# THE MITIGATING EFFECTS OF BUREAUCRATIC ENVIRONMENTS ON INFORMATION TECHNOLOGY IMPLEMENTATION PROJECTS

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John Anthony Buettner

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Abstract

of

THE MITIGATING EFFECTS OF BUREAUCRATIC ENVIRONMENTS ON INFORMATION TECHNOLOGY IMPLEMENTATION PROJECTS

by

John Anthony Buettner

The purpose of this research is to advance the body of knowledge on information technology (IT) implementation projects and the mitigating effects that bureaucratic environments have upon governmental IT projects. Federal Employee Viewpoint Survey data from the Office of Personnel Management and federal IT project health data from the Office of Management and Budget offered an opportunity to perform logistic regression analyses between the independent variables of employee ratings of their department's health, and the dependent variables of project schedule and cost health. Using overall department health as the independent variable, the findings show that overall department health significantly and positively explains a project's schedule health, but is insignificant when it comes to a project's cost health.

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# CHAPTER 1: INTRODUCTION

This thesis furthers my Public Policy and Administration studies on governmental Information Technology (IT) implementation projects. The focus of this paper is on the mitigating effects that non-technical aspects found in bureaucratic environments may have on success or failure of implementation projects. I was fortunate to work as a student practitioner within the Department of Health Care Service's (DHCS) California Medicaid Management Information System's (CA-MMIS) Project Management Office (PMO). Even before my time working with the PMO, DHCS and their fiscal intermediary counterparts at Xerox were failing in their joint attempt to implement CA-MMIS' new IT system. Considering this impending implementation failure, IT implementation failures and the organizational underpinnings of these failures quickly became the focus of my studies. California legislators, DHCS, the federal government, and practitioners throughout the nation, were studying the project as well given its prominence as being one of the largest implementation projects in the nation.

In 2016, nineteen months after I began and more than six-years after DHCS and Xerox had begun, the project profoundly failed much to the dismay of California legislators and the federal government as well. In a rare case, California successfully sued Xerox and recaptured $120,000,000 of the state's investment into the project (Healthcare, 2016). While doing well to recover their investment, many states do not. In fact, many states undertaking IT implementation projects lose money while trying to implement various systems throughout various governmental departments.

There are various systems falling into the category of IT such as enterprise resource planning systems, transaction processing systems, decision support systems, knowledge management systems, learning management systems, or database management systems, just to cover a few. These systems support a range of functions including, but not limited to, customer service and organizational operations, as well as offer tools for data analytics for decision-makers from middle management up to the executive level. All levels of government use one type system or another depending on their specific needs. Implementation of these systems is the genesis of their use, but implementation is amazingly challenging given the complex dynamics IT implementation projects face, and many governmental IT projects fail.

Practitioners and researchers alike attribute IT implementation failures to technical aspects such as design and development or project management methodology. Each of these factors offer valid rationale for a project's success or failure. However, non-technical aspects such as leadership (Kei & Wei, 2008), culture (Chin Gu, Hoffman, Cao & Schneiderjans, 2014), communication (Mishra, Boynton, & Mishra, 2014), employee satisfaction (Belias & Kouselios, 2014), and organizational structure (Csaszar 2012; Pardo & Scholl, 2012), are major aspects that not only extant literature refers to as mitigating factors belying success of many IT projects, these factors were part of my observations as well. While there are many factors influencing IT implementation projects, this thesis looks specifically at non-technical factors and their explanatory value toward success or failure of governmental IT implementation projects.

This exploratory research speaks to other researchers' findings on the influences that bureaucratic environments including leadership, culture, communication, and employee satisfaction have on IT implementation projects. To test the influence that these non-technical factors have on IT implementation projects, I use federal data from the U. S. Office of Personnel Management (OPM) and the Office of Management and Budget (OMB). OPM's Federal Employee Viewpoint Survey (FEVS, 2015) and OMB's IT Project Health data (2015) offer the data necessary to perform logistic regression analyses between the aforementioned non-technical factors, and IT implementation project health, respectively.

Aggregated FEVS data offers a foundation for a constructed variable I call Department Health (DH), which is based on employee viewpoint ratings of their perceptions on the independent variables of Environment, Leadership, Culture, Communication and Employee Satisfaction (the key factors). OMB's data gives each federal department's IT implementation project health ratings, which accounts for the dependent variable of project health (PH). Even though these data sets are separate measurements, matching them department to department allows for a fair, independent comparison. Given separate purposes and governmental intent for usage of the data sets, the analyses will objectively show if the individual, non-technical factors, and/or overall department health, help explain governmental IT implementation project health. Quantitative data such as this will not only add valuable insight for public sector IT implementation management, it will offer valuable findings for use by private sector

project management practitioners working in conjunction with governmental agencies as well.

Beginning in Chapter 2, I offer high-level overviews of the severity of governmental IT project failures and a literature review of theoretical causal factors. I then examine environment, culture, leadership, communication and employee satisfaction, and their theoretical influence on IT project health. Chapter 3 describes the federal data used to conduct the regression analyses and explains the methodology. Chapter 4 offers a brief review of the results of the logistic regression analyses, and Chapter 5 discusses the important findings and the conclusions.

# CHAPTER 2: GOVERNMENT IT IMPLEMENTATION FAILURES

The use of Information Technology (IT) systems is increasingly beneficial to governmental organizations, and their constituents, due to the inherent efficiencies of IT systems. IT systems not only help manage the delivery of services to citizens, they are also proving to be efficient organizational tools for management and staff. The increasing use of IT systems promises convenience, quality of public services, efficiency and cost savings. Additionally, the use of an IT system potentially reduces government spending and the need for human contact; offers 24/7 functionality; and purports to increase political participation (Huang & Bwoma, 2003). Indeed, IT is the future with no signs of stopping or slowing down, and is the "next step in the natural evolution of how governments respond to changes in the broader economy and society" (Huang & Bwoma, 2003).

However, IT implementation is proving to be one of the most challenging endeavors for governments and is wasting billions of taxpayer dollars every year due to failed efforts. Ching Gu, Hoffman, Cao and Schniederjans noted that "Although it is difficult to quantify the financial cost arising from low success rates associated with information technology (IT) projects, a 2003 review estimated that a phenomenal $150 billion was attributable to wastage from IT failures in the United States, with a further $140 billion in the European Union" (2014, pg. 1).

In an article entitled "Another Failed Government Tech Project Cost $1.1 Billion," Ehley (2013) spoke to how the Department of Defense (DOD) and the Veterans Administration (VA) decided to cancel their joint IT project. Seriously behind schedule

and severely over budget, finishing the project would run seven times the original estimate, leading to a final cost of $28 Billion dollars. Hendershot (2015) said that the cost of failed government IT projects conservatively creates $20 billion dollars in losses per year. Thibodeau (2013) quotes research data showing only 6.4 percent of commercial and government IT implementation projects with labor costs exceeding $10 million dollars are successful. There is no paucity of data reflecting the enormous amounts of money thrown at projects that are, according to experts, doomed from the beginning (Thibodeau, 2013; Yaraghi, 2015; Boak, 2013; Ehley, 2013; Leo, 2013; Flyvbjerg & Budzire, 2011). This is, as Ke and Wei state, a "mystery," yet it appears to be an accepted norm at a global level (2008, pg. 1).

IT implementation successes or failures are relative to perceptions about post-implementation satisfaction with the product. It is a point of contention whether the implementation is a success, or failure, because on one hand standing the system up is a victory for the project management team, but the consumer often is not happy. IT Cortex (2015), a provider of IT management consulting services, studied perceptions of successful implementation within government, IT, communications, financial, utilities, and healthcare companies implementing enterprise resource planning IT systems. They surveyed 232 practitioners from these enterprises and found that 51 percent of the participants viewed their implementation project as unsuccessful, while 46 percent did not feel their organization understood the system and only 36 percent felt their projects were successful.

In 2002, Heeks (2003) polled members from the eGovernment for Development Exchange regarding perceptions of project successes and failures. Analyzing more than forty reports from developing and transitional countries, Heeks found startling results. He found that 35 percent were total failures (cancelled projects), 50 percent were partial failures (implementation with undesirable outcomes) and only 15 percent were successes (implementation with desirable outcomes). Relative to viewpoints on what constitutes a failure, that equates to an 85 percent failure rate.

Heeks and others also find that failures cause more than just direct financial losses since there are other losses such as indirect financial costs, opportunity costs, political costs, beneficiary costs and future costs; all of which are too difficult to quantify but add up well beyond the reported losses (Heeks, 2003; Ching Gu, Hoffman, Cao, & Schniederjans, 2014). Additional studies noted on the IT Cortex website ranging from 1995-2001 (IT Cortex, 2015) concluded that implementation projects are far more likely to be unsuccessful, with only one out of five bringing full satisfaction, and, the larger the project, the more likely it will fail (2015).

Scouring literature centered on explaining successes or failures of IT implementation projects, once again, renders no paucity of research and/or expert advice on the critical factors of success, or post-hoc review of what went wrong. From a technical viewpoint, IT implementation is very complex yet methodological and scientific, and much of the literature addresses failures based on improper use of project methodology or technical difficulties. However, there is a large component factoring into

failures, with leadership and organizational structure/culture consistently on top of the list (Ke & Wei, 2008).

Niam Yaraghi (2015) spoke to bureaucratic failures in his article entitled "Doomed: Challenges and solutions to government IT projects." Often over budget and off schedule, government IT projects fail "miserably" (2015, para. 1). Yaraghi attempts to answer the question of why these projects are so prone to failure and if there is a better way of managing them, eluding to a certain amount of bureaucratic incompetency. However, Yaraghi recognizes that not all projects fail due to incompetent management, and attributes these failures more to the complexities found within governmental bureaucracies. These complex operating environments can hinder project success due to hierarchical structures making it difficult to coordinate projects through bureaucratic red tape (Yaraghi, 2015). Ehley points this out as well by citing a congressionally mandated report that studied the failure of the joint DOD and VA project. The report states that a part of DOD's and VA's joint failure was attributable to bureaucratic red tape causing delays in senior officials' decision-making, and that lax oversight and poor budgeting practices added to the $1.1 billion-dollar loss (2013).

Aicholzer (2011) points out that successful implementation projects depend on people, but, more importantly, they rely on organizational structure and the operating environment engulfing projects. In projects as complex as IT implementation, agile leadership and quick decision-making processes make the difference between success, and failure (Labrosse & Alpine, 2015). In many cases, too much bureaucratic oversight and the inherent pressure-filled environment bureaucracies operate in negatively affect

the agility of decision-making processes, which stymies and disrupts projects by creating greater pressures to perform (Pardo & Scholl, 2014; Thibodeau, 2013).

Adding another layer of pressure to the already pressured environment, is an over-reliance on private sector contractors. Federal government purchases of IT services rose from $3.7 billion dollars in 1990 to roughly $13.4 billion in FY 2000, with non-federal spending increasing to $23 billion by FY 2008 (Ya Ni & Bretschneider, 2007). Contracting out IT implementation projects to the private sector has important implications for public sector administration since governments operate in a different environment than the private sector. The differences between the two environments can affect behavior and decision-making in a myriad of different ways. One of the ways it can affect behavior and decision-making is the reliance on government for appropriation of financial resources given the intensive and elaborate formal legal constraints accompanying oversight from formal authority, which shapes and influences organizational roles, structures, and processes (Ya Ni & Bretschneider, 2007).

These layers of constraints and red tape hinder the agility of lower level decision-makers to act and can disaffect contractors by placing undue pressures to perform in untimely circumstances, which cause subsequent delays, and oftentimes confusion, leading to poor IT project health. Given the environments and additional complexities noted, it is clear that bureaucratic environments can create pressures on leadership and private sector associates, and hinder, if not subvert, implementation success (Winston, 2013).

We see from the research that bureaucratic environments are complex given their organizational structure and hierarchical design. There are many reasons that IT implementation projects fail, however, success or failure of IT implementation projects are in many cases, inexplicable. These failures and the economic waste are obviously real, but implementation is much easier on paper than in real life because human actors and their behaviors are neither scientific nor fully predictable at best. Success of any implementation project does not depend entirely on any one technical or non-technical factor, but is dependent upon all. To understand how the non-technical factors may influence project health, we review the extant literature and research discussing each individual factor and how these factors may influence a project's health.

## ORGANIZATIONAL STRUCTURE AND BUREACRATIC ENVIRONMENTS

Structure, as defined by many researchers, refers to the design of an organization's hierarchical levels, units and positions, and the formal rules that govern an organization (Rainey, 2014). These influences make bureaucratic organizations complex operating environments. Bureaucratic structures are rigid by design, with decision-making processes hierarchical and heavily influenced by checks and balances. Complexities and rigidity cause hindrances in decision-making capabilities, which can cause both untimely, and poorly informed, decision-making and in many cases, does. When it comes to IT implementation projects and practitioners' need for fast and informed decisions to keep things moving ahead, structure alone can place an enormous burden on project health through timeliness and quality of decisions (Csaszar, 2012).

Centralized decision-making structures, such as bureaucracies, affect the agility, quality and quantity of decision-making, which affects overall organizational performance. Csaszar (2012) researched organizational decision-making structures and their influence on organizational performance. Specifically, he looked at mutual fund decision-making structures and how these structures affect the number of initiatives pursued by these organizations. He sought to find correlations between performance variables of initiatives accepted (the amount of initiatives taken into consideration), commission errors (bad choices) and omission errors (missed opportunities), in decentralized and centralized organizational structures. Csaszar's findings suggest that when it comes to decision-making performance, decentralized structures perform better than centralized. In a centralized bureaucratic environment, decision-making performance is affected not only by structure, but red tape issues as well, which can drain employee work satisfaction.

Giauque, Ritz, Varone, and Aderfuhren-Biget (2012), researched the negative impact of red tape on work satisfaction. In a national survey of public servants from Swiss municipalities in Switzerland, the researchers sought to find out if red tape was a predictor of resigned satisfaction (a form of dissatisfaction, which inhibits performance and aspirations). Their survey consisted of questions measuring Public Service Motivation. The respondents answered questions from the Work Satisfaction Questionnaire developed by Bruggemann (1976) about their feelings toward public service, and provided their perception of how much red tape their organization and leaders deal with. Giauque, et. al found that red tape is the strongest predictor of resigned

satisfaction. Bureaucratic structures not only inhibit decision-making quality and agility, red tape issues affect the operating environment, which can disaffect staff and leadership. The effect of organizational structure and inherent red-tape issues negatively influence decision-making and employee satisfaction. These joint effects can influence IT implementation performance as shown by Pardo and Scholl (2002).

In a longitudinal study of New York State's Central Accounting System (NYCAS) redesign, Pardo and Scholl (2002) theorized that bureaucratic decision-making processes and pressures on performance link together through socio-technical factors, meaning social and behavioral elements combined with the technical aspects of IT implementation projects. In their research, they sought to find the key factors related to implementation failures within governmental agencies. Reviewing the existing body of knowledge pertaining to implementation methodology, and extracting best practices, Pardo and Scholl created an optimal framework and prescription for the NYCAS leadership to follow, which they called the Socio-Technical (ST) approach. ST framework addresses the inherent dynamics between social, organizational, and technical factors. With an optimal framework, solid implementation methodology, and active, on the scene research, the researchers tried to pin down root causes, or what they labeled shortcuts to failures, of governmental IT implementation failures in real time.

The NYCAS directorate agreed to use Pardo and Scholl's framework and prescriptions for avoiding shortcuts to failure so that the NYCAS directorate could further understand some of the root causes of implementation failures as well. After laying the framework out to the directorate, and acting as hands-on consultants and

decision-makers alongside the directorate in the beginning phases of the project, Pardo and Scholl (2002) then took on a purely observational role and let directorate make decisions without consultancy from the research/consultant team. Pardo and Scholl found that with their consultation and direction, leadership and team members followed the prescription in the initial phases, and were partially successful implementing the initial phases of the project (2002). However, once the researchers took on an observational role and left leadership to make their own decisions, bureaucratic and environmental pressures to perform led management in to taking short cuts to failures by giving in to certain political pressures, which diverted the directorate from the prescribed approach. Once top management gave in to these pressures, they lost a certain amount of control, and lower-level project team members within the organization did not follow through with best practices. When this happened, technical elements, rather than socio-technical elements, began to dominate the project at all levels as the important social aspects to project implementation diminished, and the project went sideways (Pardo & Scholl, 2002). Their research found that bureaucratic structures and environments play important roles, and can lead to poor decision-making and in too many cases, certain failure.

Public organizations operate within larger governmental systems that dictate organizational policy, but it is hard to say where the larger system's environmental influence begins or ends because of the diversity of influences upon each organization's policy arena (Rainey, 2014). Many forces affect an organization's technological, legal, political, economic, ecological, and cultural environments. These forces perpetually act upon leadership and organizations at different levels and varying degrees.

One of the most important forces pertinent to this research is the technological environmental condition spoken of by Rainey (2014). This condition refers to general levels of technical knowledge between leaders and staff, along with a certain knowledge and capability in science, combined with a general capacity for communication and information processing. Many organizations struggle to keep up with advances in technology because of a lack of knowledge in these areas, as well as ineffective communications (Rainey, 2014). This lack of technical knowledge and poor communications causes uncertainty in the operating environment due to a lack of the necessary technical communication skills within the organization. Combine this with pressures to perform from directorate and stakeholders, and the combination of forces can lead to poor decision-making performance when it comes to IT implementation projects, as seen in Pardo and Scholl's (2012) research.

## LEADERSHIP AND CULTURE

Leadership is always an important factor within any organization. Leadership personalities vary widely in their motivations and skills, and these variations explain a lot of success or failure of individual leaders (Rainey, 2014). The context in which leadership operates is also crucial to leadership performance. Not only do personal behavioral aspects make a difference, but successful bureaucratic leadership also depends upon favorable historical conditions such as public and political support, and timely technological possibilities such as implementing systems to enhance organizational performance (Rainey, 2014).

Culture is also an important aspect to organizational performance. Culture is a dynamic process resulting from interaction between all actors and promoted by leadership. It is a shared system of values, beliefs, and behaviors within an organization and is a pattern of basic assumptions invented or discovered in learning to cope with varying problems including external adaptation and internal integration (Schein, Belias & Koustelios, 2014). It is a safe assumption to say that leadership's motivation, determination, and optimism make a difference in public sector organizational performance, and that both leadership and culture play crucial roles when it comes to organizational well-being, organizational performance, and IT implementation project health.

O'Reilly, Caldwell, Chatman and Doerr (2014) researched the joint effects of a leader's personality on organizational culture, and, thusly, culture's impact on organizational performance. They were interested in looking at two accepted facts; (1) leaders affect culture, and (2) culture relates to performance and outcomes. The researchers tested whether a leader's personality traits affect culture and, in turn, how culture affects performance. After collecting informant data from high-tech companies in the United States and Ireland, they measured different dimensions of culture and leadership personality. Respondents objectively assessed leaders' personality using the Ten-Item Personality Inventory based on the Big Five Model.

O'Reilly, et. al (2014), found that leadership personality dimensions significantly relate to culture, and that culture significantly relates to outcomes. The results showed that leaders who were conscientious, significantly and positively correlate to a detail

oriented culture; and that leaders who were open, significantly and positively correlate to an adaptable culture; and that leaders who were agreeable significantly and positively correlate with a results oriented culture. Furthermore, adaptability and detail oriented leadership significantly relate to outcomes. These researchers' work gave us excellent insight into the fact that personality characteristics do affect culture on various levels.

Ching Gu, Hoffman, Cao and Schnederjans (2014) examined the impact of culture and environmental pressures on IT project performance by conducting a survey on IT project performance between practitioners in China and the United States. These two countries have inherent difference in culture, capabilities, and environment, which is the reason the researchers chose them. They specifically examined four dimensions of organizational culture: institutional collectivism, results orientation, positive work environment, and leadership risk tolerance. They were interested whether moderating effects such as levels of competition and regulatory pressures affect IT project performance. They found that regulatory pressures and positive work environments have significantly higher impact on implementation success, and are the most significant predictors of IT project health. Leadership and culture are important aspects for organizational well-being. Inherent pressures on leadership and operating environments can aid, or hinder, implementation success, as seen in this section.

## COMMUNICATION

As we see so far, structure, leadership, and culture, intertwine in such a fashion as to affect organizational outcomes, which can in turn affect IT implementation project performance. However, communication in IT implementation projects is one of the most

critical factors for project success, as noted in project management literature (Turner, 2007).

Mishra, Boynton and Mishra (2014) state that "Internal communication is communication between the organization's leaders and one of its key publics: the employees." Communications make for positive work environments, which is integral to greater employee engagement. Rainey (2014) states that, "vertical communication can encounter difficulties [because of] hierarchical filtering and superior-subordinate relationships," which includes "inattentiveness, misunderstanding, and reticence or withholding of information by lower levels." (pg. 391). There are many barriers to communication, with the most notable and applicable to this research being distortion in the public service sector (Rainey, 2014). Distorted perceptions, mistaken translation, errors of abstraction and differentiation, and lack of congruence, are a few of the barriers to organizational performance, and, technological possibilities (Rainey, 2014).

Communication is one of the most valuable tools for organizations for any type of project, whether that project is achieving organizational goals, implementing new programs, or at a fundamental level, basic daily operations. I argue that what is less clear, but intuitive, is that communication is remarkably weak in the public sector given its hierarchical design. Poor communication can cause uncertainty and unrest, not to mention poorly informed decision-making, which is detrimental to the performance of organizations, reduces employee engagement, usurps employee satisfaction, and can badly reflect upon all organizational outcomes. In all respects, the nature of

communication in any environment, organizational, personal, or otherwise, is a factor weighing on any project or undertaking.

## EMPLOYEE SATISFACTION

Employee satisfaction and employee attitudes are crucial considerations for leadership if an organization is to be successful in any endeavor. Ostroff (1992) researched the relationship between employee satisfaction, attitudes, and performance at an organization level by gathering student and employee satisfaction data from junior high schools and high schools throughout the United States and Canada. Ostroff found that satisfaction and attitudes positively correlate across the board with performance. She found that administrative performance significantly and positively correlates with satisfaction and attitudes, meaning the higher the satisfaction of administrative personnel, the better their performance is. These findings infer that employees' satisfaction and attitude can affect performance in a variety of organizations, both public and private.

Furthermore, Schelicher, Smith, Casper, Watt and Greguras (2015) researched Job Attitude Strength (JAS) as a moderator of job performance. JAS refers to the strength of employee's attitudes, satisfaction or commitment toward their work. JAS is important because it can predict behaviors that are important to an organization's well-being. The researchers were interested in whether employees' JAS affects citizenship behavior and withdrawal. Their research looked at employee satisfaction at a granular level; job attitude. Survey data from five field samples throughout the United States included eight measures designed to measure individuals' JAS and performance. A regression analysis found significant, positive correlations between employee JAS, satisfaction and job

performance. Better employee attitude makes for better employee satisfaction and is reflective of healthier organizations.

As seen through the research and literature, an organization's structure, whether bureaucratic or private, its environment, its leadership, culture created by that leadership, communication from within and from without, and employee satisfaction including attitude, affect organizational performance. These key factors contributing to a department's health can bear-down on IT implementation projects. It only makes sense, then, that these non-technical, behavioral aspects found within bureaucratic environments can, and oftentimes do, influence governmental IT implementation projects, positively or negatively.

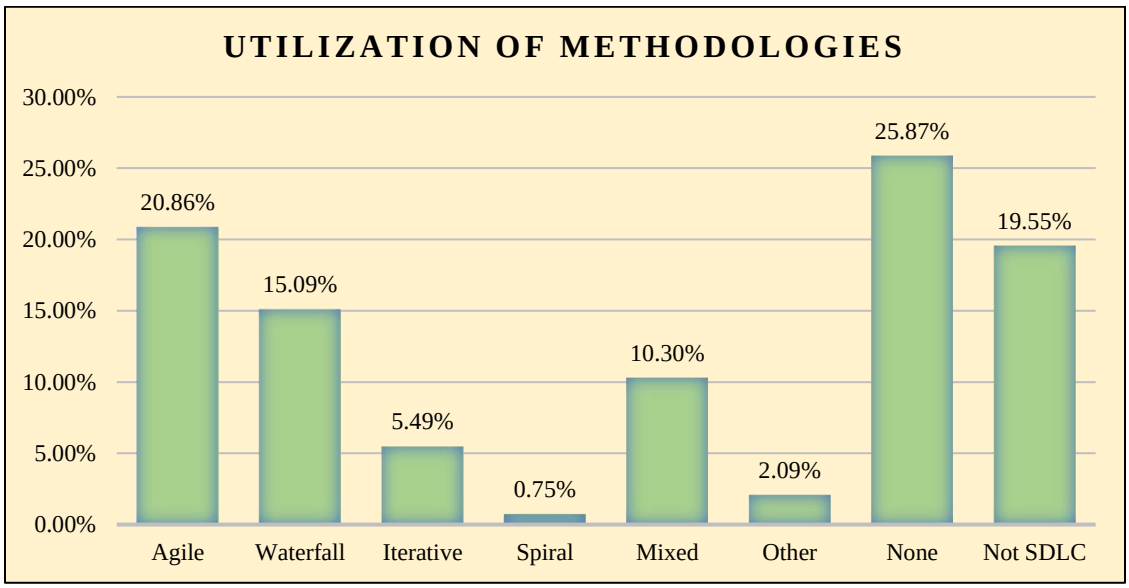
## PROJECT MANAGEMENT METHODOLOGY AND LEADERSHIP EXPERIENCE

Project management is a set of related practices, methods and processes that determine how to best plan, develop, control and deliver IT implementation projects through to successful completion. Methodology and solid, experienced management, are integral to IT implementation projects given the deep involvement with, and collaboration between, the project management team, department leadership, staff, and consumers. While organizational performance can influence project success, methodology and management are two factors that can dictate a project's health more than the key factors presented in this paper.

There are four well-known methodologies used by departments in OMB's project data including Agile, Waterfall, Iterative and Spiral. In addition, there are three alternate methodologies including Mixed, Other, and Not a System Development Life-Cycle.

Some departments report using no methodology at all. Table 2.1 below shows the percentage of use by methodology. While I use all categories to help explain project health, the main four methodologies are the most important given that project management practitioners are familiar with them, and seek to answer which one is best suited for their specific implementation project.

Table 2.1: *Utilization Rates for Methodologies Employed in Practice*




Note: *The four well known methodologies are Agile, Waterfall, Iterative, and Spiral. Alternate methods include Mixed, Other (actual method unknown), None (no method employed), and projects that are not System Development Life Cycle projects (SDLC; these projects are not development projects per say).*

Agile and Waterfall are almost opposite types of methodologies, while the Iterative process is more in tune with Agile, and Spiral is a mixture between them all. One of the up and coming practices is the Agile methodology, favored because of its purported success over Waterfall. Agile calls for a highly iterative approach, which involves consistent input across the board from project managers and related staff, system

developers, organizational leadership, staff and end-users. Waterfall is different from Agile, because, by design, Waterfall does not use iterative processes as part of its project life cycle. Iterative calls for high interaction from end users and eventual owners of the systems, which means high levels of interaction from all actors during the ongoing development phases. Finally, Spiral, a hybrid methodology-mix uses Agile/Iterative and Waterfall methodologies, combining the best of both processes.

Methodologies are diverse and highly complex, with many moving components, just like IT implementation projects and bureaucracies. Some methodologies are more conducive to larger, hierarchical bureaucratic structures, while others are far better in smaller, horizontally managed private sector organizations. Methodology is a study in and of itself, so this paper does not educate the reader about in-depth intricacies or details, it only offers high-level information about IT project management methodology relative to structure. For this research, the most important factor about methodology is how each one fares in relation to project health.

It is entirely possible that a governmental department is functioning at a very healthy level. The organization is performing well, leadership is keen and intellectually astute, adaptable, and on top of decision-making, communication is great and all actors appreciate the culture, reflecting in employees' satisfaction and organizational performance. Even if project managers are in control of their respective projects and performing very well, the project is still subject to the key factors, which are out of control of project management practitioners working outside of the mainstream

organization. These non-technical organizational factors are exogenous to the implementation project, but can still influence project health.

Project managers understand these non-technical factors exist and that these factors can influence and affect projects. They also understand that they must wisely choose which project management methodology is best suited for the organization. Synchronizing project management methodology with an organization's needs is highly important to the project's health since the extent of departmental needs depend on the structure, complexity of the project, and resource requirements. Many of these decisions come from project managers, albeit with ultimate approval from the directorate. Whether assigning staff to manage a project, or a seasoned practitioner, methodology is one of the most important factors in IT implementation projects, as is experience in managing projects.

Project management is team-work on steroids and calls for strategy, engineering techniques, and capability. Chow and Cao (2007) performed regression analysis based on survey data from Agile projects for countries across the world. They were interested in finding the critical success factors of the Agile software development projects since Agile has emerged as a promising methodology for IT project management. After finding twelve critical success factors for implementation projects upfront, a survey was sent to Agile Alliance members and data collected about members' opinions and ratings on the importance of the twelve critical success factors and their perception of success underneath the Agile methodology. Based on practitioner's feedback, they pinpointed three critical success factors for Agile projects; Delivery Strategy, Agile Software

Engineering Techniques, and Team Capability. Strategy and team capability speak to organizational strategies to implement their IT system, and the capability, and ability, of teams to work together to achieve the end-goal.

If bureaucratic structure and its environment inhibits the ability of teams to produce and make proper, prompt decisions, this can negatively affect outcomes (Chen, Neubaum, Reilly, & Lynn, 2014). Creating the right environment for employees and professionals is integral to project success, but if leadership inhibits team autonomy, as spoken of by Chen, et.al (2014), project performance can suffer. Agile thrives on an autonomous team environment, but also must rely on leadership decision-making, along with management, staff and employees' consistent interaction to be as agile as the methodology requires. The nature of the Agile methodology calls for extreme interaction and quick decision-making, which is the antithesis of a bureaucratic structure. However, interaction through the Agile method can be problematic given bureaucratic structures and operational environment, while the Waterfall methodology and its sequential, non-iterative approach seems more fitting to the nature of a rigid, hierarchical decision-making structure.

## CONCLUSION TO CHAPTER TWO

IT implementation projects fail at alarming rates, which is especially true of government IT projects. Practitioners, researchers and academicians continue to seek out why these types of projects fail. Technical aspects, and how these aspects influence a project's success, are among the important factors, while others speak to non-technical aspects being just as important. Key factors such as organizational structure,

environment, leadership, culture and communication, are among the top of the researchers' lists as non-technical factors influencing project success. These joint factors can also affect employee satisfaction and overall department health, which can influence organizational performance and affect IT implementation project health.

Much of the extant literature qualifies these non-technical factors singularly, speaking to their individual influences on IT project health. However, there is not too much quantitative data backing their theoretical dispositions on the subject(s). All non-technical factors, individual or a combination of them all, influence organization outcomes, production, staff willingness to perform, and leadership's ability to make decisions. If any combination of these factors is lacking, unintentional consequences such as implementation failures can arise.

In bureaucratic environments, complexities abound, and in many cases these complexities are out of the control of leadership. Although, if leadership can correct deficiencies in these non-technical areas before a project begins, this may help to influence a variety of organizational production, including IT project outcomes. Quantifying the individual effects of each of these non-technical, organizational health factors on IT project health, and, quantifying a department's overall health on these projects, offers solid data that may offer insight enough to alleviate much of the waste within the failure to effectively implement IT systems. If there are significant findings, this model may serve as a pre-implementation test for governmental departments to find out if their departments are healthy enough for project success, and what areas are most important to deal with prior to proceeding.

Project management methodology and project manager experience are also very important components to success or failure. Agile is an iterative process that appears to be the antithesis of a bureaucratic structure, while Waterfall and Hybrid methodologies appear to align better with hierarchical structures. Aligning methodology to structure and environment is a key to a project's livelihood, while project management experience and leadership is important to keeping the project on time and within budget. If bureaucratic structures and their environments are more conducive to one methodology over the other, then a logistic regression analysis with all key factors including methodology and project management leadership experience may give much needed insight for decision-makers when it comes to the methodology best suited for their department's project.

# CHAPTER 3: DATA AND METHODOLOGY

This section reviews the data and methods I use for the logistic regression analyses, starting with the Federal Employee Viewpoint Survey (FEVS) data. The FEVS is the data set I use to create the independent variable categories. Following the FEVS overview, we look at project health data from the Office of Management and Budgets (OMB). I then review the type of regression analyses I will perform, the data I use for the different analyses, and finally offer projections of the influences that the independent variables will have on project health.

## FEDERAL EMPLOYEE VIEWPOINT SURVEY DATA

Federal Employee Viewpoint Survey Results (FEVS) from the federal Office of Personnel Management (OPM, 2015) evaluates each department's employee satisfaction levels. The employees who responded to the survey questions were from eighty-two agencies, thirty-seven departments and large agencies, and forty-five small, independent agencies (OPM, 2015). I chose seventeen departments for the analyses basing their inclusion on the size of the department and the ease of matching them department to department with OMB's project health data.

In 2015, 421,748 employees responded to seventy-one core questions/statements eliciting their perceptions on various organizational factors (see Appendix A, B and C). The survey questions ask employee's their viewpoints and perceptions on their department's health. These questions and statements include five areas in the FEVS including My Work Experience, My Work Unit, My Agency, My Work Experience with Leadership, and My Satisfaction. Each category asks multiple questions eliciting

employees' ratings on a Likert Scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5=Strongly Agree. See Table 3.1 below for the list of questions from the FEVS data set I use to create each independent variable score.

Table 3.1: *FEVS Questions by Category*

| | |
|---|---|
| **Environment** | I have enough information to do my job well. |
| | I feel encouraged to come up with new and better ways of doing things. |
| | I have sufficient resources (for example, people, materials, budget) to get my job done. |
| | The work I do is important. |
| | I can disclose a suspected violation of any law, rule or regulation without fear of reprisal. |
| | I recommend my organization as a good place to work. |
| | How satisfied are you with your opportunity to get a better job in your organization? |
| **Leadership** | I have trust and confidence in my supervisor. |
| | Overall, how good a job you feel is being done by your immediate supervisor? |
| | My organization's senior leaders maintain high standards of honesty and integrity. |
| | How satisfied are you with the policies and practices of your senior leaders? |
| | Overall, how good a job do you feel is being done by the manager directly above your immediate supervisor? |
| | I have a high level of respect for my organization's senior leaders. |
| **Culture** | The people I work with cooperate to get the job done. |
| | Employees in my work unit share job knowledge with each other. |
| | The workforce has the job-relevant skills necessary to accomplish organizational goals. |
| | Employees have a feeling of personal empowerment with respect to work processes. |
| | Creativity and innovation are rewarded. |
| | Policies and programs promote diversity in the workplace. |
| | My agency is successful at accomplishing its mission. |
| **Communication** | Discussions with my supervisor about my performance are worthwhile. |
| | My supervisor provides me with constructive suggestions to improve my performance. |
| | My supervisor listens to what I have to say. |
| | Managers communicate the goals and priorities of the organization. |
| | Managers promote communication among different work units |
| **Satisfaction** | How satisfied are you with your involvement in decisions that affect your work? |
| | How satisfied are you with the information you receive from management? |
| | Considering everything, how satisfied are you with your job? |
| | Considering everything, how satisfied are you with your pay? |
| | Considering everything, how satisfied are you with your organization? |

Averaging all five individual variables as seen in Table 3.2 below gives us a new measure for the health of the department, which is overall "Department Health" (DH). DH is a single value denoting overall perceptions of all employees.

Table 3.2: *Descriptive Statistics*; *Overall Department Health (FEVS Data)*

| **Independent Variables** | **# of Observations** | **Mean** | **SD** | **Min** | **Max** |
|---|---|---|---|---|---|
| Environment | 3,591 | 3.50 | .153 | 3.23 | 3.87 |
| Culture | 3,591 | 3.54 | .145 | 3.29 | 3.87 |
| Leadership | 3,591 | 3.51 | .166 | 3.23 | 3.85 |
| Satisfaction | 3,591 | 3.40 | .163 | 3.12 | 3.78 |
| Communication | 3,591 | 3.62 | .151 | 3.35 | 3.92 |
| **Department Health** | **3,591** | **3.51** | **.15** | **3.25** | **3.86** |

Each department's overall department health means are a derivative of the individual department health variables means, with the mean of all means denoting overall department health. Table 3.3 on page 29 show each department's DH scores. There are no intradepartmental standard deviations to report because each department's overall health score is the same single factor applicable to each project health status.

Table 3.3: *Department Health (Means for All Categories)*

| Department of | Envmt | Culture | Leader-ship | Satis | Comms | Health Score |
|---|---|---|---|---|---|---|
| Agriculture-AG | 3.50 | 3.55 | 3.46 | 3.41 | 3.61 | **3.51** |
| Commerce-CM | 3.64 | 3.68 | 3.65 | 3.52 | 3.73 | **3.64** |
| Defense-DD | 3.54 | 3.57 | 3.57 | 3.46 | 3.66 | **3.56** |
| Education-ED | 3.56 | 3.62 | 3.64 | 3.52 | 3.72 | **3.61** |
| Energy-DN | 3.49 | 3.54 | 3.48 | 3.42 | 3.57 | **3.50** |
| Health and Human Services-HE | 3.65 | 3.66 | 3.65 | 3.54 | 3.68 | **3.63** |
| Homeland Security-HS | 3.23 | 3.29 | 3.23 | 3.12 | 3.35 | **3.25** |
| Housing and Urban Develop-HU | 3.38 | 3.42 | 3.45 | 3.37 | 3.59 | **3.44** |
| Justice-DJ | 3.68 | 3.71 | 3.68 | 3.61 | 3.72 | **3.68** |
| Labor-DL | 3.53 | 3.68 | 3.60 | 3.50 | 3.69 | **3.60** |
| State-ST | 3.70 | 3.72 | 3.74 | 3.62 | 3.72 | **3.70** |
| Treasury-TR | 3.46 | 3.52 | 3.56 | 3.36 | 3.75 | **3.53** |
| Veterans Affairs-VA | 3.48 | 3.43 | 3.37 | 3.30 | 3.51 | **3.42** |
| General Services-GS | 3.64 | 3.67 | 3.65 | 3.57 | 3.81 | **3.67** |
| Nuclear Regulatory Commission-NU | 3.87 | 3.87 | 3.85 | 3.78 | 3.92 | **3.86** |
| Personnel MGMT-OM | 3.66 | 3.67 | 3.74 | 3.60 | 3.86 | **3.71** |
| Social Security Admin-SZ | 3.70 | 3.64 | 3.66 | 3.59 | 3.75 | **3.67** |

The last variable used to configure the dataset denotes whether the participant is management or staff (A or B). Those participants who are not “A” or “B,” are filtered out

of the equation, and the remaining participants' scores used. Filtering the data is necessary because those not assigned "A" or "B" are missing too many responses. Each question in the FEVS have multiple responses with "X" or no response. Those with "X" I translate to no response. This means that each of the variable categories may have only a few of the questions out of total for each variable that have no response. Since there are multiple questions that I use for each category, averages between the numbers of questions (e.g., scores for 3 questions out of a potential 5 questions) are what the final averages total. There is no other way to account for the "X" and "non-response" scores.

## OFFICE OF MANAGEMENT AND BUDGET'S IT PROJECT HEALTH DATA

Data from the Executive Office of the President's Office of Management and Budgets (OMB) IT Dashboard reflects the IT Project Health (PH) for each respective department's projects. The 2015 data reflects the performance of federal department IT implementation projects for the 2015/2016 fiscal year. OMB's data specifies each departments' project Schedule and Cost health as Green, Yellow or Red (standard industry markers). There are 3,591 projects between the seventeen departments used in the analyses. Each Department has many IT implementation projects happening at any given time, and each project is in various phases. This allows for a comparison of the independent variables, and overall department health, to each of the 3,591 projects' schedule and cost health. There are many data points in OMB's data, but for this research, I use only Schedule Color (schedule health) and Cost Color (cost health) as the dependent variables. Table 3.4 on the following page lists the descriptive statistics for the dummy dependent and independent variables I use for the analysis from OMB's data.

Table 3.4: *Descriptive Statistics (OMB Project Data)*

| **Project Health (Dependent Variables)** | **Observations** | **Mean** | **SD** | **Min** | **Max** |
|---|---|---|---|---|---|
| Cost Health | 3,591 | .7079 | .4548 | 0 | 1 |
| Schedule Health | 3,591 | .7597 | .4273 | 0 | 1 |
| **Project Status (Independent Variable)** | | | | | |
| Complete | 3,591 | .4996 | .5 | 0 | 1 |
| **System Development Life Cycle Methodology (Independent Variables)** | | | | | |
| Agile | 3,591 | .2086 | .4063 | 0 | 1 |
| Waterfall | 3,591 | .1509 | .358 | 0 | 1 |
| Iterative | 3,591 | .0549 | .2277 | 0 | 1 |
| Spiral | 3,591 | .0075 | .0864 | 0 | 1 |
| Mixed | 3,591 | .103 | .304 | 0 | 1 |
| Other Methodology | 3,591 | .0209 | .143 | 0 | 1 |
| None | 3,591 | .2587 | .438 | 0 | 1 |
| **Project Manager Experience (Independent Variables)** | | | | | |
| Senior-level Experience | 3,591 | .4255 | .4945 | 0 | 1 |
| Mid-level Experience | 3,591 | .1261 | .3321 | 0 | 1 |
| Entry-level Experience | 3,591 | .0334 | .1797 | 0 | 1 |
| Other Certifications / Experience | 3,591 | .3055 | .4607 | 0 | 1 |

Project Status (Completed or In-Progress), System Development Life Cycle Methodology (Project Management Methodology), and Project Manager Experience, serve as independent variables. Using all project management methodologies will give us insight into which methodology is better for government IT implementation projects. Additionally, project manager experience is an explanatory independent variable helping us figure out if leadership experience in project management also helps to explain PH. Project Status will tell us whether projects that are complete are healthy versus not being complete.

## STATISTICAL ANALYSES

Performing Logistic regression analyses to evaluate the explanatory value that the independent variables have toward PH is the proper model for this research. This is because the dependent variables are binary, dichotomous variables, and the department health variables are interval data. The alternate independent variables are also binary data. Binary data is either a 1 or a 0, meaning that the specific variable either exists or it does not. Because the measurement scales are different, performing a statistical regression analysis is not possible when using binary data. Logistic regression rectifies this by giving us odds ratios based on the probabilities of an event happening. Odds ratios measure the association between an event's exposure to an explanatory factor and the odds that the event will happen, or not. It tells us that for each one-unit increase in the average score for a particular-explanatory factor, the likelihood of the outcome happening increases, or decreases, in the case of significant relationships.

I will run four separate logistic regression analyses. In the first two analyses, I use the dependent variables including (1) Schedule and (2) Cost health (Green), and the independent variable of overall Department Health. For the second logistic regression analyses between the dependent variables of (3) Schedule and (4) Cost health I use all five independent variables. For all analyses, I use the independent variables of project status, project management methodology, and project manager experience.

PROJECTED EFFECTS ON PROJECT SCHEDULE AND COST HEALTH

Table 3.5 below offers my projections of the effects of the independent variables on project schedule and cost health. I note whether I believe they will have a negative or a positive effect. After a review of the table, I offer rationale for my projections.

Table 3.5: *Projected Effects of Independent Variables on the Dependent Variables*

| **Independent Variables** | **Mean** | **Projected Effect Based on:** | **Project Health** | |
|---|---|---|---|---|
| **Department Health Variables** | | | **Sched** | **Cost** |
| Environment | 3.50 | Healthy environment | + | + |
| Culture | 3.54 | Culture is enabling | + | + |
| Leadership | 3.51 | Leadership is positive | + | + |
| Satisfaction | 3.40 | Employee satisfaction is low | - | - |
| Communication | 3.62 | Communication is strong | + | + |
| **Health** | **3.51** | **Department is healthy** | + | + |
| **Methodology** | | | | |
| Agile | Not compatible with bureaucratic structure | | - | - |
| Waterfall | Compatible with bureaucratic structure | | + | + |
| Iterative | Not compatible with bureaucratic structure | | - | - |
| Spiral | Hybrid methodology; mid-line compatibility | | **N** | **N** |
| Mixed | Not defined | | - | - |
| Other | Not defined | | - | - |
| None | Incompatible with any structure, or environment | | - | - |
| **Manager Experience** | | | | |
| Senior-level | Well-seasoned | | + | + |
| Mid-level | Experienced | | + | + |
| Entry-level | Lacking experience | | - | - |
| Other | Not qualified for complex projects | | - | - |
| **Project Phase** | | | | |
| Complete | On-time and on-budget when completed | | + | + |

We see in the qualitative research that each of the individual department health factors may affect project health, but do not know if the effects are positive or negative. Given the exploratory nature of this research, and the lack of quantitative data to make a

comparison, I base my projections in Table 3.5 on academic principles, experience in project management, and findings in the extant research and literature. Additionally, I use an age-old grading approach for the individual department health variables. Employee ratings range from 1 through 5, with 5 being the highest achievable score. If a department achieves ratings of 5 across the board, this is comparable to an "A" in academic terms. Using this logic for the aggregate data, a 4 then equates to a "B", and 3 equates to a "C". Means for each category denotes a passing grade, or whether it falls behind. As seen in the table, the only the category falling below the proverbial "C" is employee satisfaction. The old-adage "Cs get degrees" comes to mind, so if "Cs get degrees," then Environment, Culture, Leadership and Communication, are a positive effect, while employee satisfaction is a negative effect.

Finally, my discussion in Chapter 2 about project management methodology and the independent variables from OMB's project health data speak to their individual effects. Agile is the anti-thesis of a bureaucratic environment while Waterfall fits within the constraints of a bureaucratic structure. For these two methodologies, Agile creates a negative effect, and Waterfall positive. The remaining methodologies are neutral because I simply do not know, or are negative because they are undefined or simply put, they use no method at all, which cannot be good for IT implementation projects. Manager experience levels are intuitive in that the more experience, the better the performance, so those with experience will have positive effects while those without will have negative effects on project schedule and cost health.

# CHAPTER 4: RESULTS OF THE REGRESSION ANALYSES

This section first speaks to the results of the logistic regression analyses. After reviewing the results using DH as the single department health variable, I then offer the results of the logistic regression analyses using all five department health variables. Since overall DH is a single independent score and a derivative of the five key department health variables, a separate regression analysis with it carrying the sole weight for a department's health is necessary and prudent. The following sections review the significant results of the four separate regression analyses. In Chapter 5, I offer further discussion of the results as a conclusion to the paper.

## OVERALL DEPARTMENT HEALTH, PROJECT SCHEDULE AND COST HEALTH

Using overall Department Health gives us greater insight into whether a department's health impacts implementation projects because it lacks multicollinearity issues. The logistic regression results as seen in Table 4.1 on page 36 show that overall DH and whether the project is Complete or not are significant factors positively explaining a project's schedule. This matches the general theory behind this research in that a department's health matters to implementation projects. The healthier the department, the healthier the implementation project. The findings suggest that with every one-unit increase in a Department's overall health score there is a 141 percent increase in the likelihood of a project's schedule being green. Likewise, a one-unit increase in Project Status increases the likelihood of Schedule Green by 63.4 percent.

Table 4.1: *Results of Logistic Regression, Department Health*

| Project Schedule Green | Odds Ratio | Odds Ratio – 1 (*100) | Robust SE | X | P < [z] |
|---|---|---|---|---|---|
| Department Health | 2.41 | 141% | .721 | 2.94 | *.003 |
| Complete | 1.634 | 63.4% | .139 | 5.76 | *.000 |
| Agile | 1.04 | 4% | .136 | 0.31 | .76 |
| Waterfall | .634 | -36.6% | .087 | -3.31 | *.001 |
| Iterative | .758 | -24.2% | .146 | -1.44 | .149 |
| Spiral | .444 | -55.6% | .183 | -1.97 | *.049 |
| Mixed | 1.1 | 10% | .177 | 0.60 | .551 |
| Other | 1.35 | 35% | .432 | 0.94 | .349 |
| None | .717 | -28.3% | .092 | -2.6 | *.009 |
| Senior | .868 | -13.2% | .124 | -0.99 | .320 |
| Mid | .8 | -20% | .138 | -1.29 | .196 |
| Entry | .742 | -25.8% | .192 | -1.16 | .248 |
| Other Certification | .676 | -32.4% | .099 | -2.68 | *.007 |
| Constant | .167 | -83.3% | .175 | -1.71 | *.087 |
| # Observations | 3,591 | | | | |
| Wald Chi (13) | 69.57 | | | | |
| Prob > chi2 | 0.000 | | | | |
| Pseudo R2 | 0.0178 | | | | |
| **Project Cost Green** | | | | | |
| Department Health | .81 | -19% | .227 | -0.75 | 0.452 |
| Complete | .511 | -48.9% | .041 | -8.44 | *0.000 |
| Agile | .532 | -46.8% | .068 | -4.96 | *0.000 |
| Waterfall | .393 | -60.7% | .053 | -6.92 | *0.000 |
| Iterative | .509 | -49.1% | .097 | -3.54 | *0.000 |
| Spiral | .416 | -58.4% | .18 | -2.03 | *0.042 |
| Mixed | .721 | -27.9% | .114 | -2.06 | *0.039 |
| Other | .851 | -14.9% | .246 | -0.56 | 0.577 |
| None | .531 | -46.9% | .066 | -5.07 | *0.000 |
| Senior | .852 | -14.8% | .109 | -1.25 | 0.21 |
| Mid | 1.11 | 11% | .179 | 0.62 | 0.533 |
| Entry | .586 | -41.4% | .132 | -2.37 | *0.018 |
| Other Certification | 1.09 | 9% | .146 | 0.62 | 0.536 |
| Constant | 13.11 | 1211% | 12.9 | 2.61 | *0.009 |
| # Observations | 3591 | | | | |
| Wald chi2 | 159.91 | | | | |
| Prob > chi2 | 0.000 | | | | |
| Pseudo R2 | 0.0370 | | | | |

**Statistical Significance at P < .10*

The findings also suggest that the type of project management methodology matters. The results show that Waterfall, Iterative or using no method at all (None) negatively influence a project's schedule health. In the instance of Waterfall, there is a

36.6 percent decrease in the likelihood of a project's schedule being green if using this methodology versus not using it. This is the opposite of my prediction that, since Waterfall appears to fit better into a bureaucratic structure, it will positively explain schedule and cost health. With the Iterative approach, a one-unit increase in its use decreases the likelihood of a project's schedule green by 24.3 percent. Spiral, the mix between Agile and Waterfall, shows that a one-unit increase in its use decreases the likelihood of schedule green by over 55 percent.

Project manager experience does not match my predictions, which state that Senior and Mid-level experience positively explain schedule health. These two levels are insignificant. However, entry-level project managers or managers with other certifications match my predictions in that they both negatively influence project health. The results show that for every one-unit increase in the use of Entry-level managers or those with other certifications, the likelihood of a project's schedule being green decreases by 25.8 percent and 32.4 percent, respectively.

When it comes to project cost health, it appears that DH is not a significant factor. However, eight of the thirteen independent variables negatively explain project costs. The most interesting findings are the influences of the methodologies. Agile (-46.8%), Waterfall (-60.7%), Iterative (-49.1%), Spiral (-54.8%), Mixed (-27.9%), Other (-14.9%) and None (-46.9%) all negatively explain a project's cost health. It appears that methodology does not matter when it comes to project costs, which may help to explain why such economic waste of taxpayer money is so prevalent. The only other category negatively explaining cost health is whether the project manager is Entry-level, matching

my projections. For every one-unit increase in the use of Entry-level managers, the likelihood of cost health green decreases by 41.4 percent.

PAIRWISE CORRELATIONS AND MULTICOLLINEARITY

A pairwise correlation showing relationships between the independent department health variables show that the variables have strong relationships with each other and therefore, multicollinearity is an issue with the data. Correlational analyses show the extent to which variables correlate to each other. Variables can positively or negatively correlate on a range between 0 and 1. Zero means no correlation exists, and 1 denotes pure correlation. This means that the variables are measuring the same thing, in statistical terms. Multicollinearity exists when correlation coefficients are greater than 0.8, which can bias significant findings by inflating variance levels. Table 4.2 below shows this is the case between the individual variables that make-up department health. As you can see, each factor highly correlates with its pair.

Table 4.2: *Pairwise Correlation Results*

| **Variable** | Environment | Culture | Leadership | Employee Satis~ | Comm~ |
|---|---|---|---|---|---|
| Environment | 1.00 | | | | |
| Culture | 0.9585 | 1.00 | | | |
| Leadership | 0.9361 | 0.9753 | 1.00 | | |
| Satisfaction | 0.9724 | 0.9847 | 0.9743 | 1.00 | |
| Communication | 0.8648 | 0.9088 | 0.9583 | 0.9032 | 1.00 |

There are certain constraints which limit fixing the multicollinearity issue. One of the major issues is in using the FEVS data, which I am not able to alter or easily configure given that the FEVS survey design is not one that I have control of. The other issues are time and resource constraints for this project. However, when using the independent variable of overall Department Health, multicollinearity is no longer an

issue. This is because the final score is a single score which is inclusive of all the independent department health variables. Because this research is exploratory, I offer the results of the logistic regression analyses using the five department health variables for purposes of insight into their potential influences on project health.

## ALL DEPARTMENT HEALTH VARIABLES, SCHEDULE AND COST HEALTH

For the following two analyses, I use the independent variables of Environment, Culture, Leadership, Communication and Employee Satisfaction as department health measures. Given the multicollinearity issues, for the purposes of this section, I offer only the significant findings for informational purposes and greater insight into potential effects. Table 4.3 on the following page shows the results of the logistic regression analyses for each department health variable and their significance on a project's health for both Schedule Green and Cost Green.

As seen in Table 4.3 on the following page, the first logistic regression analysis shows that Leadership, and Complete are the only factors positively explaining a project's schedule health. The department health variables of Culture and Communication negatively explain a project's green schedule. Project management methodologies including Waterfall, Spiral or using no methodology at all (None), along with project managers with other certifications, are also potential significant factors negatively explaining a project's green health.

Table 4.3: *Department Health Variables on Project Schedule and Cost Health*

| **Schedule Green** | **Odds Ratio** | **SE** | **z** | **P > z** |
|---|---|---|---|---|
| Culture | .0012 | .735 | -3.75 | *0.000 |
| Leadership | 44852.08 | 87617.51 | 5.48 | *0.000 |
| Communication | .026 | .028 | -3.41 | *0.001 |
| Complete | 1.68 | .147 | 5.90 | *0.000 |
| Waterfall | .627 | .087 | -3.38 | *0.001 |
| Spiral | .427 | .18 | -2.02 | *0.001 |
| None | .76 | .10 | -2.13 | *0.033 |
| Other Cert. | .723 | .106 | -2.21 | *0.027 |
| # Observations | 3,591 | | | |
| Wald chi2 | 97.41 | | | |
| Prob > chi2 | 0.0000 | | | |
| Pseudo R2 | 0.0272 | | | |
| **Cost Green** | **Odds Ratio** | | | |
| Environment | 1.35e-07 | 1.67e-07 | -12.85 | *0.000 |
| Leadership | 183.31 | 381.22 | 2.51 | *0.012 |
| Emp. Satis. | 91958.32 | 184848.6 | 5.69 | *0.000 |
| Communication | .005 | .005 | -4.92 | *0.000 |
| Complete | .497 | .042 | -8.19 | *0.000 |
| Agile | .774 | .102 | -1.94 | *0.052 |
| Waterfall | .445 | .06 | -6.04 | *0.000 |
| Iterative | .623 | .121 | -2.41 | *0.016 |
| Spiral | .377 | .161 | -2.29 | *0.022 |
| None | .719 | .094 | -2.53 | *0.011 |
| Mid-level | 1.35 | .232 | 1.76 | *0.078 |
| Entry-level | .631 | .153 | -1.90 | *0.058 |
| # Observations | 3,591 | | | |
| Wald chi2 | 344.66 | | | |
| Prob > chi2 | 0.0000 | | | |
| Pseudo R2 | 0.0919 | | | |

**Statistically Significant at P < .10*

The results also show that Leadership, Employee Satisfaction, and Mid-level project manager experience are potential significant factors positively explaining a project's green cost health. Environment and Communication, whether the project is Complete or not, and Agile, Waterfall, Iterative, Spiral or using no methodology, along

with Mid-level project manager experience are all potential significant factors negatively explaining a project's green cost health.

A common thread between both schedule health and cost health is both leadership and communication. Leadership helps to explain project health across the board, which make sense. The better the leadership, the better the outcomes. However, communication is very interesting in that it negatively influences both schedule and cost health. The odd finding here is that the higher the employee rating on communication, the better the communication is from management. This also means, according to the results, that the better the communication is, the lower the likelihood of a project's schedule being green. If not for the multicollinearity issue, this result is almost unbelievable, and calls for further research. In the following Chapter I offer further review of the findings, then conclude the paper with thoughts on future research.

# CHAPTER 5: DISCUSSION AND CONCLUSION

My predictions in Table 3.4 (Projected Effects of Independent Variables on the Dependent Variables) show that overall department health will positively and significantly explain project schedule and cost health. According to the findings, department health does help to positively explain schedule health, matching my predictions. This makes sense in that if a department is healthy, outcomes are better. This does not hold true when it comes to project costs, however, since department health is insignificant in explaining cost containment. Cost health suffers from many factors, including if the project is not complete, inferring that if the project is not doing well, its costs reflect its status.

The predictions regarding methodology also state that Agile and Iterative processes negatively explain project health, as do Mixed, Other Methodologies, or not using any methodology at all. The findings suggest that Agile is not a significant factor when it comes to schedule health, and that Agile negatively influences cost health. This partially matches my theory that Agile is the antithesis of a bureaucratic environment, but only when it comes to cost containment. The fact that Agile is an insignificant influence on a project's green schedule health, makes the use of Agile purely preferential, not a choice that means that Agile is better for governmental IT implementation projects. Another prediction also says that Waterfall will have a positive influence. However, it appears that Waterfall negatively influences a project's green schedule and cost health. In fact, in all the analyses, Waterfall is not conducive to governmental IT projects, which nullifies my theory. As well, using a mixture of methodologies such as what Spiral does,

negatively influences a project's green schedule and cost health. Since Spiral is a mixture of Agile/Iterative processes and siloed processes such as Waterfall, this infers that any methodology using any semblance of Waterfall will negatively influence IT project outcomes. Lastly, using no method at all falls into the same category as Waterfall and Spiral, in that using no method negatively influences both project schedule and cost. This matches my predictions, and makes sense, since projects as technical and complex as implementation projects need management and control mechanisms such as what is found in proven methodologies. When it comes to project manager experience, the predictions show that the more experience, the better the project schedule and cost health. The data suggests that this is not the case, since both Senior- and- Mid-level experience are insignificant. However, having alternate certifications negatively influences green project schedule, matching the predictions.

All in all, the results are a mix of hits and misses when it comes to project schedule, but the findings are very clear when it comes to project cost. The data suggests that cost containment in a bureaucratic environment is a problem, just as the literature review states. Department health is not significant in this area, but every type of methodology negatively explains project costs. Since all methods robustly show that cost is a problem, this may denote that it is not so much the methodology that is causal to poor cost health. This means that other factors consistently contribute to IT implementation failure issues. Given the complexities within bureaucratic environments, there are a myriad of explanations speaking to the economic waste issue, as shown in the body of this paper. Unfortunately, I do not have the data available for this research paper that

explains the losses entirely. I suggest more in-depth studies, but given the enormous ongoing wastes from IT implementation failures, one can infer that economic waste in the form of cost may not be containable or curable.

## CONCLUSION

In this research, I have spoken to non-technical factors that may affect governmental IT implementation project health. Extant literature and research offers insight into factors affecting IT project health such as complex operating environments found in bureaucracies, organizational structure, and leadership. Research also points to communication and culture as contributing to IT implementation failures, while much of the literature speaks to technical factors such as project management methodology and system development technicalities. This research considers only those non-technical factors and their influence on IT implementation projects. Federal Employee Viewpoint Surveys and federal IT project health data offered an opportunity to perform logistic regression analyses to test the influence that non-technical factors and overall department health have on governmental IT project health.

Logistic regression analyses show that overall department health matters to IT implementation projects' green schedule health, but that overall department health is also insignificant when it comes to cost health. Other factors such as leadership, employee satisfaction, and mid-level project manager experience, may also play significant roles in cost containment in implementation projects. Communication, culture and environment also negatively impact project schedule and cost health. Methodologies such as Agile, Waterfall, Iterative, and Spiral, negatively explain project cost health. Even with

significant findings, however, the explanatory values for the individual department health variables are questionable. Due to multicollinearity issues between the independent department health variables, this limits the findings in this research. However, overall department health scores do not suffer from multicollinearity issues, and I consider the findings valid which show that overall department health positively influences IT implementation project schedule health. Table 5.1 below shows all factors with significant findings for departmental consideration when planning their IT implementation projects.

Table 5.1: *Influences on Project Health*

| **Schedule Health Green** | | | **Cost Health Green** | | |
|---|---|---|---|---|---|
| **Independent Variable** | **Positive** | **Negative** | **Independent Variable** | **Positive** | **Negative** |
| Dept. Health | **X** | | Leadership | **X** | |
| Leadership | **X** | | Satisfaction | **X** | |
| Communication | | **X** | Mid-Level Exp. | **X** | |
| Culture | | **X** | Communication | | **X** |
| Waterfall | | **X** | Environment | | **X** |
| Spiral | | **X** | Agile | | **X** |
| No Methodology | | **X** | Waterfall | | **X** |
| Other Certs. | | **X** | Iterative | | **X** |
| | | | Spiral | | **X** |
| | | | No Methodology | | **X** |
| | | | Entry-Level Exp. | | **X** |
| | | | Other Certs. | | **X** |

Future studies should use a more robust model to test the impact of all individual department health factors on IT project health. Resolving the multicollinearity issue to test the influence of each factor can offer valuable data for governmental management in pre-planning their IT implementation projects. Results from the individual key factors of Environment, Leadership, Culture, Communication and Employee Satisfaction will help to understand how each factor affects project health, which can aid departments in

potentially tackling environmental deficiencies that may affect their projects prior to engaging in implementation efforts. Finally, this research offers a quantitative model for future studies. With greater resources and more time, research into the mitigating effects of bureaucratic environments on IT implementation projects will offer valuable information for the public service sector and private sector practitioners when planning and developing projects, and potentially help to mitigate some of the losses from IT project failures.

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