization-wide responses, the curve is not normally distributed, with one cluster of responses centered around a value of 2 (indicating worse off before the agile transformation efforts) and another cluster of responses peaking around a value of 6 (indicating moderate gains from the agile transformation efforts). With a non-normal distribution, as described in more detail in the analysis of hypothesis one, a Wilcoxon rank sum test can detect a shift in population distributions, when the data are non-normally distributed (Ott & Longnecker, 2016). The Wilcoxon rank sum test output from SAS is shown in Table 33.

Table 33

Wilcoxon Rank Sum Test Comparing Department (Q23) and Organization (Q24) Success Scores

Z	Pr > |Z|
3.5276	0.0004

Table 33 displays the results from the Wilcoxon two-sample test, showing a p-value for a two-tailed test (e.g., Pr >|Z|) of 0.0004 (Z score of 3.5276), which is less than 0.05, indicating that the null hypothesis must be rejected. The success scores for the Department-level (Q23) are significantly higher than the success scores Organization-wide (Q24).

Summary of the Chapter

With 304 persons volunteering for this study, n=143 met all participant qualification criteria while also filling out at least 95% of the fields in the survey. Two hypotheses were tested. Hypothesis one (H1) is supported via Wilcoxon rank sum test (p-value 0.006, Z score 2.75). There is a significant difference in organizations attaining their agile transformation goals between organizations with a culture of lower control at the start of an agile transformation and organizations with a culture of higher control at the start of an agile transformation. Hypothesis two (H2) was not supported. There does not appear to be a significant relationship between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals. However, with low reliability of the instrument and outliers in the analysis for H2, further investigation into the instrument itself appears to be warranted. Additionally, the role of

respondents (whether internal employees or external consultants), the size of an organization, or the duration of an agile transformation did not impact the level of success reported by the organizations in this study. Lastly, there was a significantly higher degree of success seen by the respondents at department level versus across an organization in their large-scale agile transformations.

Chapter Five: Discussion, Conclusions and Recommendations

Introduction

After a brief summary of the results detailed in Chapter Four, this chapter focuses on providing deeper insights into the interpretation and conclusions for the hypotheses tested in this study. Additional commentary for the deeper analyses beyond the two hypotheses is provided, such as discussion regarding the profile of the respondents (i.e., demographics) who participated in this study. The contributions of this study to the literature and general practice are summarized along with recommendations for further research.

Summary

With culture commonly cited as a barrier for organizations to adopt agile at large-scale (Dikert et al., 2016; Dumitriu et al., 2018, Holbeche et al., 2019; Uludag et al., 2018; VersionOne, 2020), building an organizational culture of agility requires the shift from a top-down hierarchy and corresponding structures and systems to a culture that embraces desired behaviors, such as collaboration across boundaries, and networks (Holbeche et al., 2019). Aghina et al. (2020) assert that the gains of greater enterprise agility relates to an organization's respective starting line for agility, especially since it is difficult for organizational culture to change (Schein, 1986).

This study (n=143) has found support for hypothesis one, in that companies with a culture of low control at the start of the agile transformation (e.g., self-organization, collaboration, etc.) achieve greater success in attaining their large-scale agile transformation goals than companies with a culture of high control at the start of their agile transformation (Wilcoxon rank sum test with p-value of 0.006, Z score of 2.75,

Cronbach's alpha of 0.8887). However, there was not support for hypothesis two, in that companies with a stronger culture have greater success in attaining their large-scale agile transformation goals than companies with a weak culture. In testing hypothesis two, however, low reliability of the instrument (Cronbach's alpha of 0.4563) and outliers in the data appear to have contributed to the non-support of hypothesis two.

Discussion of Results

This section provides greater insights into the results presented in Chapter Four, starting with hypothesis one (i.e., culture of control and its impact on large-scale agile transformation success) followed by hypothesis two (i.e., strength of culture and its impact on large-scale agile transformation success). Lastly, further discussion into the demographics of the respondents and how that may have influenced the outcomes of this study are provided.

Hypothesis One: Culture of Control and Large-Scale Agile Transformation Success

When implementing agile at scale, multiple authors state it is necessary to shift an organization's culture (Denning, 2018; Scrum Alliance, 2018; VersionOne, 2020). Shifting culture could come in the form of increased collaboration and the need for holistic organizational systems thinking (Denning, 2019; Dikert et al., 2016). The culture shift towards greater organizational agility could also come from the need to transition from top-down, command-and-control bureaucracies (Dikert et al., 2016; Kalenda et al., 2018; Rigby et al., 2018) to setting an environment where teams work in a self-governing manner (Rigby et al., 2018). Because an organization's culture is deeply entrenched in how an organization thinks and operates, culture is challenging to change (Maseko, 2017; Schein, 1986).

Hypothesis one in this study purported companies having a culture of low control at the start of their agile transformation achieved their outcomes with greater success than companies having a culture of high control. Recall, for the purposes of categorization of culture orientation in this study, a culture of low control was defined as an organization that had a predominant culture oriented towards either the clan or adhocracy cultures in the Competing Values Framework (CVF) model while a culture of high control had a predominant culture of either market or hierarchy cultures. As shown in the analysis in Chapter Four, with responses for the Success Index of 5.18 and 5.78 respectively for high control cultures and low control cultures at the start of their agile transformation, both cultures had Success Index means above the neutral point of 4.0 (based upon a seven point Likert scale), indicating that there was a degree of success with large-scale agile transformation efforts regardless of a level of control at the start of an agile transformation. However, hypothesis one (H1) was supported in that organizations exhibiting a culture of lower control at the start of an agile transformation achieved their agile transformation goals *with greater success* than organizations exhibiting a culture of high control.

In the *Further Analysis* section of Chapter Four, instead of comparing two culture classifications (low control and high control) in two groups (i.e. to test H1), an analysis was run to align with the full CVF model of four classifications of culture at the start of their agile transformation: clan, adhocracy, market, and hierarchy. The ANOVA analysis from SAS presented in Figure 12 shows that the companies with a predominant culture of adhocracy at the start of their agile transformation had a significantly higher degree of success achieving their large-scale agile transformation than the market (p-value 0.0142)

and adhocracy (p-value 0.0020) cultures. There was no significant difference, however, between the clan culture and adhocracy (p-value 0.2933), market (p-value 0.4878), or hierarchy (p-value 0.1081). With adhocracy culture at the start of their agile transformation showing the highest Success Index in this study, the results align with Karvonen et al. (2018) in their assertions that the adhocracy culture most closely aligns with agility in agile software development. However, in this study, there were only seven respondents out of the n=143 samples that were classified in a predominantly adhocracy culture, and one of the seven responses was an outlier that had to be removed from the analysis, leaving only six data points represented in Figure 12, which is a small sample size.

This study generally aligns the work by Felipe et al. (2017) in their study of culture (which employs the CVF model to classify culture types) and organizational agility in the high and medium technology industries in Spain (n=172). Felipe et al. (2017) found that clan and adhocracy cultures (i.e. cultures of lower control) had a positive impact on organizational agility while there was no evidence of market culture (i.e. a culture of higher control) on its impact with agility. However, Felipe et al. (2017) found that a hierarchy culture (also a culture of higher control) did have a positive impact on agility.

While there may not be a singular preferred or ideal culture for agile due to a complex intermingling of organizational, environmental, and business factors (Karvonen et al., 2018), a culture of lower control tends to align with the needed culture of agile that embraces collaboration, focus on people, a democratic environment, and a less formalized, non-hierarchical culture (Gupta, George, & Xia, 2019). Further, changing

culture is a very challenging task, if it can be done at all (p. 14). Additionally, Aghina et al. (2020) assert that the gains of greater enterprise agility depends on an organization's respective starting line for agility. As such, this study supports the literature in that cultures of low control at the start of their agile transformation achieved greater success with their agile transformation than cultures of high control.

While this study found cultures of higher control at the start of their agile transformation had less success in achieving large-scale agile transformation goals, this study did not state that high control cultures did not find any success in their large-scale agile transformation. Higher control cultures at the start of their agile transformations did find some success in this study. However, this study finds support that lower control cultures at the start of their agile transformation simply found *greater* success than high control cultures. So, there should not be any hope lost for organizations with a culture of high control at the start of an agile transformation and a desire to engage in a large-scale agile transformation.

Hypothesis Two: Strength of Culture and Large Scale Agile Transformation Success

The strength of a culture has been purported to impact an organization's results (Andriukaitiene et al., 2019; Kim & Chang, 2019; Nikpour, 2017; Paracha et al., 2019; Warrick, 2017). However, this study did not support hypothesis two (H2) in that there was no significant relationship found between the strength of culture at the start of an agile transformation and the amount of success of achieving agile transformation goals.

A strong culture has characteristics including employees having clear understanding of the organization's values and norms (Warrick, 2017), widespread shared and strongly held norms and values (Maseko, 2017; Sorensen, 2002), alignment of

employee's goals with an organization's goals (Maseko, 2017), and individual employees who are intrinsically self-motivated to address environmental stimuli (Kalenda et al., 2018). A weak culture has characteristics of an organization's values and norms being inconsistent, confusing, or unreinforced (Warrick, 2017), greater reliance on rules and regulations (Maseko, 2017), and individual employees motivated via direction from superiors (Kalenda et al., 2018).

It is suspected that the instrument used in this portion of the study was inadequate to test the H2. The instrument had a low Cronbach's alpha (0.456) in combination with only a minimum recommended number of components (e.g., four seven-point Likert scale questions, Q10 through Q13, averaged together to create a custom independent variable Culture Strength Index). Boone and Boone (2012) assert the minimum number of four response components that use Likert scale response can be averaged together into a composite continuous variable that is suitable for further statistical analysis. When question 10 was excluded (i.e. the question that contributed a negative influence in the instrument's reliability as shown in Table 22, *Cronbach Coefficient Alpha with Deleted Variable for Culture Strength Index*) to create a new independent variable called the Modified Culture Strength Index (consisting of an average of responses from only questions 11 through 13), Cronbach's alpha was increased to 0.7229, above the recommended value of 0.7 for adequate reliability according to Nunnally and Berstein (1994) as cited by Osborne and Banjanovic (2016). However, there were only three component values that contributed to the Modified Culture Strength Index, violating the recommendation from Boone and Boone (2012) of a minimum of four component values with a Likert scale that can be combined to constitute a meaningful continuous variable

suitable for statistical analysis. In the Recommendations for Further Research section below, suggestions for improving studying culture strength and its relationship to large-scale agile transformation success are proposed.

Discussion of Demographics

In terms of industries represented in this study, the top three industries with the most respondents include Financial Services & Insurance (31.5%), Technology (21.7%), and Healthcare and Pharmaceuticals (14.0%). These industries generally align with several other studies, such as the *Business Agility Report* (Business Agility Institute, 2019), *State of Agile reports* (VersionOne, 2020; VersionOne, 2019, VersionOne, 2018) as well as industries included in Aghina et al. (2020) and in Dikert et al. (2016), with the technology industry as the highest contributor for the later two authors. So, from an industry representation perspective, the respondents in this study tend to align with what is found in the literature.

Since this study focused on large-scale agile implementations, it was anticipated for the respondents to be associated with larger companies. More than 78% of the respondents identified as working in companies with a size of 1,001 people or greater, as summarized in Table 11, *Size of Company Summary*. While the literature does not provide consensus in terms of size of organizations or number of teams that would constitute a large-scale agile implementation (Kalenda et al., 2018), the Small Business Administration in the United States classifies businesses as small or large based upon a maximum of either gross revenues or number of employees (SBA, 2019). While the SBA provides business size guidance for the Financial Services Industry only in terms of gross revenues, for the limited number of Insurance, Technology, Healthcare, and

Pharmaceutical industries where business size is listed with employee numbers (versus gross revenues), the guidance for a company to be considered large is generally in the range of 1000-1500 employees (SBA, 2019). As such, the respondents in this study tend to generally align with what the SBA (2019) defines as a large company. Lastly, in the literature review by Dikert et al. (2016), the median size of companies of case studies used in their study was 300 employees. So, the size of organizations of the respondents in this study seem to align with what could be considered as a large company.

With the sample in this study consisting of 38% external consultants (reference Table 9, *Respondent Role Summary*), there could be potential for bias in these results towards the negative. When equal in terms of magnitude of impact, negativity bias can arise when negative information is weighted more than positive information (Kaplan, Petersen, & Samuels, 2018). Consultants can be exposed to a wide variety of negative or pessimistic client stakeholders, which can, if not kept in balance, impact the perception and interpretation of events (Sridharan, 2021). Orr and Orr (2013) state one of the reasons why external consultants are hired is to provide insights into managerial challenges implying consultants are looking for problems to solve. So, there could be potential for external consultants to have greater pessimism.

However, as shown in Table 27, *ANOVA Analysis of Success Index Grouped by Role*, for these respondents in this study, there was no difference in the perception of success for the external consultants versus internal. So, there appears to be no negativity bias between the groups of internal employees versus external clients.

Considering the duration of an agile transformation and the level of success reported by the respondents, there was no significant difference in the success and

duration of transformation efforts as shown in Table 29, *ANOVA Analysis of Success Index grouped by Agile Transformation Duration*. In other words, there was not a pattern of increasing levels of success reported by the respondents as their companies invested more time in their agile transformation.

Olteanu (2018) argues that agile transformations are based in organizational change, often consisting of a series of what could be considered independent transformations, and can take a long time to address a multitude of challenges. Subsequently, there can be challenges in measuring and synchronizing the transformation efforts throughout an entire organization, especially for a large company (p. 2). It was expected, however, to see an increasing level of success seen as the duration of the transformation increased as well, which was not the pattern observed in this study. Further investigation could provide insights into why longer agile transformations did not produce significantly higher success outputs than shorter agile transformations.

Contribution of Findings to Theory and Practice

This study contributes to the emerging literature in the field of large-scale agile transformations and how culture can play a role in attaining the goals desired by organizations attempting such a transformation. Culture is a multifaceted and complex concept (Brosseau et al., 2019) especially when it comes to an agile environment (Gupta et al, 2019). While Aghina et al. (2020) assert that the gains of greater enterprise agility depends on an organization's respective starting line for agility, the authors fall short of quantifying or backing up their assertions. This study fills the gap in Aghina et al (2020) by showing that the starting line of a culture of control at the start of an agile

transformation influences the degree of success attained by the company in achieving their large-scale agile transformation goals.

Further, studies such as *The State of Agile* reports (VersionOne, 2020; VersionOne, 2019, VersionOne, 2018) reference benefits (e.g., greater visibility, increased morale, higher quality, etc.) seen by implementing agile as a discreet checklist, meaning, either the benefit is seen or not. The Business Agility Report (Business Agility Institute, 2019) states benefits of increased overall business agility (e.g., increased market share, faster turn-around times, improved relationships, greater transparency, etc.), but does not describe by how much.

This study offers additional information to the published literature by providing an order of magnitude how much certain benefits are seen at an organization that went through a large-scale agile transformation. For instance, as summarized in Table 31, *Components Used in Success Index Ranked*, the top two highest benefits reported from a large-scale agile transformation was an improved project visibility ($M = 6.04$ on a scale of 1 to 7, with 7 as the highest or most success) and accelerated product or software delivery ($M = 5.55$). The lowest benefits reported from a large-scale agile transformation was improved morale ($M = 4.94$) and overall organization-wide improvements ($M = 4.52$).

From a practical practice perspective, multiple authors have asserted that an organization's culture impacts their performance (Kim & Chang, 2019; Nikpour, 2017; Paracha, Mahmood, Saboor, & Malik, 2019). With this study revealing a culture of low control plays a role in a greater level of success in companies achieving their large-scale agile transformation goals, there could be implications for cultures of high control

attempting a large-scale agile transformation, especially for leadership. The leadership is responsible for their organization's culture (Andriukaitiene et al., 2018; Schein, 1986). In agile transformations, it is leadership's behaviors that influence to what degree an organization can become agile (Holbeche et al., 2019). For greater agility, leaders must cultivate characteristics such as self-organization, self-responsibility, networks and behaviors over top-down hierarchies and controlling systems (p. 127). Sidkey (2017) recommends that organizations ensure its culture is aligned throughout the transformation so that the existing culture does not fight back with the changes needed in their transformation. Gupta et al. (2018) suggest more specifically during information technology agile transformations for there to be better understanding of existing culture and how the new agile software development practices may impact both the departmental and organizational levels. Overall, organizations may find value in understanding their organizational culture before initiating an agile transformation so as to better set themselves up for greater success (Karvonen et al., 2018).

Recommendations for Further Research

Given the focus of this study on culture and its impact on large-scale agile transformation success, there are a few other areas of potential research and instrumentation that are suggested for further inquiry.

Leadership and Large-Scale Agile Transformation Culture

There could be value in studying leadership's role in establishing and cultivating a culture of agility. Rigby, Elk, & Berez (2020) assert it is the leadership's job to build and run an agile ecosystem. With leadership being responsible for an organization's culture (Andriukaitiene et al., 2018; Schein, 1986) especially in an agile transformation

(Holbeche et al., 2019), and this study revealing a culture of low control at the start of an agile transformation had higher success than a culture of high control in large-scale agile transformations, there could be merit in more greatly understanding the influence of leadership on a culture of control in agile transformations.

Local versus Organization-Wide Success

Several observations from the comparison of responses for two individual components of the Success Index, observed Department-level success (Q23) and Organization-wide success (Q24), should be discussed. First, as Figure 13, *Histogram for Department and Organization Success Scores*, shows, there are two peaks in the distribution of scores histograms. For both diagrams, roughly one third of the responses centers around a value of two (indicating the agile transformation efforts made things slightly to moderately worse) and the remainder of the responses around a value of six (indicating the agile transformation made things better). So, there are two "camps" of success: those that tended to have success and those that did not. One suggestion may be to run a mixed-methods study, to gain more tangible insights into actions, patterns, and practices that either enable or inhibit an organization's culture so that greater large-scale agile transformation success can be achieved.

Secondly, due to the non-normality of these data for Q23 and Q24, a Wilcoxon rank sum test revealed that there was significantly higher success seen at the Departmental level than the Organization-wide (p-value 0.0004, Z score 3.5276). Agile transformations are inherently complex endeavors influenced by a multitude of factors such as its structure, processes, technology, and people (Brosseau et al., 2019). Given the assertion from Brosseau et al. (2019) that large-scale agile transformation change requires

so many moving parts to shift, there could be greater insights for understanding concepts such as span of control and span of influence within departments, between departments, and across the entire enterprise during agile transformation changes.

Intersection of Culture Strength and Culture Type on Success

There is a plethora of literature that support the culture on an organization significantly plays a role in an organization's success (Kim & Chang, 2019; Nikpour, 2017; Paracha et al., 2019; Warrick, 2017). However, after extensive searches through various academic database for studies and instruments used to measure *strength* of culture and its relationship to organizational success (let alone the inclusion of agile in the search criteria), there appears to be little in the literature on even the general topic of culture strength in the past five years. Warrick (2017) cited research from two studies in 2013 that generally associated a stronger culture with higher performance, except when the strong culture was unhealthy.

Expanding the literature search to the year 2000, Sorensen (2002) asserts while there are claims of a strong culture correlated with high performance. However, there is little in the literature that describes strength of culture and the variability or reliability of an organization's performance, especially when there is a need for the organization to adapt to changes that arise in their environment (p. 2). Abu-Jarad, Yusof, and Nikbin (2010) state there are inconsistent results in studies to show that the strength of a culture impacts organizational performance. One of the main criticisms of several organizational culture strength studies include limiting the population to only views by management and executives and/or the use of financial metrics to measure success (p. 42). Instead, it is recommended to not just look at strength of the culture, but more importantly, how well

the culture matches or aligns with the market or environmental conditions in which the organization operates (Abu-Jarad et al., 2010; Dale Carnegie Research Institute, 2017) or with the strategy employed by a company (Tararukhina, 2019).

Given the range of opinions regarding relationship of culture strength and context of the environment considerations listed in the literature, it is recommended that a better instrument be established to measure the strength of culture with context of its environment, in this case, for large-scale agile transformations. Any new instrument created should follow good practices for reliability and validity, such as running pilots or field tests (Creswell, 2014) and ensuring a Cronbach's alpha for the instrument usage have acceptable values (Heale & Twycross, 2015; Osborne & Banjanovic, 2016). Further, any instrument to measure culture strength and environment context should be generalized beyond just large-scale agile transformations, such that the instrument could be used by other researchers in various additional applications.

Expansion of population

One limitation described earlier is in that this study is focused on large-scale agile transformations only in the United States. One recommendation might be to expand the population beyond the US to investigate any influences of regional culture on large-scale agile transformation success. Secondly, this study used LinkedIn and other personal connections to identify potential respondents for this study, which could introduce bias. While the use of LinkedIn has been noted as a means for researchers to access professionals with distinct skill sets that can be challenging to identify and connect with (Gupta et al., 2019), a greater breadth and volume of respondents could be helpful in exploring culture and its impact on large-scale agile transformation success.

Perform a Mixed Methods Study

Another limitation mentioned earlier is in the study design itself: a quantitative study. While inferences regarding a population from a sample were made in this quantitative study, there are little insights beyond the statistical analysis and discussions provided. An explanatory sequential mixed methods study run in two phases, with a first quantitative study design phase followed by a second qualitative study design phase, can help the researcher gain more insights into why certain statistical patterns may have been recorded (Creswell, 2014). For example, if interviews were included as part of this study for the phenomenon seen in the above section *Local versus Organization-Wide Success*, further insights in department-level and organization-wide successes and failures could have been examined.

Conclusion

This quantitative study (n=143) investigated the influence of organizational culture on large-scale agile transformation success. Hypothesis one was supported, in that companies with a predominantly culture of low control at the start of their agile transformation as classified by the clan and adhocracy cultures in the Competing Values Framework achieved their large-scale agile transformation goals with greater success than companies with a culture of high control classified as hierarchy and market cultures. Hypothesis two was not supported, in that there was no relationship found between the strength of a culture (i.e., a strong or weak culture) at the start of their agile transformation and companies successfully achieving their large-scale agile transformation goals. It is suspected, however, that the instrument design played a role in the non-support of H2 due to a low instrument reliability (Cronbach's alpha of 0.456) and

small number of questions used to determine culture strength. With culture in agile transformations a multifaceted and complex phenomenon, several recommendations are provided for further research including: (1) leadership's role in creating and maintaining a culture aligned to greater agility, (2) finding the relationship between span of control or influence and what is meant by department-level and organization-wide success, (3) how the strength of culture as it relates to the company's environment in which it operates versus just a one-dimensional measurement of culture strength, and (4) using a mixed-methods approach to provide greater insights into results of a quantitative survey.

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Appendix A: Questionnaire

The following questions were used as part of this quantitative study. There are 30 questions spread over four sections of this survey. All questions in section I, the participant qualification section, must be answered in the affirmative for the respondent to match the profile required for this study.

Section 1 of 4: Qualification Questions

There are three questions that determine if you qualify to participate in this study.

1. I work at a for-profit company, either public or privately owned, in the United States of America (i.e. you do not work for a non-profit organization or for any government agency, including, but not limited to a city, county, state, or federal agency).
    a. Yes
    b. No
2. I have at least one year experience participating in or leading an agile transformation in the past five years.
    a. Yes
    b. No
3. The organization in which I am providing my answers has either (1) at least 50 persons working on agile teams, or (2) at least 6 agile teams.
    a. Yes
    b. No

Note: the answers to questions 1 through 4 must all be “Yes” for the respondent to qualify to participate in this study. If any answer is “No”, then the participant will not be able to progress further in the survey.

Section 2 of 4: Organizational Culture

There are six questions related to organizational culture. Consider the time period when you *very first started your agile transformation* (not where you are now). Spread 100 points across each of four statements (A, B, C, and D) as listed below.

4. Dominant Characteristics	Points
A. The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.	
B. The organization is a very dynamic entrepreneurial place. People are willing to stick their necks out and take risks.	
C. The organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented.	
D. The organization is a very controlled and structured place. Formal procedures generally govern what people do.	
Total	100

5. Organizational Leadership	Points
A. The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.	
B. The leadership in the organization is generally considered to exemplify entrepreneurship, innovating, or risk taking.	
C. The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.	
D. The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.	
Total	100

6. Management of Employees	Points

A. The management style in the organization is characterized by teamwork, consensus, and participation.	
B. The management style in the organization is characterized by individual risk-taking, innovation, freedom, and uniqueness.	
C. The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.	
D. The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.	
Total	100

7. Organizational Glue	Points
A. The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.	
B. The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.	
C. The glue that holds the organization together is the emphasis on achievement and goal accomplishment. Aggressiveness and winning are common themes.	
D. The glue that holds the organization together is formal rules and policies. Maintaining a smooth-running organization is important.	
Total	100

8. Strategic Emphasis	Points
A. The organization emphasizes human development. High trust, openness, and participation persist.	
B. The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.	
C. The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.	
D. The organization emphasizes permanence and stability. Efficiency, control and smooth operations are important.	
Total	100

9. Criteria of Success	Points
A. The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.	
B. The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.	
C. The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.	
D. The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling and low-cost production are critical.	
Total	100

(All answer options for the below questions are:

a. Strongly disagree

b. Moderately disagree

c. Slightly disagree

d. Neutral

e. Slightly agree

f. Moderately agree

g. Strongly agree

f. I choose not to answer this question)

At the beginning of our agile transformation, …

10. …in order to make any change in our company, directives or permissions were required to come from the top.
11. …I felt I was in alignment with the culture of my company.

12. …I felt comfortable taking initiative to make change without requiring a directive or permission from my manager.
13. …I felt our company's culture was an asset and not an inhibitor.

Section 3 of 4: Agile Transformation Goals and Outcomes

The next set of questions relate to your company's agile transformation goals. Of the nine common reasons why companies adopt agile listed below, indicate to what degree that item may have changed as a result of your agile transformation. If a reason listed did not apply to your company, select "not applicable". If you do not wish to answer the question, please select the "I choose not to answer" option.

(All answer options for the below questions are:

a. This reason was not applicable to our company's transformation.

b. We are significantly worse than before we began the transformation.

c. We are moderately worse than before we began the transformation.

d. We are a little worse than before we began the transformation

e. We are about the same/no change as before we started the transformation.

f. We are just a little better than before we began the transformation.

g. We are moderately better than before we began the transformation.

h. We are significantly much better than before we began the transformation.

i. I choose not to answer this question)

14. Accelerate product or software delivery
15. Enhance ability to manage changing priorities
16. Increase productivity
17. Improve Business/Information Technology Alignment

18. Enhance quality
19. Enhance delivery predictability
20. Reduce project risk
21. Improve project visibility
22. Improve morale
23. My immediate department was successful in achieving our overall transformation goals.
    a. Strongly disagree
    b. Moderately disagree
    c. Slightly disagree
    d. Neutral
    e. Slightly agree
    f. Moderately agree
    g. Strongly agree
    h. I choose not to answer this question
24. Our organization as a whole was successful in achieving our overall transformation goals.
    a. Strongly disagree
    b. Moderately disagree
    c. Slightly disagree
    d. Neutral
    e. Slightly agree
    f. Moderately agree

g. Strongly agree

h. I choose not to answer this question

Section 4 of 4: Miscellaneous and Demographics Questions

This final set of questions helps provide insights into your organization.

25. Is your agile transformation still in progress?

    a. Yes

    b. No

    c. I choose not to answer this question.

26. How long has your (or did your) organization been working on its agile transformation efforts?

    a. Less than 1 year

    b. 1 year, up to 2 years

    c. 2 years, up to 3 years

    d. 3 years to 5 years

    e. More than 5 years

    f. I choose not to answer this question

27. How would you best describe your role?

    a. I am a team member/individual contributor

    b. I am a manager

    c. I am on the executive/senior leadership team

    d. I am an external partner or consultant/coach

    e. Other: (write in)

    f. I choose not to answer this question

28. Please indicate the industry in which your company typically operates.

    a. Education
    b. Energy
    c. Financial Services & Insurance
    d. Healthcare and Pharmaceuticals
    e. Industrial/Manufacturing
    f. Media/Entertainment & Hospitality
    g. Professional Services & Consulting
    h. Retail
    i. Technology
    j. Telecommunications
    k. Transportation
    l. Other
    m. I choose not to answer this question.

29. What is the size of your company?

    a. 50 people or less
    b. 51 to 200 people
    c. 201 to 1000 people
    d. 1,001 to 10,000 people
    e. More than 10,000 people
    f. I choose not to answer this question

30. Please enter the name of your company. This information is being used to count the number of different companies participating in this survey. Please leave blank if you would like to remain anonymous. (Blank text box)

Appendix B: Organizational Culture Assessment Instrument (OCAI) Questions

The following OCAI questions may be found in Cameron and Quinn (2011).

1. Dominant Characteristics	*Now*	*Preferred*
A The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.		
B The organization is a dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.		
C The organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented.		
D The organization is a very controlled and structured place. Formal procedures generally govern what people do.		
Total	100	100

2. Organizational Leadership	*Now*	*Preferred*
A The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.		
B The leadership in the organization is generally considered to exemplify entrepreneurship, innovation, or risk taking.		
C The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.		
D The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.		
Total	100	100

3. Management of Employees	*Now*	*Preferred*
A The management style in the organization is characterized by teamwork, consensus, and participation.		
B The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.		
C The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.		
D The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.		
Total	100	100

4. Organization Glue	*Now*	*Preferred*
A The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.		
B The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.		
C The glue that holds the organization together is the emphasis on achievement and goal accomplishment.		
D The glue that holds the organization together is formal rules and policies. Maintaining a smoothly running organization is important.		
Total	100	100

5. Strategic Emphases	*Now*	*Preferred*
A The organization emphasizes human development. High trust, openness, and participation persist.		
B The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.		
C The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.		
D The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.		
Total	100	100

6. Criteria of Success	*Now*	*Preferred*
A The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.		
B The organization defines success on the basis of having unique or the newest products. It is a product leader and innovator.		
C The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.		
D The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.		
Total	100	100

Appendix C: Changes Made for the Final Survey

As described in Chapter 4, the survey questions as listed in Appendix A were piloted with a group of 18 experienced Agilists prior to the execution of the formal study data collection. Based on feedback from the pilot, all questions remained the same, except for the response choices for questions 14 through 22. The feedback from the pilot was that the responses for these sets of questions related to outcomes of the agile transformation were long and unnecessarily repetitive. So, the adjustment was made for the final survey as follows.

For only the response choices for questions 14 to 22, the original response choices of:

a. This reason was not applicable to our company's transformation.

b. We are significantly worse than before we began the transformation.

c. We are moderately worse than before we began the transformation.

d. We are a little worse than before we began the transformation.

e. We are about the same/no change as before we started the transformation.

f. We are just a little better than before we began the transformation.

g. We are moderately better than before we began the transformation.

h. We are significantly much better than before we began the transformation.

i. I choose not to answer this question.

were modified to:

a. This goal was not applicable to our company's transformation.

b. We are significantly worse.

c. We are moderately worse.

d. We are a little worse.

e. We are about the same/no change.

f. We are just a little better.

g. We are moderately better.

h. We are significantly much better.

i. I choose not to answer this question.

No other changes to the questions or responses to the survey as listed in Appendix A were made for the final survey.

Appendix D: Coding Key for Survey Questions

In order to facilitate the analysis for this survey, the responses to several questions were translated from survey responses that the respondent viewed into numerical responses that could be analyzed. This section lists the coding used as part of the analysis for this study. If the question is not listed in this Appendix, then no coding was necessary to analyze the data. Further, with many of the codings done for seven point Likert scale (responses of one to seven), if the responded selected "I choose not to answer this question" for any question, it was coded as a value of eight.

In questions 10 through 13, participants were asked how strongly they agreed with each statement on a seven point Likert scale. The coding philosophy with Q10 to Q13 is the lower the value, the weaker the culture, and the higher the value, the stronger the culture. So, a value of 1 translates into a very weak culture and a value of 7 translates into a very strong culture. As such, the coding was:

Q10. At the beginning of our agile transformation, in order to make any change in our company, directives or permissions were required to come from the top.

For Q10, a strongly disagree indicates a strong culture (no permissions needed from above) while a strongly agree indicates a weak culture (permissions needed from above), leading to coding:

a. Strongly disagree (Code: 7)

b. Moderately disagree (Code: 6)

c. Slightly disagree (Code: 5)

d. Neutral (Code: 4)

e. Slightly agree (Code: 3)

f. Moderately agree (Code: 2)

g. Strongly agree (Code: 1)

f. I choose not to answer this question (Code: 8)

Q11. At the beginning of our agile transformation, I felt I was in alignment with the culture of my company.

Q12. At the beginning of our agile transformation, I felt comfortable taking initiative to make change without requiring a directive or permission from my manager.

Q13. At the beginning of our agile transformation, I felt our company's culture was an asset and not an inhibitor.

For Q11 to Q13, a strongly agree indicates a strong culture (alignment with culture, no permissions needed from above, culture as asset) while a strongly dissgree indicates a weak culture (not aligned with culture, permissions needed from above, culture as inhibitor), leading to coding:

a. Strongly disagree (Code: 1)

b. Moderately disagree (Code: 2)

c. Slightly disagree (Code: 3)

d. Neutral (Code: 4)

e. Slightly agree (Code: 5)

f. Moderately agree (Code: 6)

g. Strongly agree (Code: 7)

f. I choose not to answer this question (Code: 8)

For questions 14 to 22, the respondents were asked for a set of nine different possible large-scale agile transformation outcomes, to what degree did they see a change

in each of those outcomes on a seven point Likert scale. The higher the number, the greater the success seen for that item. As such, the coding for questions 14 to 22 are:

a. This goal was not applicable to our company's transformation. (Code: 8)

b. We are significantly worse. (Code: 1)

c. We are moderately worse. (Code: 2)

d. We are a little worse. (Code: 3)

e. We are about the same/no change. (Code: 4)

f. We are just a little better. (Code: 5)

g. We are moderately better. (Code: 6)

h. We are significantly much better. (Code: 7)

i. I choose not to answer this question. (Code: 8)

For questions 23 to 24, the respondents were asked how well they saw success in their department (Q23) and their overall organization (Q24) as a result of their large-scale agile transformation effort on a seven point Likert scale. The higher the number, the greater the success seen for that item. The coding for Q23 and Q24 are as follows:

a. Strongly disagree (Code: 1)

b. Moderately disagree (Code: 2)

c. Slightly disagree (Code: 3)

d. Neutral (Code: 4)

e. Slightly agree (Code: 5)

f. Moderately agree (Code: 6)

g. Strongly agree (Code: 7)

f. I choose not to answer this question (Code: 8)

Appendix E: Face and Content Validity

Four experts evaluated the survey questions used for this study for both face and content validity. The following are the emails containing their commentary on the instrument (reference Appendix A) and its relationship to the two research questions.

Expert #1: Dr. Perry Reinert

While I've written a lot here, I don't believe any of it really demands and changes your survey questions. This is an interesting topic, and there are many questions that could be asked. Your job as a Ph.D. student is to find something you can ask and ideally answer in a reasonable period of time. I think you've done that. fully understand many of my comments and questions would be further research...but these are the thoughts that occurred to me, so I shared. I suspect you've thought about much of this. Please also keep in mind that I've NOT thought about all this to your level. It's probable that I flat missed interpreted or did not think deep enough (specifically on each question), so if I'm "way off", sorry. That said, hopefully, there's at least one "thought nugget" in here for you :-) If you want to talk, I'm happy to get on a zoom call (schedule with link in signature below).

- General comments
    - The Objective -".... to investigate how the level of control in an organization’s culture at the outset of an agile transformation can impact the success of an organization reaching its transformation goals." - Great!
    - "...at the time of study"....people's memory of the org (CVF), and of how they were before their individual agile journey (strong / weak), may not be accurate. Can't do much about this other than measure at the beginning of

new transformations...yes, that would take an unreasonable amount of time :-)

- What about the distribution of respondents from different organizations? e.g., what if you were to get 20 responses from one org, versus only 5 from another org. Would the 20 have a disproportionate skew in your data? Also, just the company may not be granular enough. Within a large org, there have likely been several transformations, likely in different departments or divisions with different "micro cultures"?

- Transformation goals could be different
  - You say "...have greater success with achieving their transformation goals." BUT, Do controlling org (weak culture) want different things from an agile transformation than a non-controlling org (strong culture)?
- What about companies that brought in external organizations to lead transformation vs those that did not? It seems like that could be a significant factor as those companies using external transformation orgs would likely get a heavy (er) dose of mindset. How much of the transformation process & mindset was the [strong cultured] transformation org vs the [weak cultured] company's? There may be value in asking a question on this topic?
- Notes
  - RQ1: **Do organizations with a low controlling culture** at the outset of an agile transformation **have greater success** with achieving their transformation goals **than organizations with a high controlling culture?**

- However, I think a better (yet notably larger) question is along the lines of "What factors affect the success of transformation...for high-controlling cultures?" ... does the transformation org have an impact? What types of mindest shift activities did the transforming org (i.e., the consulting org) use to help the high-controlling org shift. Maybe save that for the book? :-)
- The more pertinent question for you is how are you measuring "success". I.e., "**Do organizations with a low controlling culture** at the outset of an agile transformation **have greater success**...?" I think those questions look reasonable.
- I do like CVF for gathering information, and I feel that that will indicate if companies have "controlling cultures". I'm not sure if there are other instruments that might be...hmm...more focused on controlling practices. Without ANY research on my part (or being a CVF expert), it seems like there could be, at least conceptually.

- RQ2: Does the **strength of an organization's culture at the start of an agile transformation influence how well the organization achieves** its transformation goals?
  - Read RQ2 above and compare it to the original objective -".... to investigate how the ***level of control*** in an organization's culture at the outset of an agile transformation can impact the success of an organization reaching its transformation goals."

        - With the - objective and RQ1, I feel an urge to "tweak" the objective - ".... to investigate how the level of control **AND THE STRENGTH OF** an organization's culture at the outset of an agile transformation can impact the success of an organization reaching its transformation goals."
        - I also keep seeing four combinations possible: controlling/strong, controlling/weak, not controlling/strong, not controlling/weak. Wondering if you do?
- Questions 10-13 address RQ2. After waaay to much thought on my part, I think I like these. My thoughts
    - The questions:
        - #10 - directly addresses RQ2.
        - #11 - addresses how much the individual relates to the culture. However, the definition of "the culture" is left to individual interpretation. It's possible that different people lock on to different aspects of culture (e.g., "great culture" - we get free cereal, we have ping-pong and foosball -vs- your "strong" vs "weak").
        - #12 - directly addresses RQ2.
        - #13 - again, shows individual alignment with company culture, but "culture" is open for interpretation

- Comments
    - In the survey, may want to "steer" their interpretation of culture.
    - Seems like really only two questions that directly address RQ2. Is this adequate?

Perry Reinert, Ph. D., CSM, CSPO, CAL, PAL, ICP-ACC, SPC, AHF

Expert #2: Dr. Lisa Mabli

Thanks for giving me the opportunity to get a glimpse at your upcoming research! Can't wait to see what you find out!

I believe your survey questions will indeed generate the kind of data you will need in order to prove or disprove your working hypotheses. There seems to be a good match there.

Also, just wanted to say that I do like the approach of allowing respondents to self-identify whether they were successful or not. Often, organizations set out baselines and metrics at the beginning of the transformation "project," without really knowing what will actually be important to measure once it gets going -- then they have wins in important areas that were not initially identified, and may in fact be a better indicator of success, while the original (prematurely formulated) metrics would make the transformation look like an abysmal failure!

Lisa Mabli, Ph. D.

Expert #3: Richard Dolman

To whom it may concern,

I have reviewed the survey questions for Mr. Martin's study on the Culture of Control and Large-Scale Agile Transformation Success and can endorse the survey as an appropriate means for gathering data pursuant to the study.

The OCAI model from Cameron and Quinn is properly applied for the first research question and hypothesis. It is a proven model and one used by experienced Agile Coaches, like myself, who understand the importance of cultural influences on an Agile Transformation.

The survey questions used related to the 2nd research question are well structured to collect input and align with the hypotheses. By seeking to understand the respondents' perspective on relative cultural strength at the beginning of their transformation, in addition to questions that identify relative level of success toward stated goals, I expect the survey will yield meaningful data that can be mapped effectively for the stated hypotheses.

As an Agile Coach, I would be very interested in reviewing the final outcome of this study to better understand and align my own experiences and apply learnings on this topic to my transformation work.

Sincerely,

Richard Dolman

Enterprise Agility Coach

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Steven's research questions and survey proposal will provide the data points necessary for enterprise agile coaches/transformation agents to leverage in order to understand how to support real change in leaders and their approach to transformations. If we want to see more success in transformations, then this research will be critical to addressing the missing piece in the approach - the true impact of existing organizational culture.

Kerri Sutey, ICE-EC, ICE-AC

CEO and Enterprise Agile Coach

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