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A Framework for Adoption of Challenges and Prizes in US Federal Agencies: A Study of Early Adopters

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Abstract

In recent years we have witnessed a shift in the innovation landscape of organizations from closed to more open models embracing solutions from the outside. Widespread use of the internet and web 2.0 technologies have made it easier for organizations to connect with their clients, service providers, and the public at large for more collaborative problem solving and innovation. Introduction of the Open Government initiative accompanied by the *America Competes Reauthorization Act* signalled an unprecedented commitment by the US Federal Government to stimulating more innovation and creativity in problem solving. The policy and legislation empowered agencies to open up their problem solving space beyond their regular pool of contractors in finding solutions to the nation's most complex problems.

This is an exploratory study of the adoption of challenges as an organizational innovation in public sector organizations. The main objective is to understand and explain how, and under what conditions challenges are being used by federal agencies and departments as a tool to promote innovation. The organizational innovation literature provides the main theoretical foundation for this study, but does not directly address contextual aspects regarding the type of innovation and the type of organization. The guiding framework uses concepts drawn from three literature streams: organizational innovation, open innovation, and public sector innovation.

Research was conducted using a qualitative case study of challenge.gov. Data was collected from multiple adopting agencies using two primary sources: interviews with challenge managers and administrators and, archival data from the challenge.gov web platform. Related documentation was used to supplement and corroborate the main data. Analysis of the platform archival data revealed four types of challenges falling along a continuum of increasing innovation. The sequence of events, activities and conditions leading to adoption and implementation were represented as a challenge adoption model. Variations among components of the model resulted in three distinct agency groupings represented as a typology of enactments characterized as inertia, application, and change. Thus challenge adoption among agencies with varying missions, operations and conditions leads to varying enactment types and different levels of change.

A FRAMEWORK FOR ADOPTION OF CHALLENGES AND PRIZES IN US FEDERAL AGENCIES:

A Study of Early Adopters

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1 Introduction

1.1 Background

In recent years we have witnessed a shift in the innovation landscape of organizations from closed, to more open models which embrace solutions from the outside. Widespread use of the internet and web 2.0 technologies have made it easier for organizations to connect with their clients, service providers, and the public at large, for more collaborative problem solving and innovation. This open approach to innovation is operationalized through a number of emergent practices which include open innovation, crowdsourcing, and prize contests.

Though originating as a private sector practice, this open approach to problem solving and innovation has recently spread to public sector organizations. For example the US federal government has moved from small scale experimentation with prize contests (referred to as *challenges*) in a handful of agencies, to a government-wide policy pronouncement. Challenges are viewed as a desirable alternative to the commonly used grants and contracts, as they open up the problem solving space to a wider audience with more diverse capabilities. The US Open Government initiative introduced in 2009, and the *America Competes Reauthorization Act of 2010* (U.S. Congress, 2011), provided legislation and guidelines to institutionalize the use of challenges in all federal agencies. The General Service Administration (GSA) was tasked with providing the technology infrastructure (challenge.gov web platform) and institutional support to agencies.

1.2 Problem Statement

Introduction of this government-wide policy on challenges signalled an unprecedented commitment by the US federal government to stimulating new types of innovation and creativity in problem solving. The policy empowered agencies to open up their problem solving space beyond their regular pool of contractors, and to engage members of the public in finding solutions to the nation's most complex problems. Requirements for traditional grant and research proposals are normally very specific and may limit creativity in both the solicitation and submissions. With challenges it is easy to specify the desired result without identifying the path to achieving it, thus enabling the use of novel and nontraditional approach to solutions. The wide reach of challenges also makes it possible for a problem from one domain to be solved by someone from a different domain. Therefore talented people who would not normally qualify for grants and contracts would encounter fewer barriers to participation.

According to (Rogers, 2003) *an authority innovation-decision* (such as the open government initiative) should trigger compliance by all agencies, though in reality some may circumvent the requisite action. Regarding this particular decision made by the White House Office of Science and Technology Policy (OSTP), there has not been full compliance by all agencies. Out of the hundreds of executive departments and independent agencies (as listed on usa.gov), preliminary analysis of listings on the challenge.gov platform revealed that challenges had not been implemented by the majority of agencies as expected.

After the first year of operation only thirty six (36) departments and agencies had implemented challenges, with an additional eleven (11) coming on board by the second year. Further, there were noted disparities in the frequency and manner in which challenges were being used across agencies. For example, five (5) agencies were responsible for close to half

(41%) of all challenges posted. These were NASA with 17, Environmental Protection Agency with 12, Health and Human Services 11, Department of Defense 10, and Air Force 10. On the other hand the majority of agencies (70%) had each posted 3 or less challenges. Thus the rate of implementation observed in the first two years represents a divergence from the widespread implementation mandated by the Open Government directive and issued by the Office of Management and Budget (OMB) in December 2009.

The America Competes Reauthorization Act of 2010 gave broad authority to agencies, allowing them to run prize competitions to help spur innovation, solve tough problems, and advance their core missions (White House, 2012). Preliminary empirical analysis of listings on the challenge.gov platform revealed that challenges were not always being employed for the intended purpose. Some agencies consistently used challenges to solve complex mission-related problems requiring highly specialized skills such as designing combat vehicles, energy efficient light bulbs, and energy efficient homes. On the other hand some agencies focused on creativity contests (e.g video, poster, photo, and logo contests) pertaining mainly to public service announcements and producing informational material not requiring highly specialized skills. The concern was that some uses did not promote innovation as intended by the Open Government initiative and articulated in the America Competes Reauthorization Act. It could be argued that some challenge implementations did not innovate, but rather reinforced the status quo. One visible sign of disparity in the level of complexity and importance to the agency was revealed in the amount of prize money offered and awarded. Some agencies paid out large sums of money such as the Department of Energy which offered $27 million for 7 challenges, and the Department of the Treasury which offered over half a billion dollars for 1 challenge. Others paid out moderate amounts such as the Navy which offered $2 million for 2 challenges, the

Department of Defense hosted 10 challenges totaling $251,000, and the Corporation for National and Community Service offered $500,000 for 2 challenges. At the lower end of the scale many executed smaller amounts under $5000, and the US EPA executed 12 challenges with no monetary compensation offered.

A further intention of the America Competes Act of 2010 was the institutionalization of challenges as an added option to more common methods such as grants and contracts. Efforts to facilitate an enabling environment for more widespread and long term use among agencies can be enhanced by understanding how challenges are currently being used and by whom. The development and deployment of policies to support innovation should be informed by an understanding of critical aspects of the innovation process, best captured using efficient data collection and analysis of innovation activities (OECD and Eurostat, 2005). Since challenges represent a relatively new practice, any further development or refinement of policies, legislation and guidelines should be informed by empirical data collected from adopting agencies. This study provides an opportunity to get a first hand understanding of the motivations, organizational practices and conditions which favor challenge adoption.

While questions regarding disparities in adoption rates and patterns have continually been investigated for various types of organizational innovations, research reviews suggest that they have not been answered definitely, and further research is recommended (Damanpour & Schneider, 2006; Tidd, 2001; Wolfe, 1994). Further, these questions need to be answered in the context of this specific type of organizational innovation (challenges) which is still an emerging practice.

1.3 Objective and Research Questions

The main objective of this study is to understand and explain how, and under what conditions challenges are being used by US federal agencies and departments as a tool to promote innovation. In response to the issues identified in the problem statement, the specific research questions are:

1. How are federal agencies using challenges, and how do these challenges differ in terms of the level of innovation involved?
2. How do agencies adopt and implement challenges?
3. How do the various adoption and implementation factors influence the type of enactment of the adopting agency?

1.4 Methodological Approach

This was an exploratory study aimed at understanding adoption of an emerging phenomenon in the US Federal Government. Research was conducted using a single case study of challenge.gov, using data from multiple agencies which were early adopters of the platform. Prominent concepts from the various streams of literature were used as sensitizing concepts to guide initial data collection and analysis. Data was collected from two primary sources- archival data from the challenge.gov web platform, and interviews with challenge managers and administrators. Related documentation including policy documents, reports, and websites were used to supplement and corroborate the main data. Data analysis incorporated a combination of deductive and inductive approach.

1.5 Theoretical Approach

Challenges were introduced as a mechanism to help agencies solve complex problems by reaching out to a wider audience. In a broad sense, challenges can be viewed as an organizational innovation because they were introduced for their potential to contribute to the performance or effectiveness of the organization (Damanpour, 1991; West & Anderson, 1996). The study was organized around the three research questions.

Research question 1 *"How are federal agencies using challenges, and how do these challenges differ in terms of the level of innovation involved"* explored the different ways in which challenges were being used by adopting agencies. Response to this question involved qualitative inductive analysis of archival listings on the challenge.gov web platform. The objective of the analysis was to uncover any discernible patterns in the types of challenges implemented, the topics they addressed, and the level of innovation invoked. A typology of challenges emerged following a descriptive and analytical classification process.

Research question 2 *"How do agencies adopt and implement challenges"* investigated the process by which agencies adopt and implement challenges. This question drew on multiple research streams related to the adoption process, organizational innovativeness, and the distinctiveness of public sector agencies. Research on the adoption process focuses on the sequence of events related to adoption (Rogers, 2003) and identifies three major stages: i) pre-adoption or *initiation ii)* the adoption decision, and iii) post-adoption or *implementation* (Damanpour & Schneider, 2006; Rogers, 2003; Zaltman, Duncan, & Holbek, 1973, Zmud, 1982;). While there is general consensus on the three main stages there is no consensus on the activities and events which make up each of these stages. Therefore several variations have been suggested such as: Hage & Aiken, 1970; Klein & Sorra, 1996; Van de Ven, Angle, & Poole,

2000; Zaltman et al., 1973. Also influencing the adoption process, *organizational innovativeness* research examines the various determinants which can enhance or hinder an organization's innovation efforts (Damanpour, 1991). This research stream is broad and fragmented and lacks consensus on which factors are the most influential (Crossan & Apaydin, 2010; Read, 2000; Wolfe, 1994). This study departs from the norm of separating process and innovativeness research, and combines them in one model to form a more holistic picture of the challenge adoption process.

While the organizational innovation literature provides the main theoretical foundation for this study, it did not offer a specific theory or model which directly addressed adoption of challenges in government agencies. Thus it became necessary to expand the literature search to address the contextual aspects of the type of innovation and the type of organization. Many of the prominent models and concepts have been derived around research on technological innovations (Damanpour & Aravind, 2012; Rogers, 2003; Tornatzky, Fleischer, & Chakrabarti, 1990). Challenges on the other hand represent a mechanism to facilitate problem solving and innovation. Though administered via a technology platform, challenges cannot strictly be classified as a technological innovation as defined in the organization innovation literature.

Adoption took place in public sector agencies triggered by a government wide mandate, prompting the review of two additional literature streams pertaining to open innovation and public sector organizations. Open innovation covers new mechanisms and approach to problem solving and includes derivatives such as crowdsourcing, challenges and prize contests. Various studies highlight factors which influence the adoption process for open innovation mechanisms, the more prominent of which are: organization commitment and not-invented-here syndrome (Chesbrough & Crowther, 2006); and the use of intermediaries, and the types of problems

addressed (Brabham, 2008; Brabham, 2009). The public sector innovation literature is introduced mainly to highlight the different circumstances and conditions that may influence innovation in public sector organizations. The primary contribution from this literature stream is organizational bureaucracy and red tape, which if present can hinder the adoption process (Bozeman & Feeney, 2011; Vigoda-Gadot, Shoham, Schwabsky, & Ruvio, 2005). The more prominent factors of the various streams of literature are then used to guide data collection and analysis.

Question 3 *"How do the various adoption and implementation factors influence the type of enactment of the adopting agency"* investigates how variations in components of the adoption process influence the type of innovation enactment. It builds on the model derived from question 2 as well as Orlikowski's (2000) types of enactment to build a typology of adoption displayed by different groups of agencies.

1.6 Remainder of Document

This chapter gives an introductory look at the use of challenges in US Federal government agencies. It outlines the background and motivation for the study, specific research questions, and the theoretical and methodological approach.

Chapter 2 reviews the extant literature relevant to this study. It starts with organizational innovation literature followed by contextual literature on newer forms of open innovation, and touches on public sector organizations. The chapter concludes by highlighting sensitizing concepts used to guide the study. Chapter 3 traces the background and history of the Open Government policy and legislation. It also outlines the use of challenges and the challenge.gov web platform. Chapter 4 outlines the research philosophy and research design including data collection and analysis strategies. Chapter 5 presents results of the analysis organized according

to the three research questions. Results are discussed in chapter 6 and connections are made with the research literature. Chapter 7 is the concluding chapter and it contains a summary of contributions, recommendations, limitations, and directions for future study.

2 Literature Review

This is an exploratory study of the adoption of challenges as a problem solving mechanism in public sector organizations. Challenges fit within the broad definition of organization innovations, and relevant portions of the extensive and well documented organization innovation literature were reviewed. This literature provided theoretical direction for the study by giving insight into stages of the adoption process and various determinants of organization innovations. However it did not offer one specific theory or model which could be used to address adoption of this problem-solving innovation instituted in response to a government wide mandate.

Challenges fall under the open innovation paradigm where organizations use solutions from outside the organization to address internal problems. This approach to problem solving started out as a private sector practice and was later instituted as a policy instrument of the US federal government. In light of this, the contextual literature on open innovation is introduced, followed by specific considerations for public sector organizations. These literature streams all contributed to the early conceptual development of the study.

The chapter starts with the definitions and dimensions of organizational innovation, followed by the broad and fragmented literature on innovation processes and determinants. This is followed by the literature on open forms of innovation, followed by specific considerations for public sector organizations.

2.1 Innovation Research

Over the past few decades innovation research has become increasingly fragmented, as researchers with varied academic backgrounds employ a wide range of theoretical lenses and methodologies (Crossan & Apaydin, 2010; Damanpour, 1991; Gopalakrishnan & Damanpour, 1997). All these differences have led to complexity in the conceptualization and measurement of the phenomenon (Damanpour & Aravind, 2012). Given the fundamental differences in the various types of innovation, no single universal innovation theory has emerged (Read, 2000; Crossan and Apaydin, 2010) and it is inappropriate to assume that a universal theory will fit across all types (Dewar & Dutton, 1986; Downs & Mohr, 1976; Wolfe, 1994) . As a result, researchers have found it more productive to focus on specific aspects of innovation such as processes, dimensions, determinants (Damanpour & Aravind, 2012). This section presents definitions, dimensions and processes of organizational innovation.

2.1.1 Definitions

Common definitions for *innovation* describe it as an idea, practice, or object which is perceived to be new by a particular unit (Dewar & Dutton, 1986; Rogers, 2003; Zaltman et al., 1973). The innovating unit can be an individual, team, organization (or organizational unit), industry, or economy (Damanpour and Avarind, 2012). Even if the idea, practice or object may already be in existence, it is considered an innovation if it is perceived as new by that particular unit (Gopalakrishnan & Damanpour, 1997).

Innovation can be contrasted with the related term *invention*, which refers to the first time the idea, process or product is discovered (Rogers, 2003). While an invention may not necessarily have any practical application, an innovation is expected to be useful (Read, 2000). An invention is therefore considered an innovation only after it becomes commercially available

(Rogers, 2003). Invention and innovation of a product or process can occur in quick succession or with a lengthy time lag (Rogers, 2003).

An *organizational innovation* can be defined as any new product, process, system (Daft, 1978; Damanpour & Evan, 1984), structure, plan or program (Damanpour, 1991) introduced into an organization. Organizational innovations are commonly introduced for their potential to contribute to the performance or effectiveness of the organization (Damanpour, 1991; West & Anderson, 1996), and may represent tactical or preemptive moves in response to changing internal and external environmental conditions (Damanpour, 1991).

Therefore challenges fit into the definition of organization innovation, introduced for their potential to contribute to the problem solving capabilities of the organization.

2.1.2 Dimensions of organizational innovation

The literature makes distinctions between specific dimensions (or types) of organizational innovation. These dimensions are usually represented as dichotomies such as: technological vs administrative/managerial, product versus process; radical versus incremental (Dewar & Dutton, 1986; Gopalakrishnan & Damanpour, 1997; Peled, 2001; Read, 2000). The first major dichotomy distinguishes administrative from technological innovations. The other major dichotomies fall under the banner of technological innovations: product versus process and radical versus incremental. These are introduced below.

Administrative innovations are related to the social structure of the organization and cover organization policies such as recruitment, task structure, resource allocation and rewards (Daft, 1978). Thus administrative innovations focus on managerial aspects and have an *indirect* relationship with the basic work activity of the organization (Crossan & Apaydin, 2010; Gopalakrishnan & Damanpour, 1997). Other descriptions of non-technical forms of innovation

refer to it as management innovation because they reflect changes in the way the work of management is carried out. This includes a departure from traditional processes, practices and techniques (Volberda, Van Den Bosch, & Heij, 2013) and contribute to improving organization performance (Mol & Birkinshaw, 2009). Technological innovations on the other hand include products, processes and technologies which contribute *directly* to the basic work activity of the organization (Gopalakrishnan and Damanpour, 1997; Crossan and Apaydin, 2010). They include technologies such as knowledge-derived tools, artifacts, and devices by which people extend and interact with their environment (Tornatzky, Fleischer, & Chakrabarti, 1990, p11). Technological innovations play an important role in organizational change by helping organizations change what they do and how they do it (Tornansky et al, 1990).

Technological innovations can be classified further based on whether they are a terminal product or part of a process to achieve some further outcome. Product innovations are outputs of the organization and are an end product for their creators and users. Process innovations are used to help the organization achieve a further outcome such as improved production or an enhanced product (Read, 2000; Tornansky and Fleischer,1990). The radical vs in**c**remental dimension represents the level of new knowledge embedded in a technological process innovation (Dewar and Dutton, 1986; Read, 2000). It is also an indication of the extent to which the internal activities and outputs of the organization are changed (Damanpour & Aravind, 2012). Incremental innovations result in minor improvements while radical innovations involve fundamental or revolutionary changes in technology (Dewar and Dutton, 1986; Read, 2000). The two dimensions actually represent a theoretical continuum, but are frequently represented as a dichotomy due to difficulty in interpretation and measurement of middle values (Dewar & Dutton, 1986; Hage, 1980).

While challenges may not be an exact match with any of the innovation dimensions described above, their characteristics most closely match an administrative innovation. Challenges are primarily a problem-solving mechanism employed to solve a range of problems which may or may not be directly related to the basic work activity of the organization. Thus similar to administrative innovations, challenges can be viewed as a means to achieving the basic work activity, thus the indirect relationship. In line with the description of administrative innovations above, challenges represent a departure from the traditional practices and techniques of problem solving, and contribute to improving organizational performance. By contrast, technological innovations were identified earlier as the products, processes and technologies which contribute *directly* to the basic work activity of the organization (Gopalakrishnan and Damanpour, 1997; Crossan and Apaydin, 2010).

2.1.3 Innovation Processes: Generation, Adoption, Diffusion

This section examines the processes through which innovations enter the organization.

Organizational innovations can be developed internally or acquired from an external source (Damanpour and Avarind, 2012; Damanpour and Evan, 1984; Lippert & Govindarajulu, 2006). The process of internal development is referred to as *generation* and involves activities related to the creation and development of new ideas. These activities include recognizing the opportunity, research, design, commercial development, marketing, and distribution (Damanpour and Avarind, 2012; Tornatzky et al., 1990).

The process by which an innovation is introduced into the organization (after it is generated) is referred to as *adoption* (Damanpour & Schneider, 2006; Zaltman et al., 1973). This process starts with knowledge of the innovation and forming an attitude towards it, to a decision

to adopt or reject, and to implementation (Rogers, 2003). Adoption may be directed by a deliberate choice by management or may be imposed by external conditions (Damanpour and Schneider, 2006). The innovation can be adopted by the generating organization, or made available on the market for purchase and adoption by other organizations (Damanpour & Aravind, 2012; Klein & Sorra, 1996). Adoption results in implementation of a new product, service, technology or practice (Daft, 1978; Klein & Sorra, 1996) which address specific needs or problems within the organization (Damanpour & Wischnevsky, 2006). Generation on the other hand is a creative process which does not necessarily address a specific problem.

Diffusion is another related term which is widely used and researched. *Diffusion* is defined by Rogers (2003) as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (p5). Thus diffusion can only spread through the organization after adoption has taken place (Crossan & Apaydin, 2010). While there is a vast body of literature examining the diffusion of innovations by individuals acting on their own and within organizations, this is outside the scope of this study. The main focus of this study is on organizational adoption of challenges.

2.1.4 Adoption of Organizational Innovations

Research on the adoption of organizational innovations is wide-ranging and spans many fields. Two major streams of this literature cover separate aspects of the adoption process-process theory and variance research (Wolfe, 1994; Hameed, Counsell, & Swift, 2012).

Process Theory focuses on the process by which an innovation is introduced and eventually used within the organization. It views the innovation process as a series of sequential steps and investigations try to identify the various stages and their sequence (Rogers, 2003).

Wolfe (1994) identifies two generations of process theory: i) stage model research views adoption as a series of stages which fall in a particular time and order ii) process research focuses on theory building and uses longitudinal in-depth qualitative inquiry to get full description of sequences and conditions of the innovation process. Variance research examines the determinants which make an organization more or less likely to innovate, also referred to as organizational innovativeness (OI). This approach identifies the various factors and innovation attributes which influence patterns of adoption over time (Benbasat,1984; Rogers, 2003; Wolfe, 1994).

The stage model approach and variance approach are considered separate research streams because most studies generally focus on one single approach (Wolfe, 1994). The intention of this study is not to stay limited to one specific stream, but rather to get a more complete picture of adoption and implementation by combining approaches. It is expected that the stage model and process research literature will inform research on the important stages, while the variance literature will provide direction on factors and conditions which influence the stages.

2.1.4.1 Stages in the Adoption process

The adoption process is described as the main sequence of events leading up to the actual use of an innovation within an organization (Rogers, 2003,Frambach & Schillewaert, 2002). The process begins with activities leading towards the adoption decision followed by the action needed to put it into continual use (Damanpour, 1991). These activities have been classified in a variety of stages by different researchers for example: awareness, selection, adoption decision, implementation, routinization (Klein & Sorra, 1996); knowledge/awareness, evaluation/choice,

adoption, implementation, expansion (Meyer & Goes, 1988); initiation, development, implementation, termination (Van de Ven et al., 2000); knowledge awareness, attitude formation, adoption decision , initial implementation, sustained implementation (Zaltman et al., 1973); evaluation, initiation, implementation, routinization (Hage & Aiken, 1970). Despite the variations in terminology the significant amount of overlap between models cannot be ignored (Wolfe, 1994).

Wolfe (1994) summarizes the common pattern among models as follows: the organization first becomes aware of the innovation, it is matched with a problem or opportunity, followed by evaluation of costs and benefits, during which forces in favor of or against may try to influence the decision. The decision is then made to adopt (or reject) followed by implementation. Following implementation the decision is reviewed and the innovation may either be continued or discontinued. If continued it becomes routine and is eventually infused into organizational operations. A more common simplification of the various models group all stages into three major sub-processes: i) pre-adoption or initiation ii) the adoption decision and iii) post-adoption or implementation (Rogers, 2003, Damanpour and Schneider, 2006; Zaltman et al., 1973, Zmud, 1982). I will now look at each of these stages below.

Initiation

This first stage in the adoption process consists of activities leading to the adoption decision. Before a decision is made to adopt a particular innovation, a need is recognized followed by the search for a solution. At this point organization personnel become aware of the innovation, assess its suitability, and propose its adoption to others (Meyer & Goes, 1988); Damanpour and Schneider, 2006). Initiation activities have been identified as problem recognition, information gathering, formation of attitude, evaluation, and identification of

resources (Damanpour, 1991), or grouped into smaller sub-phases agenda setting, and matching (Rogers, 2003).

Rogers (2003) describes the *agenda-setting* and *matching* stages as follows. During *agenda-setting* organizational problems are identified, followed by a search for the appropriate innovation to address the problem. This is ongoing and may last several months to several years. While some organizations start by seeking solutions to a problem, the majority opportunistically scan the environment for new ideas and innovations without having a specific problem in mind. Thus in many cases organizational adoption of innovations are driven by solutions rather than problems. During the *matching* stage the problem is conceptually matched with the innovation to see whether there is a fit. This stage involves planning, design, and feasibility testing where the benefits and potential problems are identified. If a mismatch is found between the problem and solution, the decision makers may choose to abort before actual implementation. If it is identified as a good fit then the process is given the go-ahead. This stage is critical as there must be a good fit if the new idea can be sustained over time (Rogers, 2003).

Adoption Decision

Once the innovation is evaluated a decision can be made to adopt or reject. If found to be strategically, technically, and financially acceptable it is chosen as the desired solution (Meyer and Goes, 1988). The decision may be influenced by internal factors such as a performance gap, or may be imposed by external conditions like an environmental change (Damanpour and Schneider, 2006). The adoption decision is usually (though not always) followed by some form of organization commitment (Damanpour and Schneider, 2006) accompanied by allocation of resources for acquisition, alteration and assimilation (Meyer and Goes, 1988).

Rogers (2003:p403) identifies three types of innovation decisions which precede organizational adoption. *Optional* decisions are taken when an individual makes a decision to adopt or reject an innovation independent of decisions by other individuals in the organization. *Collective* decisions are made when the adoption decision is reached by consensus among a group of individuals in the organization. *Authority* decisions to adopt are made when one individual or small group of individuals with some form of power, social status or expertise makes a decision to adopt or reject. In some situations two of more types of adoption decisions are made in sequence, for example an optional decision is taken by an individual after a collective or authority decision has been made. These are referred to as *contingent* decisions.

The open government initiative represented an authority decision by the White House which instructed executive departments and agencies to immediately adopt challenges as an innovation tool. This study aims to understand and explain how and why various agencies responded differently to that authority adoption decision, particularly the subsequent contingent decision to adopt. Non-adopters are outside the scope of this study.

Implementation

An innovation is not truly adopted until it has been implemented, allowing the intended objectives to be met (Damanpour & Schneider, 2009). Once the adoption decision is made the next stages are focused on putting it into use (Zaltman et al, 1973) by organizational personnel, clients, or customers (Damanpour and Schneider, 2006). Implementation consists of activities relating to modifications in the innovation itself, or preparations within the organization including trial use and acceptance (Damapour, 1991, Meyer and Goes, 1988).

Rogers (2003) identified three sequential sub-processes of implementation: *redefining/restructuring*, *clarifying*, and *routinizing.* During initial implementation there is some r*edefining/restructuring* of both the innovation and the organization to accommodate each other. In some cases the innovation is re-invented or modified to suit the needs of the organization. In other situations changes have to be made to the organization structure to facilitate its use. These changes may include the establishment of a new organizational unit, new job roles and procedures. Internally developed innovations are usually familiar to employees and perceived as compatible with the organization. Externally developed innovations are perceived as more compatible with the organization if they are flexible and allow significant amounts of re-invention by employees (Rogers, 2003). As an externally developed innovation, challenges may be more compatible with some agencies than others based on how much re-invention is undertaken, signified by the different types of challenges implemented.

During the next stage – *clarifying* - the meaning of the innovation becomes clearer as it is used more widely. This allows for the correction of any misunderstandings or unwarranted side effects. As new arrangements are being made, use of the innovation is becoming stabilized and more embedded in the organizational structure. Initial implementation is surrounded by uncertainty around questions such as how it works, who is responsible, who it affects. The clarifying process provides an opportunity to clear up these uncertainties by allowing employees to gradually gain a common understanding of the innovation (Rogers, 2003).

Routinizing is the final stage of implementation where the innovation eventually loses its separate identity and becomes incorporated into regular organizational activities. At this stage a decision can be made to discontinue or sustain the innovation over a longer term. Some factors

such as a high level of participation by employees or re-invention of the innovation increase the likelihood of the innovation being sustained by the organization (Rogers, 2003).

Though this outcome is desirable it is not automatic, as the organization has to first undergo a set of structural changes to accommodate the innovation. According to DeSanctis & Poole (1994) and Orlikowski (2000) changes may be reflexive in that the new structures give rise to changes in the innovation as users change habits during recurrent use. If use is ongoing the process is stabilized and eventually becomes integrated into the operations of the organization. This reflects one of the original objectives of the Open Government Initiative that challenges become integrated into regular organizational activities.

Though there is often a major gap between the adoption decision and actual implementation (Crossan & Apaydin, 2010), an innovation is not truly adopted until it has been put in use by the adopting organization (Damanpour and Schneider, 2009). Hence use of both terms *adoption and implementation*.

2.1.4.2 Patterns of Adoption and Implementation (Enactment)

While the major phases of the adoption process may be similar for the various agencies, widely differing conditions and contexts within these agencies may lead to different patterns of adoption and the way the innovation is invoked (or enacted). Orlikowski (2000) investigated adoption of the same technological innovation in different organizational contexts and found that varying circumstances and contexts cause users and decision makers to enact it in different ways leading to different organizational outcomes. The type of enactment was classified according to the degree of change that was effected in the organization: *inertia* produced little or no change, *application* produced some enhancements but not full change, and *change* produced a complete transformation.

In a study of the adoption and use of technological innovations by members of a university community, (Lin, Singer, & Ha, 2010) found support for the types of enactment represented in Orlikowski's (2000) typology. Their findings indicate that different users enacted the technology differently in different contexts. Inertia was represented by members who made limited use of the technology, application represented by those who used the technology to enhance teaching and augment service, while some users made maximum use of the technology representing the change enactment.

While adopting agencies are all US federal government agencies, they vary widely in terms of mission, operations and conditions. It is likely that any innovation adopted and implemented under such varying conditions will be enacted in different ways, leading to varying levels of change.

2.1.5 Organizational Innovativeness

The focus of the previous section has been the process by which an organization adopts and implements an innovation. In this section the focus shifts to organizational innovativeness which examines an organization's propensity to innovate (Wolfe, 1994) with emphasis on the various determinants which can enhance or hinder those efforts (Damanpour, 1991). These determinants may be internal to the organization or may be a part of the larger external system (Van de Ven, 1993).

Research on the determinants of innovation is extensive and fragmented and lacks consensus on a theory or on which specific factors are most influential (Wolfe, 1994; Crossman and Apaydin, 2010). The broad range of commonly studied determinants varies in influence depending on the context and requirements of the organization (Read, 2000). Tornatzky et al. (1990) group relevant elements into three main contexts: technology, organization and

environment. They describe the *technological context* as the internal technology practices and equipment, as well as new technologies available on the outside. Some important considerations include the amount of divergence between the new technology, the ability of the new technology to fit into the existing practices, and the willingness and ability of the organization to learn about the new technology. The *organization context* refers to elements which are internal to the organization and include characteristics such as organization size, structure, human and financial resources. Other factors related to operations include decision making, communication and interaction between employees, and mechanisms for monitoring changes in the external environment. *Environmental context* refers to the arena outside of the organization which has the potential to influence the innovation process. Elements of the environment include the industry, collaborators and competitors, government regulations, and information flow from the outside. The organization's capacity to make effective adoption and implementation decisions is affected by the manner in which it is linked to these environmental factors.

The technological context is not as relevant in this situation as the focus is on the problem solving and innovation capabilities of challenges rather than the technological aspect. The environmental context is relevant because of the wide range of external forces, events and trends in the external environment that can trigger organizational innovation (Damanpour, 1991; Tang, 1998). More innovative organizations are likely to emerge from an external environment where the social and cultural norms favor innovation (Tang, 1998). The industry or sector of an organization can influence its innovativeness (Damanpour, 1991; Van de Ven, 1986) as innovation is likely to occur where there are necessary and sufficient conditions in the external environment to support it (Tang, 1998). For example in private enterprise, some firms seek to

innovate as a reaction to pressure of maintaining competitive advantage or recognition within an industry (Lippert & Govindarajulu, 2006).

Among the three contexts described above, organizational variables are the most widely studied and are regarded as the primary determinants of organizational innovation (Damanpour, 1987; 1991; Kim, 1980). This includes factors such as the nature of an organization's task, vision, mission, and strategy. For example an organization whose primary task is stable and undemanding is less likely innovate (Tang, 1998). Other prominent organizational factors which influence innovation include support from management and the availability of organizational resources (Read, 2000; Spivey, Munson, & Wolcott, 1997). Management plays a crucial role in setting innovation goals, encouraging initiatives from employees, and making the decision to approve or reject innovation proposals (Daft, 1978). Other factors such as organization size and structure have been researched repeatedly and found to influence the level of organizational innovativeness (Zaltman et al, 1973; Frambach and Schillewaert, 2002). However there are contradictory indications for organization size as larger organizations are seen as having a greater need to innovate, while smaller organizations are seen as more flexible and hospitable to innovation (Frambach and Schillewaert, 2002). Organization structure has also been identified for both enabling and inhibiting adoption in different studies (Damanpour, 1991). Agencies in the study vary on several dimensions such as size, structure and mission. With such a wide range of possible organizational innovativeness factors, it is expected that factors will influence agencies differently, and that some will be more influential than others.

2.2 Context of Challenge Adoption

Wolfe (1994) describes innovation research as complex and context-sensitive, and urges researchers to minimize ambiguity by clearly addressing certain aspects of their study. These include areas such as: the stream of innovation research relevant to the research questions, the stage of the innovation process that is the focus of the study, the type of organization, and the attributes of the innovation itself. So far the literature review has outlined the various streams of the organization innovation literature relevant to this study such as the adoption process and determinants of innovativeness. However the extant literature, and by extension the literature review, has not specifically addressed the context of adopting a new problem solving mechanism as an organizational innovation.

The literature on adoption processes and determinants of innovativeness has been dominated by studies conducted around technological innovations (e.g. Damanpour and Avarind; 2011; Rogers, 2003; Tornatzky et al., 1990). This includes research on how firms stimulate and develop new technology, products and services (Crossan and Apaydin, 2010; Volberda et al, 2013). However despite the focus on technological innovation and the product development process, the literature is applied in all contexts (Damanpour and Avarind, 2012). In a systematic review of organizational innovation literature spanning a twenty seven (27) year period, Crossan and Apaydin (2010) found that not enough attention had been paid to the type of innovation studied. They found that the majority of articles published within that time period (about fifty percent) spoke of some general or unspecified type of innovation. This means that any theoretical or empirical differences that may be attributed to the type of innovation remain understudied or unknown. Of the remaining articles, they found that eighteen percent (18%) referred to technology (product or process) innovations, and another twenty percent (20%) to

product or service innovation and six percent (6%) to knowledge innovations. There was no evidence that significant consideration was given to problem solving type of innovations in this literature.

While it is expected that challenge adoption will conform to major theoretical aspects of the organization innovation literature discussed above, some form of divergence is expected to account for the unique characteristics of challenges. For example, challenges do not exactly match any of the dimensions of organization innovation described earlier. It is not an administrative/management innovation because the focus is not on how the organization is run. Though administered via a technology platform, challenges differ from the typical products, processes or technologies normally classified as technological challenges. Rather, they represent a problem solving mechanism employed to spur further innovation. Technological innovations are employed for their contribution to the basic work activity of the organization, which is usually the production of goods and services. Challenges, on the other hand are deployed in many different ways that do not always relate directly to the organization itself. The introduction of challenges into government organizations was primarily aimed at promoting research and development in science and technology areas related to national importance. This research and development would essentially create an environment conducive to private sector investment in areas where market forces do not adequately encourage investment (National Academy of Engineering, 1999). Challenges are sometimes used to motivate scientists and engineers to focus their efforts on societal goals (Stine, 2009) and to encourage entrepreneurship around new technologies. Thus in many cases the agency hosting the challenge is not the primary beneficiary.

A distinct feature of challenges is the practice of embracing outside contributions in solving problems, which overlap with extant practices like prize contests and newer practices like crowdsourcing and open innovation. According to Wolfe (1994) different types of innovation employ distinct innovation processes, and the determinants of adoption differ as the characteristics of the innovations differ. This new trend of opening up the problem solving space is an emergent practice in organizations, in contrast to the types of organization innovations typically studied. The differences in approach are distinct enough to warrant a closer look at the literature on open innovation and the relevant related concepts introduced in the sections below.

The following section helps understand the context of the more open forms of innovation. The section starts by defining prizes and contests, as well as details of their background and benefits. This is followed by the definition and explanation of the related crowdsourcing concept, followed by definition and review of the more general open innovation literature, focusing on adoption determinants.

2.2.1 Prizes and Contests

The definition of prizes and contests below were taken from the National Academy of Engineering report (1999) commissioned from the White House, and which represents the official start of a national dialog on the use of prizes in the federal government. *Prizes* are rewards in the form of cash or non-monetary compensation given to individuals or groups for a particular behaviour or achievement. Recognition prizes acknowledge some accomplishment that has already occurred such as the highly regarded Nobel Prizes (National Academy of Engineering, 1999). Inducement or incentive prizes offer cash or other type of reward as an incentive to get people or groups to meet a specified goal. Contests refer to the competition

through which prizes are awarded. Both recognition and inducement prizes are executed through *contests* where a number of submissions are judged according to specific criteria, with the prize being awarded to the winner (National Academy of Engineering, 1999).

The term *challenge* is used to represent prize contests being adopted by federal agencies, where members of the public are challenged to help solve a problem in exchange for some reward. Challenges are hosted on the public web-based platform *challenge.gov*.

2.2.1.1 Background of Prize Contests

Prize contests have been used throughout history to push the boundaries of technological discovery and innovation. For example the modern day canning industry can be traced to enhancements in food preservation techniques dating back to the 1700s (Stine, 2009). At that time the French government offered a prize of 12,000 francs to anyone who could develop technologies to advance food preservation for military troops. Modern chemistry as we know it today is the result of a prize contest launched by the French Academy over 200 years ago when a prize of 100,000 francs was offered for the production of soda alkali from sea salt (Kalil, 2006). The often-cited Longitude Prize dates back to 1714 and was launched by the British Parliament. It led to the invention of the marine chronometer which solved the problem of measuring longitude at sea (McKinsey & Company, 2009).

In more recent times the Ansari X-Prize identified as the largest prize in history led to the building and launching of a spacecraft by a private team based on certain predefined specifications. The prize launched in 1996 was awarded in October 2004 and led to the formation of a new industry by opening up the spaceflight industry to a non-government entity for the first time in history (X PRIZE Foundation, 2011). While many of the earlier prizes focus

on advancing technology for the benefit of society, some of the more recent ones launched by private companies aim at advancing internal operations to boost profits. For example the widely discussed Netflix Prize launched in 2006 offered a prize purse of $1 million to any individual or team who could design an algorithm to increase the accuracy of the company's personalized movie recommendation (NetFlix.com, n.d). The movie recommendation system relied on movie ratings from Netflix viewers to predict and recommend future movie choices. After receiving entries from more than 40,000 teams in 186 countries, the prize was awarded in 2009 to a seven member team *BellKor's Pragmatic Chaos* representing four countries. The use of the innovative algorithm has allowed Netflix to stay competitive in a highly volatile and fast changing market segment by reaching out to innovators such as mathematicians and statisticians who were previously not part of the Netflix's own R&D department (Netflix.com, n.d.).

2.2.1.2 Prize Types

Different prize types present opportunities for different approaches to stimulating innovation. Using research in the philanthropic sector, McKinsey and Company (2009) identified seven different change levers representing ways in which prizes could produce innovation and change. The change levers identified are: (i) identify excellence (ii) influence public perception (iii) focus communities on specific problems (iv) mobilize new talent (v) strengthen problem-solving communities (vi) educating individuals and (vii) mobilizing capital. Varying combinations of these change levers result in six (6) different prize archetypes based on how they are combined. The six prize archetypes and associated change levers are:

- *Exemplar prizes* define excellence and focus attention in a particular area by giving recognition and showing appreciation to accomplishments. The publicity associated with

these prizes also serves to influence public opinion and set an agenda within the discipline. The change levers are identifying excellence and influencing perception.

- *Exposition prizes* draw attention to a broad list of potential ideas and select the best among them. They influence change by identifying excellence and mobilizing capital.
- *Network prizes* aim to create and strengthen networks among communities around a particular theme by fostering interaction among stakeholders. Network prizes influence change by identifying excellence, strengthening community, and mobilizing capital.
- *Participation prizes* aim to get broad participation with the goal of influencing participants to make behavior and lifestyle changes. These prizes attempt to influence change by strengthening community and educating and improving skills.
- *Market stimulation prizes* aim to counter market forces that prevent the achievement of a desirable social outcome. They work to mobilize previously unidentified talent, drive costs down by stimulating competition and exposing latent demand. Market stimulation prizes seek to effect change through four change levers: identifying excellence, mobilizing talent and capital, focusing a community, and influencing perception.
- *Point solution prizes* focus on finding a solution to a well-defined problem which requires some form of innovation. Companies such as InnoCentive serve as intermediaries for client companies seeking solutions to point solution prizes. Intermediaries use open innovation platforms to pose the problems to their solver community. Point solution prizes seek to influence change by focusing a community and mobilizing talent.

These six (6) prize types were also highlighted in the 2010 memo entitled "*Guidance on the Use of Challenges and Prizes to Promote Open Government*" from the Office of Management and Budget (OMB) to heads of executive departments and agencies. Agencies considering the use of challenges were reminded of the broader aim of spurring change, and encouraged to consider which of the six types would best accomplish that goal (White House, 2010).

2.2.1.3 Prize Contests to stimulate innovation

In the private sector, recognition and inducement prizes are widely used to promote breakthrough in a given field and to reward advances or revolutionary development in traditional and nontraditional thinking (Schroeder, 2004). While many of the earlier prize contests in history were privately sponsored, recent trends show an increase in the use of prizes in government. This trend is triggered by a need for creative thinking among government suppliers (Stallbaumer, 2006) and indicates an increasing belief in government agencies of the effectiveness of prizes in driving innovation (McKinsey & Company, 2009).

According to the NAE (1999) report, the introduction of prizes in US federal agencies was primarily aimed at stimulating private sector investment in R&D and innovation in areas of national importance. These areas include safety, energy efficiency, and public health, where market forces do not adequately encourage investment. A related objective was to motivate scientists and engineers to focus their efforts on societal goals not yet reached (Stine, 2009) and inspire participation from those who may not otherwise be inclined to participate (Stallbaumer, 2006).

2.2.1.4 Benefits of Prizes and Contests

Traditionally the US federal government showed a preference for using grants, competitively-bid contracts, and the patent system to pay for innovation (Mckinsey & Company, 2009). Prizes offer an alternative to these traditional methods and other investments which may otherwise be viewed as too risky or costly (Stine, 2009).

Prizes stimulate creativity and unconventional approaches to innovation by allowing the government to set a goal for technological advancement without dictating the method (National Academy of Engineering, 1999). They also play a very important role in public outreach and education by drawing attention to the societal challenge being tackled, and the potential role of science and technology in addressing the challenge (National Academy of Engineering, 1999). An additional benefit of the public outreach is that it may generate enthusiasm around science and technology related skills and entrepreneurship opportunities and encourage more young people to pursue careers in that field (Kalil, 2006). While highlighting the importance of prizes in motivating science and technology innovation, Stallbaumer (2006) cautioned that their use should not conflict with private sector efforts and that advancement of some new technologies are best left to private enterprise. By the same token government intervention is welcomed if the private sector has fallen short.

2.2.2 Crowdsourcing

Crowdsourcing is a term used to refer to the practice of outsourcing to crowds. Jeff Howe (2006) is widely credited with coining the term and the following widely used definition:

> *Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call (Howe, 2006).*

Crowdsourcing involves a diverse set of practices from contests where individual winning entries are selected and rewarded, to pooling of individual contributions to contribute to a single solution (Schenk & Guittard, 2009). It is used in various types of situations such as: i) inexpensive completion of routine tasks by members of the crowd acting either independently or collectively ii) to provide a number of possible solutions to complex problems iii) for creative tasks modelled after offline poster and logo design contests Schenk and Guittard (2009). Crowdsourcing can also be used for idea generation where a search is broadcast to the crowd for new ideas (Hennala, Parjanen, & Uotila, 2011) or to gather user feedback for development or improvement of products and services (Poetz & Schreier, 2011).

Crowdsourcing is more than just the latest web 2.0 fad, but rather can be viewed as a strategic model capable of producing superior solutions by reaching out to motivated members of the public (Brabham, 2008; Terwiesch & Xu, 2008). While the practice may not be new, the interactive nature of the internet and web 2.0 tools provides the organization with free and easy access to the crowd (Schenk & Guittard, 2011). Organizations make the details of their problems publicly available and invite potential solvers to submit solutions (Jeppesen & Lakhani, 2010). Thus rather than contacting known experts, the call goes out to anonymous individuals who are usually amateurs (Schenk & Guittard, 2009).

One of the major benefits of this practice is the opportunity to get ideas and solutions from individuals with diverse views and experiences, thus presenting a different perspective from employees (Brabham, 2008). Crowdsourcing allows firms with limited budgets to get access a wide range of skills at reasonable cost (Whitla, 2009) as the crowd labour is often worth more than payments for winning solutions (Brabham, 2008).

One commonly cited example of the early successes of open innovation and crowdsourcing involves the company InnoCentive which played the role of knowledge broker to firms in science and high-technology industries. Lakhani & Panetta (2007) provide a description of the business model. InnoCentive provides client firms with a forum for posting difficult science-related problems for which an in-house search for a solution may be too expensive or time consuming. Cash prizes ranging from $5,000 to $100,000 were usually offered for an acceptable solution. Potential solutions were submitted by members of InnoCentive's solver network which consisted of over 120,000 scientists from countries around the world. In return for the prize money the solver with the winning solution gave up all intellectual property rights, and the solution became the property of the seeker firm.

Based on the definition and uses stated above, prize contests (Challenges) can be viewed as one form of crowdsourcing where members of the crowd submit individual entries and compete to win a prize. There are other forms of crowdsourcing where members of the public jointly collaborate or contribute to the end product, and there is no search for a 'winning solution'. This type of crowdsourcing is not considered challenges or prize contests. Crowdsourcing is part of a growing trend in which organizations are opening up their innovation processes to embrace ideas and solutions from external sources broadly referred to as open innovation. This topic is introduced next.

2.2.3 Open Innovation

The open innovation concept was first proposed by Henry Chesbrough in his 2003 book entitled "*Open Innovation: The New Imperative for Creating and Profiting from Technology*". Since then the topic has generated much interest, discussion and research. The most cited definition given by Chesbrough (2006, p1) describes it as:

> *the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation*

Sometimes an organization encounters a problem which cannot be solved internally for various reasons related to knowledge or capacity and needs to look outside for possible solutions (Jeppesen & Lakhani, 2010). Some organizations lack internal capacity to develop and commercialize all internal discoveries and are forced to shelve spillover ideas from their Research and Development (R&D) efforts (Chesbrough & Crowther, 2006). Thus openness in innovation refers to the practice of embracing outside participation as well as sharing with others on the outside (Chesbrough, 2011).

The three distinct approaches to open innovation based on the core processes are: i) *outside-in* where companies utilize external ideas and technologies from suppliers, customers and other partners to enrich their own operations and production (Gassmann & Enkel, 2004) ii) *inside-out* where companies market their internally developed ideas and technologies to the outside, for example amazon.com offering its online retailing technology to other large vendors for a fee. iii) *co-creation* which combines the outside-in with inside-out processes, and use joint operations to develop and commercialize innovation (Enkel, Gassmann, & Chesbrough, 2009; Gassmann & Enkel, 2004). The internet allows the easy flow of information and the connection of widely dispersed experts and enthusiasts (Chesbrough, 2003).

The most common definitions of open innovation reveal an emphasis on outside-in process which involves the opening up of organizational boundaries to knowledge in-flows from the outside (Enkel et al., 2009; West & Gallagher, 2006). Prize contests and crowdsourcing practices as described above fall under the outside-in category where solutions are solicited from outside the organization to solve internal problems.

2.2.3.1 Benefits of Open Innovation

Both research and practice have labelled this new approach of opening up to outsiders as beneficial to solving problems. Empirical data suggests that the primary driver of open innovation in private firms goes beyond the mere desire to adopt a new paradigm, and is targeted at growth in new products and revenue (Chesbrough & Crowther, 2006). When used in the new product development process the innovating company can receive input directly from its intended audience in the early stages of idea generation and design, translating into innovation at a faster rate and with lower risk (Chakravorti, 2010).

In an empirical study in the scientific community Lakhani, Jeppesen, Lohse, & Panetta, (2007) found that open innovation led to the successful resolution of one-third of problems which were previously unsolved by experts within Research and Development departments. When comparing ideas for new products generated by professional employees of a firm versus those submitted by users in an idea generation contest, Poetz & Schreier (2011) found that the user submitted ideas had significantly higher scores on novelty and customer benefit. While this approach has proven effective in improving innovation outcomes in a number of cases, Lakhani and Panetta (2007) caution that traditional organizations should not view it as a 'silver bullet' solution to all innovation problems but rather as a supplement to their on-going innovation strategies.

2.2.3.2 Factors influencing adoption of Open Innovation Practices

Companies which decide to invest in open innovation are sometimes hindered from profiting from these activities due to certain risks and barriers which they face (Enkel et al, 2009). Thus despite the stories of success and benefits being achieved by some implementing firms, the open innovation process still proves to be extremely challenging for many others. Also there is still uncertainty surrounding the long term sustainability of these new types of initiatives (Chesbrough & Appleyard, 2007).

In a study of Small and Medium Enterprises (SMEs), Van de Vrande, De Jong, Vanhaverbeke, & De Rochemont (2009) found a diverse set of organizational, managerial and cultural issues brought on by interaction with external partners. An empirical investigation conducted in a range of industries outside the high technology sector (Chesbrough and Crowther, 2006) sought to document practices which provided favourable conditions for adopting open innovation practices within an organization. They found a critical requirement was the introduction of highly focused practices which were in alignment with overall objectives of the business, and identified two critical adoption challenges: i) the not invented here (NIH) syndrome, and ii) sustaining internal commitment long enough to realize the benefits of open innovation.

In a detailed assessment of a 'successful' implementation of open innovation at Proctor and Gamble, Huston & Sakkab (2006) provided a first-hand account of some of the changes experienced. By their account, the company had to cultivate an internal culture of change different from the existing centralized and internally focused culture. This involved promoting the exchange of ideas emanating both within and outside the organization. Another practice that was adopted involved a reward structure to recognize employees involved in the development of

a successful product, whether the ideas came from inside or outside. One of the reasons given for providing rewards was to force change in the culture of resistance and "not invented here" syndrome. They report that initial resistance was centred on the belief that the importation of external ideas would somehow reduce the need for internal ideas and that some people would lose their jobs. On the contrary, there was a need for new skills, and the practice has now been generally embraced despite a few pockets of resistance. The report underscores the importance of top management support, including explicit declaration as a company strategy from the CEO. They claim that any initiative is destined to fail if it is seen merely as an isolated trial handled by a selected minority.

2.2.4 Gaps in Open innovation Research

The emerging research on open innovation and crowdsourcing focuses mainly on the use of these concepts in private business firms, particularly in the manufacturing and production sectors. Other studies found that open innovation concepts could be suitably applied in a broader context outside of the high tech manufacturing industry (e.g Chesbrough and Crowther, 2006). Open innovation concepts can be readily applied to the provision of services as it allows companies the opportunity to work closely with customers in the development of new solutions (Chesbrough, 2011). There is also a strong and increasing incidence of open innovation in Small and Medium Enterprises (SMEs) and service firms (Van de Vrande et al., 2009). While there is increasing utilization of open innovation in many firms (Enkel et al., 2009; Huizingh, 2010) there are shortfalls in the knowledge and understanding of organization-related mechanisms to implement open innovation, as well as a lack of understanding of when to adopt and how to receive maximum value from it (Enkel et al., 2009). As far as the various forms of open

innovation are concerned, it is important to understand the processes and conditions which best facilitate their adoption into various organization types, including the public sector.

Many of the prominent prize contests in history outlined in the literature (e.g. Stine, 2009, Kalil, 2006, McKinsey & Company, 2009; X PRIZE Foundation, 2011) as well as the more recent examples like Netflix (recounted above) were privately sponsored events aimed at solving one specific problem, and not as a regular organizational occurrence. Other prominent work on crowdsourcing (e.g. Lakhani and Panetta, 2007), examine the work of the popular innovation broker Innocentive in facilitating crowdsourcing for different companies in the high technology industry. The focus of this work is on ideal features of prizes rather than as an organizational innovation. With the exception of a handful of studies (e.g. Chesbrough & Crowther, 2006; Huston & Sakkab, 2006) the research literature has not adequately addressed topics such as the organizational conditions and processes necessary to facilitate and institutionalize the adoption of these emergent forms of innovation. Therefore this study can bridge the gap between research on organization innovation and newer forms of open innovation.

2.3 Organizational Context

This study examines the adoption of a practice which started in the private sector and later spread to public sector institutions. Historically the greater emphasis of innovation research has been in the private sector (Damanpour & Schneider, 2009). A significant proportion of this innovation literature emanates from theories of new product development and technological innovation (Hartley, 2005). Similar to the private sector, the public sector innovation literature is fragmented and lacking consensus on general theories and concepts (de Vries, Bekkers, & Tummers, 2014). Vigoda-Gadot et al (2005) express support the application of existing knowledge from the private business sector to inform public sector innovation research, but should also be informed by the public management doctrine.

The intention for this study is to use concepts from the more established and better developed organization innovation literature to inform the study on adoption in public sector, while also acknowledging and making allowances for differences which may influence variation in innovation activities. While the type of organization is not the focus of the study, it is important to examine prominent differences which may have an impact on the findings.

Comparing the two sectors, the most commonly mentioned difference is the underlying goal of market viability and profit in private institutions versus the multiple, often intangible and sometimes conflicting goals of the public sector (Caudle, Gorr, & Newcomer, 1991). In the private sector successful innovation is highly desirable as a means of ensuring competitiveness (Hartley, 2005; Vigoda-Gadot et al, 2005). In the public sector innovation is viewed as justifiable only when it is seen to increase public value in the efficiency and quality of governance and services (Hartley, 2005, De Vries, H.A., Bekkers, V.J.J.M., Tummers, L.G., 2014).

According to Potts & Kastelle (2010) there is a structural disconnect between the political mandate to introduce new initiatives and the subsequent development and implementation by employees whose general approach may be less than enthusiastic. They contrast this with private sector innovation where incentives are aligned so that those backing a new idea receive compensation if it succeeds but bear the risk if it is a failure. Additionally, public sector leadership may display some aversion to getting involved in complex innovation projects (Vigoda-Gadot et al, 2005).

Public sector agencies are often described as bureaucratic and conservative with the tendency to follow strict rules and methods with which they are familiar (Vigoda-Gadot et al, 2005). However in recent decades, some movement away from classic bureaucratic structures has made them somewhat more receptive to the introduction of innovative ideas (Vigoda-Gadot et al., 2005). There are increasingly more incentives to innovate at all levels of the public sector driven largely by public and media expectations for improved quality of services, combined with the pressure of tightening public finances (Clark, Good, & Simmonds, 2008).

In a survey of public sector innovators the most commonly reported situations that led to their innovations were identified as: the political system, new leadership, crisis situation, internal problems, and new opportunities (Borins, 2001). Of these the most frequently identified innovation trigger was internal problems which included conditions such as resource constraints, and inability to coordinate some policy or meet demand for a program (Borins, 2001). Other reported barriers to innovation include the lack of incentives to innovate, lack of funding, and the need for public support (Damanpour & Schneider, 2009). While opening up to the outside is an exciting prospect, its use may be limited to particular circumstances. For example there is a need

for secrecy in certain sectors like the intelligence community where public articulation of a need may be a sign or admission of vulnerability (Doney, 2009).

In a recent review of public sector innovation research, De Vries et al (2014) recommended further research in some specific areas which they found inadequate. Two of these areas are directly relevant to this study and have potential to influence the findings. These are i) recognizing importance of the environmental context which includes effects of an external push such as policy and political pressures and ii) identifying linkages and interrelationships between the various influential factors.

The factors mentioned in this section highlight pertinent considerations for adoption by public sector organizations, though it also does not specifically address newer forms of innovation. For this study three major streams of literature were reviewed: organizational innovation, open innovation, and public sector innovation. Since no one theory or framework provided the ideal fit, prominent concepts from the various streams were combined to provide conceptual direction for this study. These concepts are discussed in the next section along with reasons for their selection.

2.4 Conceptual Framework

The focus of this study is to understand and explain the adoption of a newer form of organizational innovation in public sector agencies. From the literature review it was still not clear which of the wide range of innovation concepts and models would offer the most accurate explanation for adoption and implementation in the particular context being studied. Further, because of the emerging nature of the phenomenon my objective was not to test existing concepts, hypothesis, and theories derived from other contexts, but rather to inductively build a framework which was truly representative (Merriam, 2009). Therefore I used an exploratory approach which acknowledged the potential contributions from the literature while leaving room for emergence of more relevant explanations from the data.

Sensitizing concepts are often used in qualitative research to orient data collection and analysis (Patton, 2002). While the inductive nature of qualitative research encourages us to be open to learning as much as we can about the phenomenon, the use of sensitizing concepts helps ensure that we do not enter the field with a completely blank slate (Patton, 2002). This is also in line with advice from Eisenhardt's (1989) and Yin (2009) concerning case research where they advocate using existing literature to help frame the research problem and questions, and identify some initial concepts and variables to guide data collection.

Following this advice I identified six (6) sensitizing concepts based on their prominence in the literature, and from observations and preliminary analysis of listings on the Challenge.gov web platform. I used these concepts at the beginning of the study to build a conceptual framework and to guide data collection and analysis. The original objectives of the study were to identify the enabling and hindering conditions for challenge implementation as well as factors influencing the adoption decision. At that point I focused around the contextual literature on

open innovation and crowdsourcing, reflected in the limited focus of the sensitizing concepts. Due to the iterative nature of qualitative research, additional components of the implementation process and different patterns of adoption started to emerge as the study progressed. This presented an opportunity to adjust the research questions and expand the literature reviewed. Despite the expanded objectives, the original propositions are still critical as they help trace the conceptual development of the study and origin of the interview instrument. I present the initial sensitizing concepts below along with reasons for their selection.

2.4.1 Management support

As stated earlier, the organizational innovation literature is extensive and fragmented with inconsistent findings. Notwithstanding these inconsistencies, the importance of management in leading and influencing innovation activities remains the most commonly identified factor. For example Read (2000) identified management support for innovation and an innovative culture as the most important determinant. Damanpour (1991) identified attitudes of top managers and their willingness to take risks and contribute to the successful implementation as critical. Mumford & Licuanan (2004) highlighted the importance of leadership guidance and support in creating conditions conducive to innovation, and Vigoda-Gadot et al. (2005) found leadership and vision to be an important determinant for public sector organizations in Europe. While there seems to be consensus on the role of management, the level and type of support may not always be equal. Dewar and Dutton (1986) highlight the important role of senior executives though indicating that they may or may not embrace change. Crossan and Apaydin (2010) underscore the importance of leadership from all levels of the organization to lead as well as maintain momentum. The type and level of support from management is expected to have an important impact on the adoption process.

2.4.2 Employee attitudes (Not-Invented-Here Syndrome)

This concept was selected for its prominence in the open innovation literature. Regarding attitudes to inputs from open innovation, the Not-Invented-Here (NIH) syndrome is identified as a major influential factor (Chesbrough & Crowther, 2006; Chesbrough, 2011; Huston & Sakkab, 2006). This concept imported from the research and development literature refers to internal resistance to outside knowledge. In describing the build-up to Proctor and Gamble's successful open innovation practices, Huston and Sakkab (2006) refer to the realization that "massive operational changes" were needed to shift the company's attitude to innovations from resistance to enthusiasm, from "not-invented-here" to "proudly-found-elsewhere". Companies in the study reported they were able to overcome NIH and obtain buy-in from employees through articulating reasons why internal efforts were not adequately meeting objectives. Through the process they were also able to create a greater level of organizational commitment and alignment to the open innovation approach. Like other open innovation practices, challenges solicit contributions from outside the organization and efforts may be hindered if the NIH syndrome is present.

2.4.3 Organization commitment

Organization commitment is a broad term used by Chesbrough and Crowther (2006) in the open innovation literature to refer to the level of commitment displayed by the organization. The level of commitment was found to be a significant determinant and was evidenced by the presence of enabling factors such as resources and modified processes to promote innovation. In their study of open innovation in European Small and Medium Enterprises, Enkel et al., (2009) found that one of the critical challenges encountered was the sustenance of internal commitment long enough until the benefits were realized. Some indicators of this commitment were the allocation of dedicated human and financial resources, and fostering a balance between open

innovation activities and regular business. Chesbrough and Crowther (2006) identified internal commitment as one of the critical factors in how organizations 'adopted, deployed and encouraged' open innovation. Their indicators of commitment include: senior management support, funding, innovation champions, revised internal processes, metrics and incentives. Therefore it is likely that the presence of organization commitment will have a positive influence on the adoption and implementation process of challenges.

2.4.4 Use of intermediaries

From the open innovation and crowdsourcing literature Terwiesch & Xu (2008) used the example of pioneer crowdsourcing intermediary *InnoCentive* to describe the role of an intermediary in executing contests for its clients. Potential solvers register with the intermediary indicating their area of specialization (or interest). The intermediary works with the seeker organization to help formulate a description of the problem and rules of the contest, including considerations for ownership or transfer of intellectual property rights. The problem description is then made available to the pool of solvers, some of whom then attempt the problem with a (usually) smaller number submitting solutions. These solutions are then forwarded to the seeker who makes a judgment on suitability, and makes arrangements for advertised rewards where appropriate. Huizingh (2010) suggests that both smaller firms and larger organizations can benefit from using intermediaries, especially when engaging in the essential but time-consuming tasks related to locating and establishing partnerships for outbound open innovation. Chang & Kannan (2008) highlight the rising engagement of third-party firms to act as intermediaries between government departments trying to reach out to citizens using various forms of new technologies.

Preliminary analysis of the challenge.gov website revealed that among agencies producing the largest number of challenges, over sixty percent (60%) had their challenges hosted on third party sites such as Innocentive, TopCoder, Health 2.0. This is an indication that the challenges were managed by intermediary organizations hired or working in partnership with adopting agencies. Due to the extra duties involved in the adoption and implementation of challenges, it is projected that the use of intermediary organizations will have a positive influence on the adoption process.

2.4.5 Nature of problem faced

While the promises of open innovation and crowdsourcing practices seem appealing, the process is not a good fit with all types of problems (Terwiesch and Xu, 2008). Problems may vary in complexity (e.g simple, complex, creative) (Schenk and Guittard, 2009) and further research can help determine which types of ventures succeed and which ones fail (Brabham, 2008). For example, a problem which can be clearly defined and all the data provided can be easily outsourced (Brabham, 2009). One of the earliest and most prominent observations made from preliminary analysis of the challenge.gov platform was the variation in challenge types from basic public service announcements to highly complex scientific and technological problems. Therefore it is important to examine how those variations influence the likelihood of adoption as well as the nature of the adoption process.

2.4.6 Organizational red-tape

Organizational red-tape refers to rules that create unnecessary compliance burdens for the organization without contributing to functional objectives (Bozeman & Feeney, 2011). This is especially relevant for public organizations as they tend to be more bureaucratic, in direct contrast to the more flexible and dynamic nature of private organizations which can more easily facilitate innovation (Vigoda-Gadot et al., 2005). The authority decision to adopt challenges as a government-wide practice had the underlying assumption that this practice could easily be transferred from private to public sector agencies. It is a common perception that bureaucracy and red-tape in public sector agencies act as a hindrance to innovation efforts.

In contrast to common perceptions, Pandey and Bretschneider (1997) found that organizational red-tape had differentiated effects on different organizations, producing different dynamics and outcomes. Thus while high levels of red tape generally acted as a hindrance to innovation adoption, Pandey and Bretschneider (1997) found that high levels of red-tape could actually motivate organizations to adopt innovations as a way of overcoming the red-tape. While it is expected that red-tape will have some effect on challenge adoption, the extent and level of this effect are not known at this point.

Having examined the various literature streams and highlighting the conceptual direction for this study, the focus now shifts to the research setting.

3 The Research Setting

This chapter traces the background of the Open Government Initiative and the introduction of challenges in federal agencies.

3.1 Overview

Challenge.gov is a web-based platform that enables U.S. federal agencies to post challenges and invite members of the public to submit solutions. The platform is administered by the U.S. General Services Administration (GSA) though their Office of Citizen Services and Innovative Technologies, in partnership with the developer ChallengePost (GSA, 2011a). While the platform is administered by the GSA, implementing departments and agencies bear full responsibility for all activities related to the planning, formulation, execution, and posting to the web platform. GSA provides guidance and policy support while the provider *ChallengePost* provides technical support.

3.2 Background

As far back as 1999 the National Academy of Engineering (NAE) acting on a request from the President's National Economic Council began a national dialogue to explore the possible use of prizes as a way to spur technological innovation to benefit society as a whole. This dialogue was held in the form of a one and a half day workshop hosted by the NAE and sponsored by the National Science Foundation (NSF). The event brought together experts from academia, industry and government with the objective of building a knowledgebase to guide policy, and increase public understanding on the use of prizes to promote innovation.

The NAE (1999) report identified four different ways in which federally funded inducement prize contests can be used to promote technological advancement: 1) *new or best inventions* awarded for the invention of a new technology or technique based on a specified technical objective 2) *new applications* awards offered to anyone who can extend an existing technology to meet a new objective 3*) performance improvement awards* offered for improving the performance of an existing product 4) *technology diffusion* offered to those who help a new technology spread in the marketplace (e.g. through sales or production activities).

One of the recommendations coming out of the NAE led workshop was that limited experiments should be encouraged among federal departments that sponsor research and technology development in science and engineering (NAE, 1999). Based on this recommendation, Congress authorized limited use of Prizes in 2003 (Stine, 2009), and pilot programs were set up in a small number of science and technology oriented departments and agencies.

The first prize contest referred to as the Defense Advanced Research Projects Agency (DARPA) Grand Challenge was launched in 2004 under authorization of the *Bob Stump National Defense Authorization Act* for Fiscal Year 2003 (H.R. 4546, Sec. 2374b) (Stine, 2009). The focus of this Grand Challenge was to advance research and development in unmanned combat vehicles that could navigate intelligently and save American lives on the battlefield. A $1 million dollar prize was offered to the individual or team who could conduct a successful field test under prescribed conditions. The price went unclaimed as none of the 15 finalists were able to get their vehicles over the difficult desert route. In 2005 the second DARPA Grand Challenge was hosted with the same objective of designing and testing an unmanned combat vehicle, this time increasing the prize amount to $2 million and changing the route for the field

test. The prize was won by the Stanford racing team with the fastest time out of the five teams that completed the prescribed route (DARPA, 2007). The third prize contest titled the DARPA Urban Challenge was launched in 2007, and involved the safe manoeuvre of unmanned vehicles in high traffic areas. Prizes were awarded to three winning teams out of eleven qualifiers (Stine, 2009).

The next agency to launch prize contests was NASA under the Centennial Challenges program launched in 2005 (NASA, n.d.). NASA sought to drive progress and solve technical problems in aerospace technology by inviting participation from independent inventors, student groups and companies. The Power Beaming Challenge was launched in 2005 and continued in subsequent years until a winner was announced in 2009 (NASA, n.d). The focus of this challenge was to wirelessly power mechanical devices so they could propel themselves up a vertical cable. The technology could allow NASA to remotely propel rovers and other instruments on the moon. A prize was awarded in 2009 to LaserMotive LLC of Seattle, Washington (NASA, 2009). The Strong Tether Challenge was launched in 2006 and offered a prize of $2 million for the design of very long, strong cables with higher than normal strength to weight ratio. Contests were held every year (except 2008) with no team claiming the prize to date. Other past prizes offered under the NASA Centennial Challenge program include the Astronaut Glove Challenge launched in 2009 and awarded in 2010, and the Green Flight Challenge sponsored by Google in 2011. Competitions were managed on behalf of NASA by third party non-profit organizations.

The Department of Defense launched the $1million Wearable Power Prize Competition in 2007 under authorization from the *John Warner National Defense Authorization Act of 2007* (P.L. 110-36) (Stine, 2009). The objective was to develop a lightweight, long-endurance power

pack to be used by war fighters in the field. Six finalist teams were selected from 169 registered entries, and the prize was shared between first, second and third place winners (US Department of Defense, 2008). Other agencies which launched pilot prizes during that period include the Department of Energy (DOE), and the Biomedical Advanced Research and Development Authority (BARDA) which falls under the jurisdiction of the Department of Health and Human Services (HHS)[1].

3.3 US Open Government Initiative – White House

More widespread use of prizes in the US federal government was introduced as part of the Open Government initiative of the Obama administration. On his first day of office in January 2009, President Obama signalled his administration's commitment to creating unprecedented level of openness and transparency in government. In a memorandum issued to all heads of departments and executive agencies he identified transparency, participation, and collaboration as the three cornerstones of his open government initiative. He also highlighted the critical role of openness in strengthening democracy, efficiency, and effectiveness in Government (White House, 2009a). This was followed by an Open Government Directive issued by the Office of Management and Budget (OMB) in December 2009, which mandated executive departments and agencies to advance their open government initiatives and to set goals and deadlines for action. The OMB reiterated its commitment to helping agencies find cost-effective and innovative solutions through the use of contests and challenges, thereby promoting the open government initiative (White House, 2009b).

[1] For a complete list of Prize Competitions prior to 2009 see Stine (2009)

3.4 America Competes Reauthorization Act 2010

In January 2010 the US Congress passed the "America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act" commonly referred to as the "*America COMPETES Reauthorization Act of 2010*". The stated objective of the Act was "to invest in innovation through research and development, to improve the competitiveness of the United States, and for other purposes" (America Competes Reauthorization Act, 2010). The Act gave broad authority to agencies allowing them to run prize competitions, with the objective of it being used as a standard tool to help agencies "spur innovation, solve tough problems, and advance their core missions" (White House, 2012). The Act outlined the legal and operational framework under which contests could be implemented by federal agencies. It addressed issues such as types of challenges, participant eligibility, government liability, intellectual property and post implementation reporting guidelines, among other things. It also specifically identified the role of the General Services Administration (GSA) in providing administrative assistance to help agencies in their preparations to implement prize competitions. Within 180 days of the enactment, GSA was expected to help further agency efforts by facilitating the government wide sharing of best practices, and provide access to relevant products and services through the development of a contract vehicle, and provide technical assistance in planning and implementation of challenges (America Competes Reauthorization Act, 2010).

3.5 Challenge.gov Platform

In March 2010 the OMB provided specific guidance and instructions to agencies on the projected use of challenges and prizes (simply referred to as challenges). Agencies were encouraged to make use of this tool as a means to further their mission and the principles of open

governance (White House, 2010). They were instructed to increase their capacity to support, design and manage prizes, and to proactively identify and address any legal, regulatory or technical barriers hindering the implementation of these challenges. In that memo, the GSA was tasked with making available a web-based platform within 120 days which would allow agencies to post challenges and invite submissions from potential solvers. Reiterating the role laid out in the America COMPETES Reauthorization Act, the GSA was tasked with facilitating the sharing of best practices across government in the longer term. They were also tasked with expeditiously providing a contract vehicle where agencies could access relevant products and services to aid their challenge initiatives (White House, 2010). In response to the OMB directive, the GSA selected ChallengePost as the provider for the no cost government challenge platform *Challenge.gov*, after evaluating offers from eight organizations (GSA, 2011a).

The web-based platform *Challenge.gov* was launched in the public domain in September 2010 and served as a central site for all prize contests hosted by federal agencies (GSA, 2011a). The platform is administered by GSA in partnership with provider *ChallengePost*, and is made available at no cost to all federal agencies. The platform facilitates the public broadcast of problems by agencies in the form of contests (also called *challenges*). For each challenge, members of the public or specific groups are invited to submit solutions, which are evaluated by a panel of judges or put up for public vote. Generally the submitted solutions remain in the public domain to allow other users to comment or vote on the various entries. Various combinations of monetary and non-monetary incentives are awarded to the winner(s) of each specific challenge (GSA, 2011a).

After the first year of operation the platform had hosted 115 Challenges from 36 agencies, received 1,515 user submissions, and paid out $38 million in prizes (GSA, 2011b). By the second year the number of contests had increased to over 200 submitted by 47 agencies. According to a report from the White House OSTP (2012), significant new activity had been observed in areas of national priority such as health, veterans' services, and employment.

3.6 Adopting Units

Due to the emergent nature of challenge adoption across the federal government, there are wide variations in the structure of adopting units across agencies and departments. Adopting units vary in features such as composition, place in organizational structure, level of formality and autonomy within the agency. For example in some agencies adoptions follow the formal structure of the agency and is contained within functional divisions, while in other cases adoption is informal and based on collaboration across functional divisions. A small number of agencies have a centralized approach where one person or unit is formally charged with the responsibility of planning and managing all challenges in partnership with the relevant functional units. However, the majority of agencies have a decentralized approach where functional units and individuals take full responsibility. Some challenge managers were (formally or informally) appointed by administration, while some voluntarily took up the responsibility of leading the initiative due to professional interests or functional overlap. Duties were sometimes carried out by designated personnel acting alone or with the support of external contractors, and in other cases they were added on to regular professional duties. The number of projects executed per adopting unit ranged from a onetime occurrence to a portfolio exceeding 10 projects per year.

The next chapter presents the research methodology.

4 Methodology

This chapter starts with the philosophical perspective that guided the research and explains the various choices for the research design and strategy.

4.1 Research Philosophy

The way a researcher conducts an inquiry is influenced by the way he/she views the world (Schutt, 2009). This study is guided by the interpretive perspective which postulates that reality is socially constructed, and the main aim of social science research is to understand the meanings that people give to that reality (Schutt, 2009). Interpretivist researchers believe there is no one single reality, but rather multiple realities which represent different interpretations of a single event (Merriam, 2009). In direct contrast positivist researchers view reality as objective and concrete, which can be observed and measured with scientific methods (Schutt, 2009). Therefore the underlying objective of interpretive research is not to 'find' knowledge, but to construct it (Merriam, 2009).

I selected the interpretivist perspective primarily because of the exploratory nature of this research. The main objective of the study was to get an understanding of the reasons and conditions that influenced an agency's adoption of challenges as a tool to spur innovation. As an emerging phenomenon I thought it was important to gain an understanding of the situation from the perspective of the human actors involved in the process, rather than imposing explanations developed in some other external contexts (Orlikowski & Baroudi, 1991). This perspective placed value on the experiences of the public employees and how they interpreted what was happening within their respective agencies. This I believed would present a more realistic picture of what was actually happening.

Interpretive research also recognizes the researcher as an actor in the process which is being studied and capable of interpreting what they see and hear in the field (Miles & Huberman, 1994). I therefore acted as an instrument for data collection and analysis by collecting and interpreting data directly from participants (Merriam, 2009). This had an advantage because at any time during the interview I could respond or adapt immediately to the situation at hand. For example I was able to ask clarification questions, summarize and interpret responses, and get verification and feedback from participants (Merriam, 2009). I felt this perspective was ideal as it recognized that as a researcher I was not coming into this study as a blank slate. My several years of work experience in implementing and managing public sector innovations could enhance my understanding and interpretation of the data collected. However I also had to be mindful that I did not bring any preconceived biases to the aanalysis and interpretation of results (Patton, 2002). In this case bias was not an issue since my experiences had been in another country and I had no personal interest or benefit in the outcome of this study. Further, the use of informants from many different agencies helped ensure that multiple views were captured, reducing effects of any potential personal bias.

4.2 Qualitative Research as a tradition of Interpretivist perspective

Interpretivist researchers employ qualitative research methods which capture people in their natural settings (Lincoln & Guba, 1985). The term 'qualitative' suggests an emphasis on the *qualities* of the entities and processes studied, as opposed to quantities and intensity measured by quantitative methods (Denzin & Lincoln, 2000). Qualitative research focuses on understanding how social experiences are created and how they are given meaning by the participants (Denzin and Lincoln, 2000, Merriam, 2009). This makes it an ideal approach for exploring disparities in the number and types of challenges being adopted and implemented by

the various agencies. Therefore I used qualitative inquiry to understand why and how challenges were being implemented in each agency, and more importantly to understand the differences.

4.3 Research Design

The inquiry took the form of a single-case study of the challenge.gov web platform. Data was collected from multiple early adopting agencies that hosted challenges on challenge.gov during the first two (2) years - September 2010 to August 2012. The two primary sources of data were: i) interviews with challenge managers, planners and administrators, ii) archival listings of challenges from the challenge.gov web platform. Related documentation from reports, policy documents and websites were used to supplement and corroborate the main data. Below I provide details and justification for various components of the research design.

4.4 Case Study

Benbasat, Goldstein, & Mead (1987) advocated the case research strategy for studying organizational innovation. This he felt provided the opportunity to capture knowledge directly from practitioners which could then be used to develop theory. Eisenhardt (1989) also highlighted the importance of using case study evidence to generate theory. The case study strategy is suitable for this study because the objective was to understand and explain major events and conditions related to the adoption and implementation of challenges as an organizational innovation. An expected outcome was to offer a tentative theory based on the data collected.

Other justification for using the case study approach is provided in Yin's (2009) guidelines for when a case study is the preferred method. The first condition identified by Yin (2009) relates to the type of research question that is asked. Research questions that ask "how" or "why" suggest an objective which is explanatory, and deals with tracing operational links over

time. He contrasts these to "who" and "where" and certain "what" questions which suggests descriptive or predictive goals, and are more likely favor survey methods. This guideline speaks directly to this study's intention to understand and offer an explanation for how challenges are being adopted and implemented. The three research questions ask "how", for example: 1) *How* are federal departments and agencies using challenges, and how do challenges differ in terms of the level of innovation involved? 2) *How* do agencies adopt and implement Challenges? 3) *How* do the various adoption and implementation factors influence the type of innovation enactment of the implementing agency?

The second and third conditions identified by Yin (2009) where case study is a favored method refers to a need to manipulate events, and the level of control the researcher has over research conditions. For example a case study is appropriate where conditions do not need to be manipulated as in experiments. For this study I was interested in understanding how the different events and processes occurred in their natural setting, and was not interested in manipulating the conditions or events. For the third condition Yin (2009) identified case studies as the appropriate choice for studying contemporary events and practical problems. At the time, the challenge.gov platform was less than two (2) years old, and the practices in the various agencies were still emerging.

4.4.1 Case Selection

A case can be described as an integrated system (Stake, 1995) which is bounded by some common obvious boundary (Merriam, 2009). An important first step in any case study is to identify the case boundaries (Merriam, 2009). All federal agencies adopting challenges under the Open Government Initiative are required to list their challenges on the centrally administered *Challenge.gov* web platform. Challenge.gov therefore provides a visible boundary for the case.

Selection of this particular case for study was in line with the guidelines articulated by Stake (1995). For example, he advocates that the first criterion for selecting a particular case is that it enables us to maximize what can be learnt within the limited time available. Further, selection may also be based on the need to get understanding and insight into a particular situation or question. Accordingly, this case provided an ideal opportunity to get direct exposure and insight into how federal agencies were adopting this new approach to problem solving and innovation. Stake (1995) also advised that we should select cases which are "hospitable to our inquiry" and provide easy access to willing participants (p4). This was one of my primary motivators for selecting this particular case, as the administering agency the General Services Administration (GSA) was very interested in the results of the study. They agreed to give full access to case related data such as contact information for potential participants, documentation, and invitation to activities related to the case in exchange for a report on the findings.

Case design may be either single or multiple depending on the situation at hand. According to Yin (2009) single-case designs are sometimes considered to be vulnerable because everything depends on this one case, in comparison to multiple case designs which are considered to be more robust. However there are situations where single-case designs are appropriate and justifiable such as when the case is unique (Yin, 2009). This case is unique because of the unprecedented and unique nature of the Open Government Initiative. To date this represents the biggest policy push to adopting challenges as an innovation tool in public sector agencies. The policy is being promoted from the highest levels of the US Federal Government and has been accompanied by legislation and allocation of specific resources.

Another justification for the appropriateness of single case designs can be found in Stake's (1995) categorization of *intrinsic* case studies. He describes an intrinsic case study as one where the case itself is of primary interest, and is selected because the researcher wants to know more about the specific case, and not for its ability to represent other cases. In this situation my interest is in understanding and explaining the adoption and implementation of challenges among US Federal agencies. I consider this an intrinsic case study because the phenomenon is tied to the context. The intended outcome is to offer a conceptual framework to represent this specific case, not to build general theory.

4.4.2 Unit of analysis

This is a single case study of challenge.gov with multiple adopting units. The presence of sub-units provides an opportunity for rich analysis and better understanding of the case, as data can be analyzed separately within each sub-unit as well as across all the sub-units (Baxter & Jack, 2008). Interview data was collected and analyzed at the level of the sub-unit (adopting unit.

4.5 Data collection

Case studies usually have multiple sources of evidence such as interviews, documents and archives, and observations (Denzin & Lincoln, 2000; Eisenhardt, 1989). The main data sources were interviews with challenge managers, planners and implementers; and archival listings on challenge.gov web platform. Documentation related to the open government initiative and the challenge initiatives were used to corroborate and supplement the main data sources.

4.5.1 Archival data from Challenge.gov

I collected data from the challenge.gov web platform in two phases. The first phase was conducted in January 2012 and involved one hundred and forty three (143) challenge listings posted on the platform from its launch in September 2010 until December 31 2011. The second phase was conducted in September 2012 and involved an additional sixty (60) challenges which had been added to the site from January to mid-September 2012. This brought the total number of challenges hosted on the platform from inception to the second anniversary to just over two hundred (200).

Challenges were listed on the site in reverse chronological order. The listing for each challenge was represented by an image and basic identifying information such as name, agency, prize value, and submission deadline. Each listing had a link to more detailed information such as objectives, background, narrative descriptions, and submission and judging details. Though the descriptions had a standard layout, there were variations in the level of details provided by different host agencies. For each phase of data entry I manually entered basic identifying information for each challenge into an electronic spreadsheet. Each row represented a separate challenge listing and each column represented an attribute. Some attributes represented qualitative data such as description, objectives, and submission type, while others represented quantitative data such as prize value, contest dates and number of submissions.

Some challenges were hosted entirely on the challenge.gov platform, so that all related data from announcement, submissions, judging, and prize awards could be found in one central location. For others the platform was used solely to announce the contest, and third party sites were used for managing submissions and judging.

4.5.2 Interviews

In a case study interviews are essential to get descriptions and interpretations of what we cannot observe for ourselves from others (Stake, 1995) and to find out information from someone else's mind and understand their perspective (Patton, 2002). Interviews allowed me to discover the multiple realities and viewpoints from the perspective of the challenge managers and administrators (Stake, 1995). It was important to get their perspectives because I wanted to understand the intentions and motivations driving adoption as well as their various experiences during implementation.

4.5.2.1 Preliminary Interviews and data gathering

I made initial contact with the relevant GSA officers in August 2011 through a member of my dissertation committee. Over the next few months we conducted a series of preliminary discussions and informal interviews via telephone and email, to help get a better understanding of the initiative and how it had progressed to date. I then formulated and shared a high level outline of the objectives and expected outcomes of the proposed research to ensure there was an overlap between my objectives and theirs. Over the next few months we held additional informal interviews and discussions as I refined the research proposal. The GSA officers were very keen on the proposed research and agreed to provide the necessary endorsement and access to research data and participants.

Additional preliminary data gathering took place in March 2012 at a challenge Meet and Greet event in Washington DC organized by the GSA challenge team. During the proceedings I conducted brief preliminary interviews with twelve (12) participants representing challenge programs from different agencies. I enquired about the background and current status of initiatives at their agencies, and some of the major hindrances they faced. I took handwritten

notes which I used later to modify the research questions and provide direction for the literature review.

4.5.2.2 Sampling and Recruitment for main interviews

Purposive sampling refers to the practice of selecting a sample from which the most can be learned (Merriam, 2009). I thought that the most could be learned by capturing data from as many agencies as possible, and employed a *comprehensive* sampling strategy where every unit of interest is selected for data collection (Miles & Huberman, 1994). The challenge.gov program managers provided contact names and information for the challenges listed on the challenge.gov platform. I sent out individually addressed email to potential participants from fifty one (51) adopting units, introducing the study and soliciting their participation *(see appendix for recruitment email)*. For those who responded and were willing I set up appointments for an interview at their convenience. For those who were not immediately responsive I followed up with a second email, followed by a telephone call if still not responsive after two weeks.

As recruitment activities and interviews progressed I noted that it would not be possible to interview all players within the projected time frame since some remained non-responsive even after follow-up emails and phone calls. As a result I had to adjust the sampling strategy to make it more purposive and ensure that I had representatives from the now emerging theoretical groupings based on frequency of executions. The adjustment of sampling strategy is not unusual in qualitative studies and Strauss & Corbin (1998) caution that sticking too rigidly to the set sampling procedure can have negative effects on creativity and the analytic process. At this point I targeted certain programs on both ends of the spectrum: large numbers of challenges (e.g greater than 10) as well as infrequent implementers (3 or less).

The final sample consisted of 36 interviewees representing 31 adopting units. Table 1 lists the number of challenges and interviewees by agency. These interviewees included mainly challenge managers, contractors, and overall administrators. Some of the units (3) were represented by two respondents who agreed to do joint interviews.

4.5.2.3 Interview Procedure

I conducted interviews during the period May to October 2012. Each interview lasted approximately 45 minutes to one hour, and was conducted face-to-face or via telephone as logistics permitted. This was a study involving human subjects and I sought and obtained Institutional Review Board (IRB) approval (see Appendix) before commencement of interviews. All participants received information on the objectives of the study and were given an opportunity to ask questions or seek clarification prior to the interview. I also sought permission to record interviews while ensuring participants of anonymity and confidentiality when reporting results. I recorded interviews using a hand held digital recorder, and in two cases where permission was not given to record I used handwritten notes. All participants received an informed consent form and were given the opportunity to opt out of the study with no consequences.

Executive Agencies and Departments Implementing Challenges	No of listings on challenge.gov	No. of Interviewees
US Department of Agriculture	4	
Center for Nutrition Policy and Promotion	1	
Forest Service	1	
National Institute of Food and Agriculture	1	1
US Department of Commerce	1	
US Patent and Trademark Office	2	
US Department of Defense	11	
Air Force	12	2
Army	1	
Navy	2	1
National Security Agency	1	
US Department of Education	6	2
US Department of Energy	8	1
US Department of Health and Human Services	14	2
Administration on Aging	1	
Centers for Disease Control and Prevention	6	
Centers for Medicare & Medicaid Services (CMS)	1	
Let's Move Faith and Communities	1	
National Institute of Health	6	2
Office of the National Coordinator for Health Information Technology	21	2
Substance Abuse & Mental Health Services Administration	3	1
US Department of Homeland Security		
Transportation Security Agency (TSA)	1	1
Federal Emergency Management Agency(FEMA)	1	
US Department of Housing and Urban Development	1	
US Department of Justice		
National Institute of Justice	1	1
US Department of Labor	5	1
Occupational Safety and Health Review Commission	2	
US Department of State	2	1
US Department of the Interior	1	
National Park Service	1	
US Department of the Treasury	3	
US Department of Transportation	8	2
Distraction.gov	1	
US Department of Veterans Affairs	4	2
Executive Office of the President		
The White House	3	
Council on Environmental Quality	1	
Independent Agencies		
Consumer Product Safety Commission (CPSC)	1	
Corporation for National and Community Service	5	1
Election Assistance Commission	1	
Environmental Protection Agency (EPA)	15	3
Federal Communications Commission (FCC)	3	
General Services Administration (GSA)	4	3
National Aeronautics and Space Administration (NASA)	20	3
National Archives and Records Administration (NARA)	2	1
National Science Foundation (NSF)	4	1
Small Business Administration (SBA)	7	1
Social Security Administration (SSA)	1	
US Agency for International Development (USAID)	3	1
TOTALS	205	36

Table 1: Number of Interviewees by Agency

4.5.2.4 Interview Protocol

The interview protocol was developed using the research questions and sensitizing concepts selected from the literature as a guide. Development of the protocol was an iterative process involving several rounds of revisions after consultation with committee members, GSA program officers, and pretesting with two challenge managers. Questions were open-ended and followed a semi-structured format which allowed for exploration of main themes from the literature, while allowing flexibility to explore emerging themes and new ideas. Questions focused on the processes, enabling and hindering conditions, outcomes, lessons learned, and recommendations. Plain language was used to make questions easy to understand, and care was taken to avoid technical jargon and concepts directly from the literature (Merriam, 2009).

Questions were organized into six (6) major groupings described below (See appendix for entire protocol).

a) **Background Information**

The first set of questions served as a warm-up for the interview and helped establish basic facts about the respondent and the implementing unit. Questions enquired about respondents' educational and professional background, and their role within the organization. It also enquired about the mission and operations of their agency and implementing unit.

b) **Agency Innovations**

In this section the questions focused on general innovation practices including common sources of motivation and inspiration to innovate.

c) Decisions/Processes

This section captured critical data on reasons for the decision to adopt, enablers, and hurdles. It asked participants to recall specific challenges and recount their motivation for adopting, and the nature and level of decision making required. It also probed into specific enablers and hurdles identified in Chapter 2 as sensitizing concepts. These include: special initiatives and organization commitment, management support, rules and red tape, attitude of colleagues and NIH syndrome. Questions also probed into alternatives routes that were considered, challenges abandoned along the way, other hurdles, and surprising incidences encountered.

d) Lessons Learned and recommendations for public managers

The last section of the instrument asked participants to reflect on their experiences and to offer recommendations based on their assessments. It solicited personal opinions on effectiveness of the method, and the types of problems that were suitable. Some questions used repetition to ensure that the most salient points were captured, and participants were asked again to reflect on the most important enablers and hurdles.

e) Opportunity for additional information

At the end of the interview there was an opportunity for the respondent to add anything pertinent that did not come up in the interview. There was also an opportunity to ask questions or seek clarification on anything concerning the research project.

4.5.3 Documentation and web resources

In case study research documents play an important role in corroborating and supplementing data from other sources as well as providing leads to other sources of data (Yin 2009). I consulted various forms of documentation such as reports, press releases, agency and provider websites, blogs, YouTube videos and social media pages to help corroborate and supplement data from challenge.gov listings and interview data.

Concerning archival data collection on challenges, the non-standard layout of external sites led to many instances of missing or difficult to locate data. I relied extensively on related documentation such as agency websites, media announcements, articles and blogs to locate any missing data. For the analysis and categorization of challenges there were many cases where I had to rely on reports and media releases to supplement data and provide insight into initial goals, plans and outcomes.

I used agency websites and the social media platform LinkedIn to collect background information on interviewees prior to the interview. I also used documentation from agency websites and media releases to supplement and corroborate interview data concerning planning and execution of prominent challenges. I also used repositories of reports and policy documents found on websites of agencies such as Department of Health and Human Services (HHS), NASA Center of Excellence, GSA and the challenge.gov Listserv to help provide a more complete picture of processes, guidelines and trends for challenge execution.

4.6 Data Analysis

Qualitative analysis is a highly intuitive process which is creative, dynamic and iterative (Taylor & Bogdan, 1998) Throughout the analysis I was constantly trying to refine my interpretations (Taylor and Bogdan, 1998) by going back and forth between the data, emerging themes and the literature. First I analyzed the archival listings of challenge.gov and then moved to coding and analysis of interview data.

4.6.1 Analysis of archival data from web platform

I collected and analysed data from the platform in two phases which were eight months apart. Initial steps involved browsing through the list of challenges looking for repetitions and common themes to help identify common attributes which could inform the classification process. I closely examined each column of attributes such as description, objectives, submission requirements, judging criteria and prize value. First I compared values of each attribute looking for patterns and variations. As I began to notice similarities I formed loose groupings of similar types and iteratively tried to combine smaller groupings into larger ones. For example in examining the attribute *submission types*, I identified various formats such as video contests, photography contests, logos, mobile applications, data management software for institutions, blueprints, white papers, etc. During the next iteration I combined these smaller groupings into four larger groups: *creativity contests* (posters, video, photos, slogan, logo, etc.); *software products* (mobile and institutional apps); *research papers and ideas*; and *product* (design, prototype, actual product) or working model of a product.

I used the similar method to look for groupings among other attributes. The most prominent groupings were found among the *objectives* attribute, which I was able to link to the *submission*s groupings. For example I was able to link challenge objectives related to public

education and engagement with submission type *creativity contest,* and established similar links among other groups. Then I went a step further in the analysis and placed categories along an innovation continuum by making comparisons among the objectives, descriptions and outcomes of the different groups. The emergent categories and their properties are detailed in the Findings chapter which follows.

Validation and support for the classifications came from three sources: 1) coding was conducted in two distinct phases nine months apart and categories remained stable between phases 2) consultation with one of the GSA program managers for challenge.gov agreed that the representation was accurate and 3) interview data from challenge managers revealed support for the view that not all challenges were equal, and that there were differences in level of sophistication and innovation.

4.6.2 Analysis of interview data

Analysis of the interview data was an iterative process which began during data collection and continued long after data collection was complete. Following Miles and Huberman (1994), after each interview I wrote a memo to document any major thoughts, hunches, ideas which could inform the ongoing data collection and analysis. Recorded interviews were professionally transcribed into word processing documents. For each interview I read through the transcript while listening to the recording. This helped ensure accuracy of the transcript and helped regain some of the context that may have been lost in transcription. I read through transcripts a second and third time and made notes on emerging themes and patterns.

There were two major activities in the analysis i) coding to identify the main activities and decisions of the challenge adoption process and ii) identification of agency groupings. I will first describe the coding and development of the adoption model.

I loaded electronic transcripts into the qualitative data analysis computer software package NVivo 10 along with corresponding memos. I also imported my provisional list of start codes into the software. This list contained eighty six (86) codes derived from sensitizing concepts identified earlier, combined with concepts from the research questions (Miles and Huberman, 1994) and the first set of variables emerging from the data (Strauss & Corbin, 1998). The provisional start list captured presence or absence of concepts from the data such as: employee attitude (NIH syndrome), management support, special funding, dedicated employee, use of intermediaries, organizational red-tape. As I progressed through coding more interviews I was continuously revising the codes to ensure that it reflected the data. For example some codes did not have sufficient segments to fit them and eventually had to be discontinued or combined with other codes, while others with extensive number of segments had to be broken down into sub codes (Miles and Huberman, 1994).

The first level of coding was descriptive and the focus was on naming, labeling and identifying categories and variations within these categories. For example one category was *agency mission*, with variations within that category identified like *public engagement*, *research and development*, *service provision*. Another emerging category was *external trigger* with dimensions *policy*, *exposure*, and *mandate*. I continued identifying categories through several rounds of coding until I felt there were no new categories emerging which were relevant to the research question (Lincoln & Guba, 1985). The final list of codes grew to over two hundred (200) codes (see appendix).

The next level of coding was more analytic and focused on identifying and explaining patterns and recurrences (Miles and Huberman, 1994). At this point I sought to find relationships between the various codes, as well as reasons for these relationships. This involved

looking at the various contexts, circumstances, and intervening conditions under which adoption was likely to take place. Utilizing data displays as suggested by Miles and Huberman (1994), I used a diagram to represent the categories and their relationships. I represented the various categories as boxes and used lines to represent the relationship between them. The diagram went through several iterations and revisions during which time I got feedback and input from colleagues and members of my committee. The final diagram which emerged (chapter 5, Figure 3) represents the various components and relationships involved in challenge adoption and implementation.

After writing memos and reflecting on the first set of interviews I noticed a pattern emerging with two different groups of agencies. In the first group, agencies were adopting awareness type challenges which focused largely on public service announcements and education campaigns. The other group adopted research and solution type challenges related to science and technology related topics. As I continued reading through interviews and memoing, I noticed a third group that seemed to fall somewhere in the middle. That third group of agencies were implementing software application type challenges (service) for use by their constituents. Recalling the typology of challenges and continuum of increasing innovation levels which emerged from analysing the archival list from challenge.gov, I concluded that the three groups of adopting agencies were implementing challenges with varying levels of innovation. With this realization I went back to the literature in search of some similar phenomenon. During this literature search I encountered Orlikowsk's typology where technology adoption in organizations followed three enactment types: inertia, application and change. I was able to identify agencies that fit each type of enactment. From that I was able to build a profile for each enactment type where I highlighted factors from the adoption model such as external trigger, internal motivation,

preparation type. Once I built this profile for each enactment type, I used pattern matching (Yin, 2009) which allowed me to compare new cases. Therefore I was able to group the remaining agencies according to the three enactment types.

4.7 Accuracy and trustworthiness of results

Overall, reliability and generalizability do not feature very prominently in qualitative research. What is more important is ensuring the accuracy (Creswell, 2006) and trustworthiness of the findings (Yin, 2009). Creswell (2006) recommends that qualitative researchers use at least two of the common verification techniques to help ensure accuracy of findings. Triangulation is the most well known strategy of increasing the credibility of research results. I employed data triangulation which involves the use of multiple data sources to help corroborate the findings (Yin, 2009). I conducted multiple interviews to get a wide range of perspectives using people from different agencies and implementing units, and representing different roles such as agency challenge managers and coordinators, program managers, and private contractors executing challenges. There was consistency in the findings regarding the adoption process and influencing factors resulting in the representation of the process and different agency groupings. This consistency provided an indication of validity of findings (Patton, 1999).

Another method to ensuring validity of results was maintaining a chain of evidence by carefully documenting all steps increases the reliability of information gathered for a case study. This makes it possible for an external observer to follow (and replicate if desired) and trace the steps from research questions to conclusion (Yin 2009, p122). The steps for this study have been carefully documented to ensure that proper procedures were followed, and that it can be replicated by another researcher if necessary.

Results are presented in the next chapter.

5 Findings

This chapter presents findings based on the three research questions which guided the study. The first question examined the types of challenges posted by agencies on the challenge.gov web platform. Analysis involved classification of over two hundred (200) challenges into four (4) major categories falling along a continuum of increasing innovation. Research question 2 sought to reconstruct the sequence of events, processes and conditions leading to challenge adoption and implementation. The various components are represented in a diagram followed by the narrative description. Research question 3 examined how variations in the components of the adoption and implementation process result in different enactments of challenges. The three types of enactment used by Orlikowski (2000) - inertia, application and change – are used as a typology to classify the different patterns observed.

Detailed presentation of findings follow.

5.1 Research question 1

How are federal departments and agencies using challenges, and how do challenges differ in terms of the level of innovation involved?

One of the primary objectives of the challenge program was to provide a tool to help agencies innovate. This research question sought to gain deeper insight into how challenges were deployed at the various agencies; and to what extent they were put to innovative uses. For example, one popular way that challenges were used to spur innovation was to create a climate and conditions under which others could innovate:

> *A very central part of what we are trying to do…is to create a climate where a lot of these tools can be developed. But we are a very small team, and we are not so quick to develop the tools ourselves, but we can create a climate and conditions under which tools can be developed then* (Informant 8)

From my preliminary observations of the challenge.gov platform, it was evident that not all challenges were being used to spur innovation. Some were being used to replicate existing practices and maintain the status quo rather than transforming the way of doing things. Some of the more savvy informants articulated observations that some challenges were not meeting the intended innovation goals. They spoke of the need for more carefully selected objectives to allow maximum creativity and target knowledge gaps. The following quotes illustrate views of two participants who stressed that challenges only make sense when there is room for creativity and innovation.

> *I think that if there's a piece of technology that you need and you have very, very clear specifications, and there's not much room for creativity or building in other functionality, if what you need is a key to fit into a lock, then challenges probably aren't the way to go.* (Informant 9)

> *I feel like a challenge really makes more sense when you don't know what the solution is. Like if we want to do some amazing thing and we don't know how to figure it out.* (Informant 22)

Concerning why challenges were not always deployed for innovative uses, a key informant suggested that some agencies were implementing challenges because it was the popular thing to do and they did not want to be left behind.

> *…it's a new thing that a lot of people are trying, and people don't want to be left out or left behind, so they feel like well, I better try this too. And, I'd better show my management that I'm thinking about this before they come to me. So, government personnel just want to show their leadership hey, we're thinking about this and we're trying to get this going*….(Informant 24)

Some also felt that there was tremendous pressure on agencies to implement regardless of the nature of, or appropriateness of the problem:

> *I think there can be value in giving outside perspectives to solve problems. And that challenges can be a valuable tool for solving those problems. I think for some time now, since challenges have become a bigger thing in government, there's pressure to do challenges, whether or not you really have a problem that a challenge makes sense as your way of finding the solution* [..]. . *I guess that they have a place, but there's been a push to do them, just to do them*. (Informant 22)

The differing perspectives on why challenges are not always used for innovative means are summed up in the following quotes. The first quote identifies a fundamental lack of understanding for challenges as the main reason.

> *There is a lack of fundamental understanding of how challenges work and where, and how to create them in a way that might actually meet your goals, and what kind of issues lend themselves to being solved through challenges.* (Informant 35)

The second quote has a more opportunistic outlook that agencies are 'playing it safe' because the program is still new and not fully accepted. However, once fully accepted it would potentially draw riskier but more innovative uses.

> *Given that there were a lot of eyes on this program, a natural inclination is to play it safe. And I think that once challenges are more accepted, and more part of the norm across government, there will be more space to take on those larger challenges. Challenges that are higher risk, but also potentially higher reward* (Informant 9)

The remainder of the question examines the actual manner in which challenges have been used among the various agencies.

Challenge Categories

Following qualitative analysis of over two hundred (200) challenges listed on the challenge.gov platform, I identified four (4) distinct categories. The categories represented varying patterns in objectives and complexity of problems addressed. The majority embraced an element of public education and outreach. These required minimum skills to participate, produced low innovation and made minimum contribution to agency operations. At the other end of the spectrum there were some complex problems which required specialized training or skills to solve, produced higher levels of innovation, and made more significant contributions to agency operations.

Following this I arranged the categories along a continuum of increasing levels of innovation based on my perceptions of the level of novelty required for the solution, as well as level of specialized skills and knowledge required to solve. The largest category (*awareness)* focused on public service announcements and education campaigns, which generally represented lower levels of innovation. The *operational* category focused on functional outcomes resulting from new or extended knowledge and represented the highest innovation level. *Service* and

research categories fell at different points in between, with *service* representing a slightly higher level.

Below I present a profile of each category accompanied by examples and quotes. The examples have been extracted from archival listings on challenge.gov and identify challenge name and agency name. The quotes were extracted from interview data and were used to support placement of the various categories along the innovation continuum. In order to maintain anonymity of interviewees, the highlighted challenge examples did not coincide with quotes from interviews.

5.1.1 Awareness

Challenges in this category had a mandate to inform, sensitize or educate on topics with wide public appeal such as the community, health, and the environment. Participation usually involved submission of creative products such as videos, posters, photos, slogans, logos, and to a lesser extent nominations for recognition awards. Minimum skills were required for participation, translating into low barriers to entry and low innovative outcome. The general public was usually the main beneficiary, though in some cases specific groups were targeted. Awareness challenges represented forty percent (40%) of total implementations, making it the largest category.

Name of Challenge	**Agency**	**Contest Objective** *(extracted directly from challenge.gov)*	**Description** *(extracted directly from challenge.gov)*
National Radon Poster Contest	Environmental Protection Agency (US EPA)	Raise radon awareness in schools using posters	Engage student leaders in raising radon awareness through their *posters* among their family, school and community
Youth Sustainability Challenge: Creating An America Built to Last	Council on Environmental Quality	Raise awareness of young people on practices to foster sustainability in the US and the world at large	Create a *video t*o tell the world what you are doing in your community to foster sustainability and create an America and a world built to last
Picture It! Safe Workplaces for Everyone	Occupational Safety and Health Administration (OSHA)	Kick off a national collaboration that relies on talent, imagination and creativity to raise awareness of workplace safety and health	Capture an *image* of workplace safety and health and share it with the OSHA
Stop Bullying Video Challenge	Department of Health and Human Services	To help prevent and end bullying in schools and communities across the nation.	Create a *video* to tell us how you can be more than a bystander and help kids who are involved in bullying
Absentee Voting Slogan Contest	Department of Defense, *Federal Voting Assistance program*	Promote absentee voting by the Uniformed Services, their families, and U.S. citizens residing outside the United States.	Create a simple *slogan* (or slogans) that express the importance of voting and will inspire others to vote.
Two-Second Turnoff Distracted Driving Video Challenge	Department of Transportation, *National Highway Safety Administration*	Bring awareness to distracted driving	Create a *video* with a Public Service Announcement against distracted driving and post it on YouTube
HBCU Mental Health Promotion Campaign 2011	Substance Abuse & Mental Health Services Administration	To utilize the creative talents of Historically Black Colleges and Universities (HBCU) students to produce a communication campaign to raise awareness and education about mental health, its impact on the overall well-being of students and associated impacts on academic performance.	Produce a *communication campaign* to raise awareness and education about mental health, its impact on the overall well-being of students attending Historically Black Colleges and Universities (HBCUs) and associated impacts on academic performance.

Table 2 Examples of Awareness Type Challenges

One informant who previously ran a video contest expressed the view that many of these contests did not solve any specific problem, an indication of its lower ranking on the innovation scale:

> *Video challenges to me seem like a contest. There's not really a problem to solve, it's just we're saying we want you to make a video on a topic, and give some money to the best one. It's like do you really need the videos? If you really wanted the videos, why not have that specially created. I guess I can see the value of having the public submit videos, but what is that really solving?* (Informant 22)

Another informant who ran several large scale challenges saw awareness challenges as an important starting point for agencies to learn from, though advocating progression to more sophisticated types.

> *I think it's worthwhile for everybody to get their feet in the water, to try these things out, but to try to do things a little more sophisticated than poster competitions and video competitions, things like that. I think, that's a great place to start, but they would be wasting an opportunity if they got stuck there.* (Informant 26)

Another expressed excitement over the prospect of moving from awareness challenges to larger more innovative projects, which was the ultimate goal:

> *I think it's exciting as we move from small scale videos and apps to larger sort of point solution challenges….* (Informant 8)

Examples of Awareness type challenges extracted from challenge.gov are listed in Table 2.

5.1.2 Research

These challenges sought ideas to expand industry knowledge on particular topics, and in some cases foster development of new technologies or products. Topics were usually science and technology related. The targeted participants had to have knowledge and understanding of the field, but did not necessarily need practical experience. Submissions were sought in the form of white papers, conference papers, idea submissions, and usually required some form of

research or new knowledge, but did not require operationalization. This was the smallest category and contained fourteen (14%) of the total number of challenges.

The challenges in this category can be considered more innovative than awareness challenges because they involve the discovery of new knowledge or ideas. However the level of innovation is limited because the solicitations focus on the discovery and presentation of the new knowledge. Neither the hosting agency, nor participants seemed particularly interested in immediate application of that knowledge to solve any identified problem. The following illustrates:

> *The way the challenge was set up was to invite ideas for other ways to use [new technology name]. Assuming that it's out in the world, which we're not certain of, but if it were, what should we do with it? So there's what we call an ideation challenge, which is to say, we just want to know your thoughts, just a white paper.* (Informant 16)

The next illustrates one common example of research challenges which involved the search for ideas on how to jumpstart a particular type of software development.

> *It wasn't a problem that we were facing; I wouldn't describe it that way. We are trying to jumpstart data application development across the country. And so we put out a (notice) that encourages the researchers in the universities and colleges across the country to submit a white paper to us, and then we would look at it and see if the ideas are good or not, and if they were, we would ask them to submit a bigger proposal to us. But that doesn't really reach into the open source developer community. So in order to reach out to the hundreds of thousands of open source developers, to hold a competition would be a better approach. So, we're doing both simultaneously. We still want to reach out to the universities and the researchers that are there, but we want to reach out to anyone who has a great idea for [project name], and we don't care where the persons are located. We really want to get the best ideas.* (Informant 32*)*

Generally the objective of research challenges was not for the internal use of hosting agencies, but rather to expand knowledge and jumpstart use of new technologies in industry. The following quote describes the agency's intention of encouraging research on a particular type of material, which can then be used by practitioners to manufacture commercial products.

> *What we're trying to do is spur innovation. We are not trying to create something that we can hold and use and be the proprietors of. We want this to be something that can be used by the public. We will maintain rights to use it within the federal system, but the developer has the right to continue developing it, or to sell it to do whatever they want. Because we're obviously not in the business of making money. We just want to get the feel, pushing in this direction, because there's a need among the practitioners, and we'd like to have people focus on that.* (Informant 30)

Examples of Research type challenges are listed in Table 3.

Name of Challenge	**Agency**	**Contest Objective** *(extracted directly from challenge.gov)*	**Description** *(extracted directly from challenge.gov)*
DTIC Student Paper Competition	Department of Defense; *The Defense Technical Information Center (DTIC)*	-To promote the generation of new ideas and the conduct of new research in areas of strategic interest to DTIC -To promote understanding of DTIC's mission and program among information professionals	Defense Technical Information Center (DTIC) solicits student papers for consideration on the agenda of its annual conference
NIH Lessons About Bioscience (LAB) Challenge	National Institutes of Health	Contribute to collection of engaging, inexpensive experiments for students from kindergarten through high school	Help us bring cool experiments into the classroom so everyone can enjoy doing science! Submit written procedures of experiments. The best experiments will become part of an official collection that NIH will distribute for free in print and electronically.
StartUp Amarica Policy Challenge	The White House	Help knock down barriers to innovation and entrepreneurship in health care IT, clean energy, and learning technologies	Potential entrepreneurs post barriers to growth of their business, and members of the public submit ideas for potential solutions.
Connected Vehicle Technology Challenge	Department of Transportation, Research and Innovative Technology Administration (RITA)	Solicit ideas that will help build the transportation system of the 21st century	With new wireless technology, vehicles can "talk" to each other. The DOT challenged the public to submit white papers to share ideas for what vehicles should say to each other.
Sponsoring Scholars in Science	Navy, *Office of Naval Research (ONR)*	-Stimulate K-12, higher Ed and educational research initiatives designed to heighten student interest in the STEM disciplines. -Growing the pipeline of future scientists and engineers for the naval workforce.	Present white papers aimed at generating innovative projects that cultivate student interest and participation in science, technology, engineering and mathematics (STEM). Each winner will receive a research grant worth up to $100,000 to further develop their proposal.

Table 3 Examples of Research Type Challenges

5.1.3 Service

The objective of these challenges was to initiate or improve delivery of government services by facilitating production of software tools and other methods. Software tools included applications for institutions providing public services and mobile applications to facilitate public access to government services. Other objectives included promoting the use of publicly available datasets and spurring entrepreneurship and industry around provision of a service. The target audience generally consisted of software developers and enthusiasts. This represented the second most common type of implementation and accounted for twenty six percent (26%) of the total.

The following quote illustrate the use of a challenge for the development of software applications to help consumers. The reason I classify these service challenges as slightly more innovative than research challenges, is that they go beyond solicitation of ideas, and result in an end product that can be used for public benefit.

> *… this is where the prizes and challenges come in. Because of many of the new and sophisticated tools, like social media platforms. We the government are not so advanced in developing these. So what we have is a lot of raw data. And much of why we are interested in prizes and challenges, is because we are trying to incite, promote, sort of leverage the talent, skills, and knowledge of those outside of the department. Those who can help build tools using those platforms that help consumers and physicians and researchers, and so on, access [agency name] data for the purposes of improving their health. (*Informant 8)

> *So we try to get challenges that have high operational impact, and strategic value. And what I mean by that is we don't want ideas for changing the color on our logo. We want how do we enhance the customer experience at […] which is a really important issue. So we don't want fluffy challenges we want real impact.* (Informant 31)

Name of Challenge	**Agency**	**Contest Objective** *(extracted directly from challenge.gov)*	**Description** *(extracted directly from challenge.gov)*
US DOT Motorcoach Safety Data Student Challenge	Department of Transportation; *Federal Motor Carrier Safety Administration (FMCSA)*	Seeking fresh ideas and innovative solutions to make vast amounts of data easier to access and understand for motorcoach travelers	Create an online or mobile application product to translate safety data into a web-based or mobile application that helps bus travelers quickly choose the safest bus available.
Apps for Entrepreneurs	Small Business Administration	Give small businesses and entrepreneurs better tools to navigate the Federal Government more effectively	Create apps to help small businesses and entrepreneurs identify useful programs and services on federal government websites
Electronic Health Record (EHR) Accessibility Module Challenge	Office of the National Coordinator for Health Information Technology	To promote accessibility and usability in health IT for the disabled community, and significantly improve the health of disabled individuals.	Create and test an application that makes it easy for disabled consumers to access and interact with the health data stored in their EHRs.
Apps for Energy	Department of Energy	Help homeowners and businesses take action, understand their usage and make better-informed decisions.	Create new apps that help utility customers make the most of their Green Button electricity usage data.
CDC Flu App Challenge	Centers for Disease Control and Prevention	To promote healthy behavior for flu prevention by introducing the software development community to those resources, and generating useful and innovative solutions with those data	Use CDC flu data to develop an innovative mobile or web app, data visualization, system, tool, or game.
Department of Commerce Business App Challenge	Department of Commerce	To help businesses identify opportunities, grow, enhance productivity and create jobs.	Design an app for innovative ways to utilize Department of Commerce and other publicly available data
Blue Button for All Americans	Department of Veteran's Affairs *(VA Innovation Initiative)*	To encourage widespread use of Blue Button℠ personal health records (PHRs) outside Federal health care programs to benefit all Americans -- including Veterans who receive care from non-VA providers	Looking for a simple, secure and convenient app which uses the Blue Button(sm) technology and which is installed on the websites of 25,000 physicians across America
Occupational Employment Statistics Challenge	Department of Labor	Finding new ways to use Occupational Employment Statistics	Create data visualizations that assist in planning education or training, making career choices, moving to a new area, or negotiating pay.

Table 4 Examples of Service type Challenges

While these challenges ranked fairly high on the innovation continuum, those who were running them recognized that there was a higher level of innovation to aspire to:

> *I don't know that we've developed something that it is incredibly innovative. As innovative as some of the apps* [software applications] *have been, they're still mobile apps. There hasn't been any sort of industry disrupting technologies.* (Informant 9)

And though they had not quite gotten to the type of challenges they considered the most innovative, there was definite desire to move to in that direction:

> *But so far, the contests that we have held are primarily more educational and like working with our records to produce mash-ups and things like that. Maybe in the future we're kind of always thinking about how we could run a contest or a challenge on some kind of tech heavy questions or things like that, but we just haven't gotten there yet.* (Informant 35)

> *I would say to date, most of our challenges have been around apps, or… promotional videos. That is changing. I mean we are moving toward more complex solutions.* (Informant 8)

Examples of Service type challenges are listed in Table 4.

5.1.4 Operational

These challenges sought to provide a functional solution to a specific problem and were generally science and technology related. Solutions in this category were highly technical and targeted participants with specialized knowledge and skills. The submission format included finished products or plans, designs, models, prototypes of actual products (e.g. energy saving light bulb, combat vehicle). Unlike other categories, solutions were sometimes intended for use in operations of the hosting agency. This category represented twenty (20%) of challenges.

Challenges within this category were viewed by informants as closer to the ideal of what challenges should be designed to achieve. Informant 22 who worked on a video challenge referred to a challenge ran by another agency as epitomizing the ideal:

> *the Department of Energy did some challenge about creating a better light bulb or something. That was really looking for innovative outside ideas that came from smart people that maybe didn't work at their department, or their agency. To me that's a challenge. We're asking you to solve it however you want and we want a specific end result.* (Informant 22)

Informant *27* who had ran numerous operational challenges articulated the need for more technical challenges to stretch the knowledge environment level and promote innovation:

> *I think to engage the scientific and engineering workforce out there; they need to be technical challenges, not just ideation challenges or apps challenges which folks are doing, which I don't think stretch the knowledge environment level.* (Informant 27)

Informant 9 who ran one of the larger and more prominent challenge programs provided a vision for the ideal transformational challenge which goes beyond the technological and scientific to transform entire processes or workflows. This type of challenge may be complex and risky, but potentially represent innovation at the highest levels:

> *Those with higher risk and potentially higher reward might be more on the lines of how do we change an entire process. And that is something where a solution would go beyond just a technological solution. Maybe it requires an entire change in workflows or a change in mentality, or building an entirely different group of people into a process. That may be more difficult to implement and would not necessarily guarantee results...but have potentially higher reward.* (Informant 9)

Examples of Operational type challenges are listed in Table 5.

Name of Challenge	**Agency**	**Contest Objective** *(extracted directly from challenge.gov)*	**Description** *(extracted directly from challenge.gov)*
Medical Transportation Device for Combat Rescue	Air Force	Deliver a concept/design for a next-generation medical transportation device	Produce innovative designs for a transportation device that can be carried into a combat site by a single rescuer and safely evacuate the injured
USPTO Algorithm Challenge	Patent and Trademark Office	Deliver an algorithm that can automatically identify and locate specific elements within patent documents	Develop new algorithms to aid in patent examination
Design and simulation of an accurate shooter-locator	Air Force	Looking for a design of a shooter locator that can detect any small arms fire within a fraction of a second and pinpoint its source accurately (within a few meters) within a few seconds	Requires a written proposal and proof-of-concept data including a computer simulation of the radio frequency and electrical performance of the system. Convincing evidence of feasibility based on component availability and physics or empirical simulation is required for the award. Experimental evidence desired but not required.
Bright Tomorrow Lighting Prize (L-Prize)	Department of Energy	-Spur development of ultra-efficient solid-state lighting products to replace the common light bulb -Substantially accelerate America's shift from inefficient, dated lighting products to innovative, high-performance products	Design and produce lamps that are suitable for replacing 90-watt 120V standard halogen or 70-watt 120V halogen infrared (HIR) PAR 38 lamps. These products will allow direct replacement of halogen PAR 38 lamps in lighting fixtures with medium screw-in (Edison) sockets. As such, winning products must be similar to the products targeted for replacement, in terms of size, shape, operating environment, and light output, distribution, and quality.
Sample Return Robot Challenge	NASA	Encourage innovations in automatic navigation and robotic manipulator technologies	Demonstrate a robot that can locate and retrieve geologic samples from a wide and varied terrain without human control.
2011-2012 FAA Design Competition for Universities	Federal Aviation Administration, Department of Transportation	National Design Competition for Universities addressing airport design challenges	Students can address technical challenges regarding the safety, capacity and efficiency of the nation’s airports, offer innovative solutions, and win cash for outstanding proposals

Table 5 Examples of Operational type Challenges (extracted from Challenge.gov)

Type of challenge	Submission format	Objective	Target Audience (Participants)	Beneficiary	% of total
Awareness	- Creativity contests (poster, photo, video, art, music, slogan, logo) - Nominations for public recognition - Ideas	Inform, sensitize, educate on certain issues or services, gather ideas	General public	General public	40%
Research	- Research paper - proposal	- increase knowledge about new technology - spur entrepreneurship around new technology - engage broader group of potential solvers - inform and influence policy	Specialists in particular field (e.g. researchers, scientists, engineers, universities)	Specific industry or sector	14%
Service	- software products - mobile applications	- encourage use of public data - enhance and market government services - encourage entrepreneurship around provision of service	- Software developers - enthusiasts	- Constituents - entrepreneurs	26%
Operational (functional)	- physical product - software system - Representation of solution (e.g Blueprint, Prototype, proposal, plan)	Improve or solve functional problem	- Scientists - Engineers - software developers - other professionals	- Host agency - Industry	20%

Table 6: Summary Characteristics of the various Challenge Types

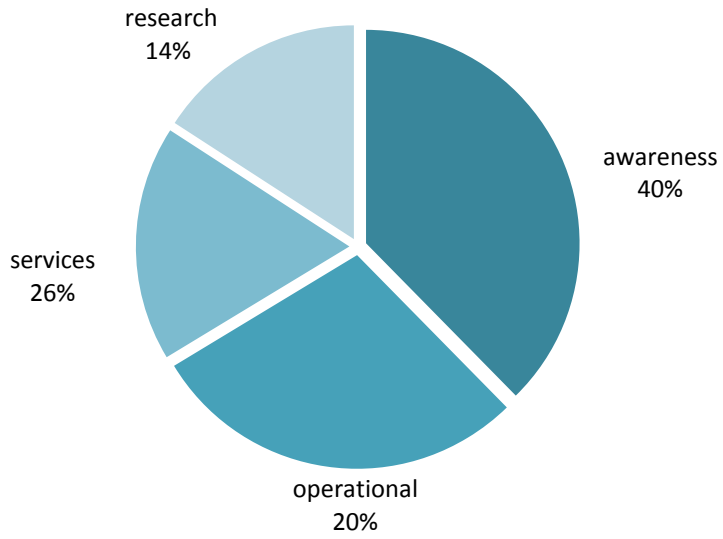

Figure 1: Challenge Categories

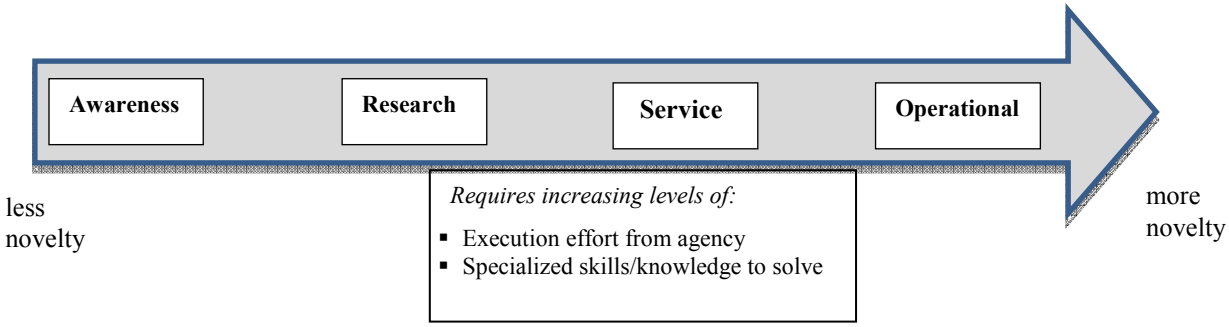

Figure 2: Continuum of innovation levels

Question 1 investigated the types of challenges hosted on the challenge.gov platform. Analysis and classification of 203 challenges hosted by 47 agencies revealed four distinct categories, which ranked from low to high in the level of innovation attempted. The next question investigates the stages and influencing conditions involved in the adoption and implementation of challenges.

5.2 Research Question 2

How do agencies adopt and implement Challenges?

This question sought to reconstruct the set of events, factors, and conditions involved in the adoption and implementation of challenges. Responses were extracted from interview data and were based on informants' description of their experiences before, during, and after adoption.

The resulting model (Figure 3) emerged as a representation of the challenge adoption process. The model outlines the various stages of the process, the factors that influence the stages, and the relationships between them. The main stages of the model are i) external trigger, ii) internal motivation, iii) selection of challenge characteristics iv) implementation preparation, and v) execution and feedback. The factors which influence those stages are a) agency mission and experiences, and b) enablers/hurdles.

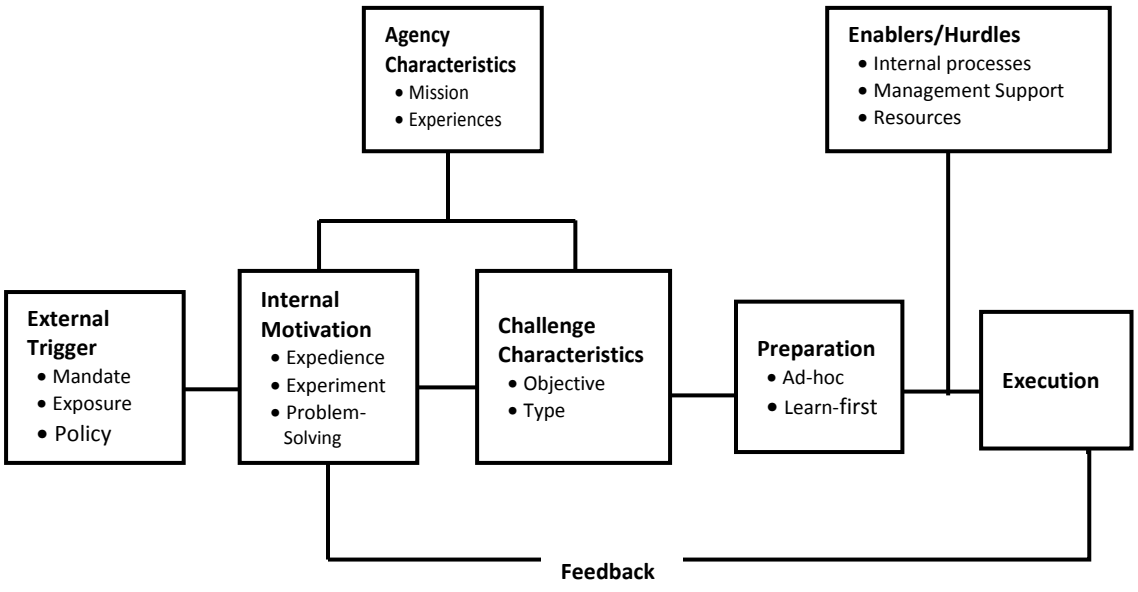

Figure 3: Challenge adoption model

The adoption process illustrated in the challenge adoption model (Figure 3) can be described as follows:

An *external stimulus* triggers the process. Depending on the nature of the stimulus, the agency develops an *internal motivation* to act. The motivation influences decisions about challenge characteristics such as type and objective. Agency characteristics such as the mission and experiences influence the type of motivation as well as challenge characteristics. The agency makes *preparations* to implement using either an *ad-hoc* or the more strategic *learn first* approach. Implementation is influenced by the degree to which certain critical factors are present. When present, these factors act as enablers, while their absence serves as a hindrance. Challenge execution involves activities such as collection of submissions, judging, and awarding prizes. The execution experience during one challenge provides feedback for, and influences the motivation for succeeding challenges. Further description for each component is detailed below.

5.2.1 External Trigger

A trigger from the external environment sensitized the adopting agencies to the availability of challenges as a problem solving tool. While the policy directive was sufficient to act as a stimulus in some agencies, additional triggers were necessary in others. For example one informant representing a large challenge program explained how the passage of the America Competes Act legislation was the primary driver of what they were doing:

> *A big driver of all the things that we're doing now, around challenges stems from a particular piece of legislation that was called the America Competes Act. […].The America Competes Act gave government agencies the ability to use challenges as a mechanism to spur innovation. Prior to America Competes, essentially the only way that a government agency could pay you, in sort of, the broader sense, was either through a grant, or through a contract. Now with the Competes Act, government agencies are able to use competitions and prize challenges as a way to encourage people to innovate, to build applications and thus be rewarded for their innovations. So, a big part of why we're running the challenges through [agency name], is that it is specifically focused on the Competes Act and using the challenge mechanism* (Informant 33)

From another perspective an informant recalled wanting to run a particular competition before hearing about challenge.gov:

> *We had actually tried to do this competition even before Challenge.gov, we were kind of sensitized to it* (Informant 10)

However in the absence of the special legislation they were unable to run a competition and award a prize. This changed when America Competes was passed.

> *…But then we realized that competitions actually fall in a different category, and we didn't have authorization to actually have competitions and make prize awards. So then we had to kind of put that in the back burner. And when the America Competes Act came along, then we were able to go ahead and really fully realize our vision for the whole program.* (Informant 10)

These are just examples of external triggers. Further analysis revealed three main categories for external triggers: the legislation and policy, specific directives from outside the agency, and exposure to the practice in other agencies. Brief explanations follow.

i. *Mandate*: Following passage of the government wide policy, some agencies received specific directives to implement. These directives were communicated orally or via informal communication channels, and in some cases were accompanied by a timeline within which to act.

ii. *Exposure*: Some agencies were exposed to the practice in scientific and research organizations in the business sector, while others witnessed the adoption by other government agencies. In some cases the exposure happened before the policy and legislation were implemented, but had to wait for the legislation. In other cases some were aware of the legislation, but were only prompted to act after seeing it implemented in other agencies within or outside of government.

iii. *Introduction of Policy and Legislation*: Before running challenges, agencies must be legally authorized to do so by an Act of Congress. Prior to 2010 a limited number of agencies were able to run challenges under legal authority specific to their functions. Others had done background research and were contemplating ways they could employ challenges. In 2010 Congress passed the America Competes Reauthorization Act which granted legal authority to all agencies to run challenges and award prizes, in addition to guidelines and stipulations for use. When the legislation was enacted it served as an external stimulus to those agencies that had already been considering it, thus triggering the formal adoption.

5.2.2 Organizational Mission and Experiences

Organizational characteristics such as mission and experiences were important determinants in the challenge adoption process. The primary mission types emerging from the data were (1) service provision, (2) public education and information, (3) regulatory, and (4) research and development related to science and technology. Some challenges reflected the core mission of the agency, and were seen as more critical than those addressing topics outside the

core mission. In the following quote, the informant indicated that his challenge effort was enabled because he was able to link it to work his organization had been doing for years.

> *I think what helped me a lot was that I was able to link the challenge effort to work we'd already been doing for years. I think these are really crucial to be rooted in strategic planning. The organization in my opinion needs to fully understand why they're moving in a particular direction, and if they choose new problem solving tools like this, why they are choosing them. And then to understand where are they applying them for the most effect.* (Informant 12)

In a contrasting situation, an agency whose primary mission was regulatory encountered some resistance, because their mission did not readily accommodate the level of innovation and change which challenges were meant to promote.

> *One of the important pieces that frames all of this discussion about us being a regulatory agency, there's an added layer of resistance to coming up with innovative approaches to our regulations, because it takes a lot to change. So we don't have some of the same flexibility as the other agencies do.* (Informant 20)

Outside of challenge adoption, different agencies had varying experiences with producing innovations. The agencies which stood out as having more innovative challenges, also had in place very clear and established processes for regular innovation. The two quotes below represent examples of agencies with clearly articulated innovation initiatives outside of challenges.

> *We absolutely do have a process. In fact we've got a few different ones depending on the nature of the innovation or the issues that we're dealing with. Or the constituency from which we'd like to garner the ideas. For example, if you're to take the [contest name] that we run once a year, that's the process that begins in late fiscal year, let's say 2011. We identified challenge areas we want to focus on at a strategic level for the [agency name] and by February, we've effectively settled on a group of 4 to 5 different issues, and we write them into problem statements that are no more than a few pages long each. […] And we use that in order to solicit ideas from industry. That's not into the prize challenge, but it's one of the ways in which we go about soliciting ideas and investing in innovation. What follows after that is a white paper phase. We take those white papers and we determine which ones we want to seek full proposals from.* (Informant 17)

> *Internally, one of the programs that I helped develop is a contest called [contest name]. And this is a contest we run twice a year where we invite employees to submit write-ups about innovations that they have developed, or they have developed in partnership with contractors. […].We invite our employees to submit innovations, and then we have a social networking platform where we display the top 20 or so, and we ask our entire community of employees to vote, comment on which innovations they like best, which ones they think would be most applicable in their home agency, and then we select winners and honorable mentions, and we celebrate them at a ceremony that we telecast across the department, and the winners actually receive cash awards.[…] We're trying to show our employee base that these are things that they too could develop, and, try and generate good ideas, and or showcase things that could be applied elsewhere* (Informant 8)

The agency mission and experiences influence the agency's internal motivation to adopt, as well as the challenge characteristics.

5.2.3 Motivation

Depending on the nature of the external stimulus, the agency develops an internal motivation to act. That motivation is critical because it set the tone for subsequent events and the overall adoption pattern. In some cases there was no real reason for adopting, except that they were following instructions. In other cases the agency simply sought to take advantage of an opportunity created by the America Competes Legislation. For example:

> *So it wasn't a specific problem that we had, rather it was an opportunity that we had a lot of data, and a lot of software developers who might want to use it. And, he said let's take advantage of that opportunity.* (Informant 21)

In other cases there was a deliberate strategic move to address specific areas that needed innovating:

> *Coming out of our strategic plan and looking at now having learned about open innovation tools, we did an analysis of our portfolio of work to see what problems we might want to address. […]. With any portfolio of work like that, you have gaps, insufficient resources or knowledge or technologies. So we took those gaps and we worked with [name] to use this 2 by 2 quadrant and criteria to map our gaps to various types of collaborative opportunities, and we did a whole workshop with him to do that. So we selected 12 challenges to potentially run a prize, and then we worked through*

> *certain criteria to see if they would map to the open innovation quadrant. And the ones that did, we then felt had a high likelihood of success.* (Informant 27)

On other cases it was a combination of reasons, for example:

> *We did a challenge really for two things. One was to understand how to work with challenges period, because this agency had no experience of working with challenges. And the other one was to be able to attract interest and attention from communities that we don't know of, to become involved in [technology name].* (Informant 15)

The different forms of internal motivation can be classified as follows:

i. *Expedience*: These agencies were faced with situations where compliance with the policy or some directive was the ultimate objective. Therefore they chose the easiest and quickest way to get the Challenge over and done with.

ii. *Experiment*: Some informants spoke of being exposed to the use of challenges in practice and were motivated to try it out. At this point they were not sure how or under what circumstances it would be best utilized, but were excited at what they saw and wanted to experiment. They usually took a wait and see approach before attempting to implement any long term program.

iii. *Problem solving*: Some were able to match this new tool with existing problem areas which were either previously tackled or were being contemplated. For others it was an opportunity to address gaps in their strategic plans or to attempt something which they were previously unable to do. This usually included a long term objective of integrating challenges into the regular operations of the agency for purposes such as an alternative to grants and contracts.

5.2.4 Challenge Characteristics

Selection of challenge characteristics refers to the selections made for challenge type and objective. While this represents two activities, the separation is often indistinguishable in practice. As mentioned earlier, the agency mission and experiences influence the challenge topic and type of challenge selected.

Challenge Objective

The challenge objective refers to the problem or topic which the challenge addresses. Objectives that closely match the agency mission or operations give an indication of high importance to the agency. Objectives that are loosely related to the agency mission are usually seen as less important. The challenge objective also gives an indication of the level of innovation employed. For example, did they just use members of the public to do the same tasks that they would have done anyway (little or no innovation)? Or did they use it as an opportunity to produce something which they were not capable of doing before (true innovation)? The ideal objective as described by one informant was for innovative uses, and not for traditional uses that have been repeated year after year.

> *If you want to do something that you typically do, but you just want to use Challenge.gov, and you already have a process in place, and, you think well maybe I can speed it up using Challenge.gov, that's really not going to work. […]. But if it's something related to innovation and we're seeking to solve a problem that we have been unable to solve over the past couple years. So there's a difference between an expected deliverable that you're doing year after year, or an existing issue that there is no deliverable for, because you haven't been able to solve. If that's the case, then use Challenge.gov. If it's to reinvent a deliverable of sorts, that might not be the best. Then you really need to look, inside and think otherwise* (Informant 13)

Stressing the ideals of innovation, challenges are most effective when they have an objective of helping the agency accomplish something they were not able to do before using traditional methods.

> *Well, it was easy to make that decision. So, these were gaps where we had tried other tools. We had tried research grants, or we had tried small business proposals, or both. Possibly even contracts. These were areas where people felt they were somewhat stuck. That makes it a little bit easier to be at the end of the line where people pulled out gaps that they thought were important problems, but they hadn't been able to solve those yet*. (Informant 27)

The three categories of topic motives emerging from the data are listed below, ordered by increasing level of innovativeness:

i. No specific problem; introduced mainly for the sake of using the tool

ii. Try to find an easier way of doing some existing task

iii. Do something they were not able to do before

Challenge Type

The type is characterized by factors such as objective, task, submission format, and gives an indication of the level of innovation involved. Four main challenge types emerged during analysis of challenge.gov listings: *Awareness, Research, Service, and Operational* (detailed in research question 1 above). Challenges with awareness as the main objective represent lower innovation levels, while those with operational objectives represent the highest level. Awareness and research challenges are generally considered easier to execute and often associated with ad-hoc implementation. Service and operational challenges often require more organizational effort and can be associated with long term planning and more systematic organizational effort and commitment.

5.2.5 Preparation

Different agencies had different approaches to challenge implementation, and this was reflected in their preparations for the process. Preparation involved planned deliberate attempts to provide structure and guidance at the organization level, and included organization initiatives such as internal contests, designated personnel, training, and the creation of a framework of guiding policies. In the final analysis avoiding procedural difficulties all came down to the organization's prior preparation and ability to learn from past experiences.

Those with a long term view of integrating challenges into regular operations had a strategic *learn-first* approach. They spent time upfront conducting preparation activities to ensure a smooth implementation. These activities included internal initiatives such as pilots, education and training, and setting up and documenting internal policies and procedures. Additionally, some contracted out to private or non-profit entities with experience in that area, freeing them of time-consuming procedures. The following illustrates:

> *And so much of the work that I've done on prizes and challenges is background policy work. A lot of what I've done is setting up the framework. So, you know, the America Competes Act was passed a year ago, and agencies were sort of handed this new authority, and yet we didn't have any systems. I mean we had like no mechanism for actually paying our winners, and we had no policies, and we had no framework, so for example talk about one policy in particular is our delegation of authority. So the Secretary was given authority to run prizes and challenges. But an organization as large as ours, it doesn't make sense to channel everything through the Secretary. So we developed a delegation authority whereby the secretary delegated that authority to our agency heads, and then we created another policy where prizes and challenges that are above a certain monetary threshold go through secretarial review. But anything that's smaller would just go through an agency review.* (Informant 8)

This type of preparation and arrangement was even more critical for large departments that have several agencies under their jurisdiction. This next example outlines how one large department centralized the process to make it easier for their agencies.

> *So when you have [number] different agencies, if you democratize this process, what you have is chaos. So, no one knows what the other person is doing, how the process really works, best practices, minimum requirements, legal jargon, etcetera. So what we've done is we've centralized it. We have educated each of our agencies not only on the potential, but on the requirements, on how they should think about their challenges. And, they are responsible on most cases for coming up with the idea. But we are responsible for coordinating and running and leading the management of implementation, execution, evaluation, and then conclusion, of the challenges. And it's a group of individuals that work together to ensure that all are aware. Otherwise, it's over-democratized, and you lose control, and then something might get lost.* (Informant 13)

The end result of this centralization was described as a fast track process to help agencies under that department execute a challenge.

> *What we have provided them is with a fast track process of being able to formulate, launch, and, and execute the challenges, then conclude them, evaluate, and then award. It is a formalized process, easy to follow, and you don't need to be a subject matter expert.* (Informant 13)

Others with a short term focus used an *ad-hoc* or trial and error type of approach where they learned as they went along. With that approach there were no internal processes in place and implementation was not usually a smooth process. For example in the arrangement below, everyone is left on their own to figure out how a challenge should be run.

> *There is no one person responsible for all the challenges coming out of the agency. I think (there are) pockets of one or two people around the agency that want to do a challenge and then figure out how to get it done* (Informant 29)

5.2.6 Enablers/Hurdles

The path taken by agencies during preparation influenced internal readiness to deal with the rest of the implementation process. Those agencies which took the learn-first approach took measures in advance, to ensure the presence of enabling conditions, and had a smoother implementation experience. The quote below identifies some of what the informant considered important enablers which should be put in place.

> *If you're going to run a challenge, make sure to allocate the right amount of resources. Be ready to invest the time. Be ready to learn how other successful challenges have been run. Be ready to create compelling price structures, and a list of judges, not just within the federal scope. And reach out to departments that have done it before and have done it well.* (Informant 13)

And, speaking of specific factors that enabled to successful execution of multiple challenges:

> *I think just departmental leadership, openness to doing things in a different way. Looking outside of your sandbox, and saying so this is how things are being done outside of our department, learning from them. Having an open mind at the, at the highest level. And we've gotten a lot of support from our leadership - the Deputy Secretary is a champion in this area.* (Informant 13)

Agencies which took the ad-hoc approach did not do as much advance preparation, resulting in less availability or absence of enabling conditions. The absence of an enabler (or its availability in lesser quantities) is viewed as a hindrance.

The list below identifies the major enabling conditions emerging from the data:

i. *Internal processes*: This refers to the existence of an internal mechanism with clearly identified and documented procedures and guiding policies to run challenges. It is a reflection of the extent of process knowledge within the agency and covers activities such as: a) weeding out non-viable challenge topics, b) allocation and payment of prizes, and c) obtaining legal compliance.

ii. *Management support*: This is a reflection of the level of support displayed by leadership of the agency for the challenge initiative. The level of support was not equal across agencies. Some agencies received visible support from the highest levels such as the Secretary or administrator, signaling the agency's commitment to supporting all aspects of the program. Other agencies received passive

endorsement with no visible support, or agency-wide commitment for the initiative.

iii. *Financial resources*: The larger challenge programs had dedicated financial resources which could be used to offer larger prize purses, thus attracting higher levels of innovation. Financial resources also facilitated the hiring of external contractors and partners with expertise, removing the burden of challenge management and implementation from employees. In some agencies funds were allocated to run internal pilot programs, which enabled the learning process and promoted the use of challenges. Financial resources were also more likely to be present among agencies with ongoing research and development or innovation portfolios.

iv. *Human resources*: some agencies had a designated challenge manager for whom implementation related activities were a priority. In other cases, duties had to be absorbed by Program or Communication Officers, who performed them in conjunction with their regular duties. The adoption and implementation processes were described as time-consuming and burdensome, and influenced future decisions to execute challenges.

5.2.7 Execution and Feedback

Execution follows the preparation stage, and the execution experience is influenced by the presence (or absence) of process enablers. Execution covers all necessary activities needed to complete the Challenge. Activities include publicity, hosting on platform, judging, and awarding the prize. Publicity refers to activities related to the promotion and marketing to the public and target audiences using traditional and new media channels. It may also involve promotion to agency employees with the objective of obtaining organization buy-in. Next, the challenge is hosted on the challenge.gov platform, and in some cases agency websites of third party providers or implementing agency. This activity involves technical actions associated with uploading and managing on the platform, as well as responding to queries from the public. Judging involves the selection of judges, and ensuring that the judging criteria are adhered to. Following judging, an award is made to the winning submission, accompanied by a certain level of publicity.

Given that the program was new, the execution experience was not always straightforward, leading to sometimes difficult execution experience as recounted in the quotes below:

> *None of the early challenges have been easy, simply because they're new. One of the things that happens when you have a new tool is people are scared. People think about everything that could go wrong, they think about are we complying with every regulation and rule we're supposed to. And so I mean the approval process to do this was complicated, not because the challenge was inherently complicated, but because it was one of the first.* (Informant 8)

> *I think you need to have somebody who is devoted to being in charge of that. Like you need to have a clear project manager to deal with the legal, to deal with judging, to deal with the submissions- just the administrative tasks that have to be done in a challenge. Challenge.gov is nice because you can collect all of your submissions and things in one place. But you still have to have judges go in and judge them. And you have to find judges and coordinate when they're judging. So, there's a lot of administrative work that somebody needs to be devoted to doing.* (Informant 22)

Following completion of one challenge, feedback from the experience will influence the agency's motivation for subsequent challenges. This is represented in the model by a feedback loop. For agencies with an initial goal of running multiple challenges, the early experiences were used to fine-tune internal processes and conditions, contributing to smoother implementation for subsequent challenges. For others, feedback from the first execution experience helped determine future direction of the challenge program. These agencies were able to learn from early experiences and made appropriate internal adjustments, enabling them to replicate the process later on. The following quote illustrates the numerous difficulties that were associated with selection of judges. However once the appropriate steps were covered, this experience was used as feedback to inform a department policy to guide future challenges.

> *One of the issues that came up in this challenge was the issue of judging, and who was allowed to judge a challenge. And we have fixed rules that state that inherently governmental functions must be done by the government, and if they're not done by the government, then they need to be done by special government employees […]. And one of the difficulties with this first challenge was with selecting who be the appropriate judges. And so that just took a while. But I mean the benefit is once we went through this, then we were able to come up with a policy for the department around how we select judges.* (Informant 8)

Some agencies lost interest in continuing the program:

> *…there was a long gap, and there was some interest in starting up some challenges again here. I think they still maybe on the table, although I don't know where they are in the process.* (Informant 35)

Others lacked the desire or ability to make the necessary adjustments, and abandoned the idea of future challenges.

5.3 Research Question 3

How do the various adoption and implementation factors influence the type of innovation enactment of the implementing agency?

5.3.1 Types of Enactment

The challenge adoption model presented and described in Figure 3, represents the various stages, factors and conditions that agencies navigate during adoption and implementation. Following Orlikowski's (2000) typology of enactment introduced in Chapter 2, I categorized agencies based on the level of change stimulated by challenge adoption. This resulted in three agency groupings characterized by the following descriptions:

- *Inertia* retains the existing way of doing things. It represents the lowest level of innovation because it signifies no change in organizational practices.
- *Application* augments or refines the existing ways of doing things, and demonstrates moderate innovation levels.
- *Change* substantially alters (or transforms) the existing way of doing things. This represents the highest level of innovation due to the substantial changes in existing practices.

For each group I demonstrate how the enactment type is related to specific conditions at each stage. For example inertia enactment is associated with a specific type of external trigger (directive), a specific type of motivation (expedience), specific type of challenge objective (no specific problem), and so on. The conditions for each enactment type are illustrated and supported with examples from interview transcripts.

5.3.2 Inertia Enactment

This form of enactment evoked little or no change in the agency's approach to problem solving and innovation. Agencies within this group were responding to a specific directive to adopt, or external pressure to conform. They primary motivation was expedience, leading to the selection of challenge objectives and types they felt were the easiest and quickest to execute. There was minimal upfront preparation, leading to an absence of critical enablers such as internal processes and funding. This led to numerous difficulties during execution, making repetition unlikely.

5.3.2.1 External Trigger

During the early days of the Open Government initiative, there were formal communications to agencies strongly urging them to employ prizes and challenges as a problem solving mechanism. There was also informal marketing and promotion from the White House Office of Science and Technology Policy (OSTP), using word of mouth and personal communication channels. This informal evangelizing sometimes resulted in specific directives to individual agencies to undertake a challenge project, usually within a relatively short time frame. This directive was sometimes relayed directly to program staff, and in other instances relayed through the agency head. The following quotes illustrate examples of both.

> *we were told that we needed to do some type of event, and that we had a few months to pull it together, and that we had to use challenge.gov to do it.* (Informant 34)

> *it came about in a very straightforward manner. …the then Technology Officer told us that he wanted us to do a challenge. And he wanted it out in two weeks* (Informant 30)

> *We were told to use a challenge… it came down that Challenge.gov is launching; we need to have challenges* (Informant 22)

These mandates coming from outside the agency triggered a specific type of motivation, which influenced subsequent implementation events.

5.3.2.2 Organization Mission and Experiences

The agencies with missions related to public outreach often selected *awareness* challenges, while those with research missions deployed ideation type research challenges. Both of these types fall on the lower end of the innovation continuum for challenge types. The challenges executed in this group were not seen as central or critical to the agency mission, and in one case the challenge was contradictory to the mission.

> *We provide leadership, we don't generally provide implementation. Implementation is supposed to be a job for the states, not of the national office. So this was something kind of outside of our agreed responsibilities in order to do this.* (Informant 34)

In terms of experiences, these agencies did not indicate any elaborate ongoing innovation processes.

5.3.2.3 Internal Motivation (Expedience)

Directives given with a tight timeframe led to hasty selections. At this point the focus was on complying with the directive, rather than making strategic choices about problem solving or innovation. For example, *informant 22* who was responsible for executing a video contest admitted that this was the only idea they could come up with at the time:

> *And so it was told us that we needed to do a challenge, and to think of a challenge, and that was what we came up with* (Informant 22)

Similarly, *informant 34* who executed a photography contest admitted that they were not dealing with any specific issue, but rather complying with the directive that had been given:

> *Ours really wasn't that issue based. Challenge.gov is something that we were told from higher ups within the government that they wanted used* (Informant 34)

The internal motivation was very closely tied to challenge objective, and by extension the challenge type.

5.3.2.4 Challenge Characteristics (objective and type)

Owing to the random manner in which these challenge projects were selected, there was not sufficient time to be strategic about selecting problems or issues to advance the mission or work plan of the agency. As a result the objectives were neither central nor critical to the work plan of the agencies, and did not invoke high levels of innovation. For example, *Informant 34* who admitted that their photo contest was not trying to solve any specific problem:

> *...So we weren't looking at an issue. We came up with the only thing we could think of, and that was to do a photography contest.* (Informant 34)

Another admitted that they had no idea what to with a challenge and struggled to find an appropriate topic:

> *... so we said so what should we be doing with a challenge. We think it's a useful tool, but we're not exactly sure what problem fits it* (Informant 16)

There is a very close relationship between the challenge objective and challenge type. The two are interrelated and often the choices are made in conjunction with each other. The types of challenges implemented were geared towards *awareness* (see description in research question 1) which include creativity contests such as video, poster, photo, slogans, etc. These invoke the lowest levels of innovation. For example one informant indicated that their poster contest did not involve any form of innovation since it could have easily been done internally:

> *I just would have had our graphic designer do it. I mean we have those resources available* (Informant 22)

There were also two research type challenges in this group however these were on the lower end of the scale because they were mainly looking for ideas on how to deploy different technologies.

5.3.2.5 Preparation

The approach to implementation is an indicator of whether the agency intends to build a sustainable challenge program, or whether it is intended as a one-time event. Within this group, agencies proceeded in an ad-hoc manner, and went straight to implementation once challenge objective and type were identified. They did not make provisions for advance preparation and experimentation, and actions did not demonstrate intentions of developing a sustainable program. As a result, informants in this group reported an absence of the critical enablers, discussed in the section below.

5.3.2.6 Enablers/Hurdles

One of the biggest and most common hurdles reported was the absence of internal processes to guide challenge implementation. This was very closely related to a lack of knowledge both around the challenge process, and to a lesser extent the requirements of the platform itself. Challenges in this group were implemented in the early days of the Open Government initiative, and there was little institutional knowledge across the agencies. In the absence of any guiding mechanism or prior training, those charged with the task struggled considerably with the process and were forced to learn while doing.

One informant explained that it had taken over a year to figure out the mechanisms for internal procedures such as disbursing money and awarding prizes.

> *We had to figure out an internal mechanism for making it happen. And that's taken over a year. So to get that really down right, and then to get procedures for disbursing the money, for granting the prizes, for reviewing the different proposals, to do it right takes some time.* (Informant 30)

Another explained that the process was not systemized within their agency:

> *…when I heard of it (challenges) it wasn't systematized at all* (Informant 35)

Another common hurdle reported from this group was that running the challenge came with additional responsibilities which had to be absorbed by current staff. Because it was mandated, some felt that responsibilities were just thrust on them. They described challenge responsibilities as time consuming and burdensome. *Informant 34* talked about the personal experience of having to work overtime to get it done.

> *We weren't given any funding. It was something we had to add to our current job responsibility. I had to come in on the weekends in order to work on this project, because I just couldn't fit it into my regular assignment.* (Informant 34)

Another key informant put it in general perspective:

> *The lack of dedicated resources is a big one. This is pretty much an unfunded mandate or unfunded option for people to use. And so it ends up being an additional task that somebody takes on in addition to their other responsibilities. I can easily see it being a full time job for one person, at least for an agency.* (Informant 35)

The lack of certain key enablers made for a difficult implementation experience and reduced the likelihood of agencies running repeat challenges.

5.3.2.7 Execution and Feedback

For those agencies with *awareness* challenges, they had run one or two challenges, with no immediate plans to repeat. In response to the question whether there were plans for more challenges, informants indicated that repeats were unlikely for various reasons stemming from lack of fit with agency mission, changing priorities with departure of an administrator, and seemingly a loss of interest. Some of the reasons are illustrated below:

> **Question**: *Do you plan on running any more challenges?*
>
> **Response**: *Not unless we're given another mandate to do one.* (Informant 34)

In the case referred to by informant 22, there were plans on the way which included funding to do additional challenges. However with the departure of the administrator, the plans as well as

the funding were put on hold and so the agency did not run any more challenges. The following quote illustrates:

> *So there was money put aside. An idea was that that money would be used across the agency to support challenges. And that the agency had a goal of doing, think it was 20 or 25 challenges in the next year. But I don't think that that's a goal any longer, since that administrator is no longer here […]. So if that administrator is no longer here, and that money is no longer being set aside for challenges, I think that was part of the concern. […]. So no, we haven't done any other challenges* (Informant 22)

For the research oriented agencies, there were no initial plans to institute more challenges. However, there was now the potential to work on setting up internal processes to help enable future challenges.

5.3.2.8 Inertia Enactment Summary

The following table provides a summary for characteristics of inertia enactment.

Inertia Enactment	
External trigger	-Directive
Internal motivation	-Expedience (choose the easiest and quickest way to get this done)
Challenge objective and type	-Problems were not very critical, not taken directly from work plan -Types: Awareness and research
Agency Mission and Experiences	-Mainly public outreach, some research oriented - No elaborate innovation processes
Approach to Implementation	-Did not spend time to build internal processes -Encountered difficulties during implementation
Enablers/Hurdles	-Lack of dedicated financial and human resources -Lack of internal processes
Execution and Feedback	-Encountered difficulties during execution -Abandoned idea after one or 2 challenges

Table 7: Inertia Enactment Summary

5.3.3 Application Enactment

Application enactment refers to a situation when an agency uses challenges to improve (but not fully transform) existing processes. For example, the development of a software application to make the agency's data more accessible to the public can be viewed as a form of application. However if this approach is used inconsistently, it has not caused a fundamental change in the way the agency solves problems or innovates, and does not represent change or transformation. Adoption in these agencies started out as capitalizing on an opportunity to try this new tool and matching it with a suitable problem/issue. Another form of application enactment involved the use of challenges to improve a task that was previously performed using another means.

> *We had tried to operate something similar to these before Challenges. So we had some structure and rules in place which the General Counsel helped us develop. So we just adapted them for the challenge, that we retain ownership of the submissions and stuff like that.* (Informant 4)

Adoption did not usually start out with a plan for long term integration. However a positive learning experience could lead to the continuation of the program while the opposite led to its termination.

5.3.3.1 External Trigger (Exposure)

A common thread echoed by informants in this group was that outside of the policy and legislation, they were moved to act by some form of encounter or exposure to challenges in practice. Some of these interactions occurred while attending formal challenge events and demonstrations. For example informant (4) recalled attendance at one such event:

> *Well quite a few of us have attended a session sponsored by the White House talking about challenges. So we brought that message back* (Informant 4)

In addition to attendance, the conversations and personal interactions that followed were instrumental in making an impression. Informant *(32)* recalled one such interaction:

> *Robynn Sturm at OSTP came and talked to [my group] maybe a year ago, and I've had many telephone conversations with her, to kind of clarify issues. And so she was very helpful in educating me on how to do this.* (Informant 32)

As part of the interactions, there were conversations about implementing specific challenges. However in contrast to the *inertia* group, these were described by informants as suggestions rather than directives, because these were tied to specific objectives. The following quotes illustrate:

> *The idea was suggested by Aneesh Chopra, who was at the time the Chief Technology Officer of the United States. He suggested that we do this challenge.* (Informant 21)

> *Right after that conference, some colleagues and I, went and we met with Todd Park (OSTP), because we loved this idea of opening up data and making it available. And so he said well why don't you consider doing a challenge?* (Informant 12)

This exposure or personal encounters triggered an interest within the agency, motivating them to act.

5.3.3.2 Organization Mission and Experiences

This represented the largest group of agencies representing varying missions and operation. This group was not as distinct as the inertia and change groups. Many had operations which produced large quantities of data related to public issues such as health, education and the environment.

5.3.3.3 Internal Motivation (Experiment)

Exposure to the challenge program triggered the desire within agencies to experiment. Program officers and managers were curious to explore to see whether it fit their needs. For example *informant 11* spoke of the agency's desire to try a challenge because they had not done one before:

> *Yeah, the whole point was like we need to do a challenge. We haven't done a challenge at all. We haven't leveraged this platform.* (Informant 11)

The desire to do a challenge preceded the identification of how exactly it would be used.

> *It was just getting at that's what we're going to use. So I have a little bit of a different history with challenges. I actually remember the very first apps challenge done here in D.C., called [challenge name]. I even know the guy [name] who did this from his marketing firm, who ran the first one. So I'd always known about challenges, knew about challenge.gov. So this was like, hey we need to do the same thing, we need something like that, and so let's run something.* (Informant 29)

However the motivation got a boost when they were able to capitalize on the opportunity and match the tool with an existing issue:

> *Well we looked at what we were trying to get, what our end result was going to be, and we thought it was an effective tool, rather than us trying to build some tool inside to get what we need.* (Informant 4)

5.3.3.4 Challenge Characteristics

Stemming from the desire to experiment, some challenge objectives were not related to specific problems, but were used as an outreach and engagement tool. However this form of engagement required tasks which were slightly more complex than awareness challenges. This is illustrated in the following example:

> *So our goal was really to excite the students. So we were not really so much interested in the end result, even though that's a desirable outcome. But we were really interested in the process of engaging the students to push themselves and to expand their boundaries and get them excited about the topic….* (Informant 10)

Others saw the opportunity to go beyond engagement, and incorporated an issue which needed addressing. For example, as part of the Open Data initiative, agencies were required to make their data publicly available. This opened up new opportunities for creating software applications to enable public consumption of the data, as well as opportunities for entrepreneurship. The following quotes illustrate:

> *So it wasn't a specific problem that we had, rather it was an opportunity. We had a lot of data and there were a lot of software developers who might want to use it. And he said let's take advantage of that opportunity.* (Informant 21)

> *more than anything else was just marketing the fact that we did have a set of web API,'s or web services that was available. There wasn't really a problem, it was more used as a marketing tool* (Informant 11)

The types of challenge were mainly service involving software applications, but also included some research and a few awareness types.

5.3.3.5 Preparation

The decision to run a challenge preceded the selection of a problem or issue. Adoption was seen as an opportunity to experiment with something extra, not necessarily critical to the internal operations. Similar to *inertia* enactment, initial challenges undertaken by an agency focused on ad-hoc and stand-alone issues. Implementation was not preceded by long term preparation and learning, but rather was more improvised. Challenge champions had to take the approach of learning by doing, and had the task of convincing management and colleagues.

> *In setting up the first big challenge the [agency name] did, I am very inclusive and I brought everyone to the table to understand what I was doing, so I brought in people from our Office of General Counsel, I brought in people from our Policy Office, to let them know exactly what it was that I was planning on doing, and for them to be able to give me any input, or to share any concerns they might have.[…] So during all the planning of the [name]competition, I had all of the stakeholders in conversation with me about what I was doing.* (Informant 32)

Some organizations were able to learn during the process and use that new knowledge to inform future attempts.

5.3.3.6 Enablers/Hurdles

Initiatives were bottom-up and decentralized, resulting in an absence of official organization policies, guidelines, and training initiatives. In the absence of a guiding framework, challenge managers and champions were forced to learn as they went along, encountering many hurdles along the way.

Lack of Internal Processes

With the practice still emerging, many agencies lacked documented instructions on the mechanics and sequence of tasks necessary for achieving milestones such as getting the project approved, and the allocation and disbursement of cash prizes. Several challenge managers spoke of uncertainties, and recounted having to learn through trial and error with no one to turn to for help. While some saw these as part of the learning process, others blamed it for lengthy delays in execution.

> *…the first time anyone in our agency had ever done one of these, and… part of me was (thinking) I don't know what I'm doing, and I don't know who to ask for help. So we just kind of figured it out as we went along* (Informant 23)

> *it was a very big ordeal, because we didn't even know who had to approve what, and so the procedure was not defined. We didn't know if it could be approved at our agency, or the head agency. So, this was really challenging.* (Informant 10)

Though the process for the first challenge was extremely difficult, the experience improved with subsequent projects as agencies were able to learn and improve. Thus agencies were now able to set policies and guidelines based on earlier experiences, making it easier for other individuals and internal implementing units. This is illustrated in the account given by informant 10:

> *I was one of the first at [agency name] to do a challenge, and the [agency head office] really worked with me, and that kind of set precedent. And that's how they established rules for challenges. So now there is a very organized way to help people who want to do other kind of challenges, to guide them.* (Informant 10)

Absence of dedicated staff resources

The challenge effort was initiated by curious program managers and professional staff who acted as pioneers within their agencies. They voluntarily took on duties of challenge manager or champion, in addition to their regular duties. However they soon realized the extent of time commitment required:

> *From the first thought, it wasn't clear to me how much time commitment this takes on the challenge manager's part. But it really takes time from establishing the competition and running it, and staying on top and answering the questions, and making sure that the website works properly and all these things. So that would be one thing that I would really make sure somebody who's considering a challenge is aware of...* (Informant 10)

In the absence of an appointed challenge manager, the situation was improved with someone who takes on special projects or innovation:

> *having someone who's willing to experiment like myself, is important because that's kind of my job is to take on special projects* (Informant 32*)*

Management endorsed but not management driven

Challenge champions were often successful in educating top management and their colleagues, resulting in management endorsement. While management was generally supportive, that support was limited to endorsement rather than driven from the top.

> *Our associate administrator was very enthusiastic about doing this from the beginning. And so beyond that, we had to do some education, even up to the administrative level, just to let them know what we were doing* (Informant 11*)*

Though not common, there were a few cases where risk-averse management hindered the process of challenge execution.

> *Before we launch a challenge, we put it through our whole vetting process, all the way up to the, the head of the agency, to make sure that they're okay with it.* (Informant 4)

and continued…

> *It's just like they're afraid, they like all the safety with the grant competition. There are more steps and more checks or balances. And they're afraid of what's going to be posted, what's going to be submitted, especially with public voting they're a little nervous. They're more nervous the less control we have over the results. They know that we're supposed to be turning towards challenges, and we've structured these in a way that we've gotten it past them. It's been challenging to us internally. We can't give out cash awards outside of the grant mechanism, is a view of our legal office.* (Informant 4)

Lack of funding for cash prizes

Because of the spontaneous manner in which these challenges emerged, there was often no funding in the current budget allocated for cash awards. However, there were positive reports that challenges could be run successfully in the absence of monetary prizes.

> *So there's no monetary…we didn't have funding for this. And, the experience we had with the [challenge name] challenge was that if you do it the right way, you don't need money. That people are using this because they want to be part of something larger, it's a resource for them. And having the recognition from the White House makes a big difference.* (Informant 5)

5.3.3.7 Execution and feedback

The hurdles encountered during implementation made the experience difficult. Some agencies were able to learn from the process and make improvements for the future. However without all the required enablers, the rate of adoption was still intermittent and did not cause a transformation in the agency's existing practices. Other agencies were not able to learn from the initial experiences, and abandoned after the first few initial attempts. In response to the question of whether there were any challenges that had been planned prior, or were there future plans, this informant responded in the negative for both questions:

> *This is our first foray… we don't have any (challenges) in the queue right now.* (Informant 5)

5.3.3.8 Application Enactment Summary

The following table provides a summary for characteristics of application enactment.

Application Enactment	
External trigger	-Exposure
Internal motivation	-Experiment (curious about challenges)
Challenge objective and type	-Problems were not very critical, not taken directly from work plan -Service, research
Agency Mission and experiences	primarily service
Approach to implementation	-Did not spend time to build internal processes -Encountered difficulties during implementation -After running the first or second challenge some agencies decided to build organizational procedures so program could be continued
Enablers/Hurdles	-Absence of internal processes -Lack of dedicated human resources
Execution and Feedback	Two sub groups - One group experienced characteristics similar to inertia, and abandoned after a small number of challenges - One group learned during the process, and have started to institute internal processes for program continuation

Table 8: Application Enactment Summary

5.3.4 Change Enactment

This is the most innovative use of challenges, as it enables transformation of the agency's approach to problem solving and innovation. Challenges implemented in this category were problem-driven and initiated at the program level, with a long term focus on integration as a problem solving tool. Generally these initiatives were strategic, and linked to the agency mission. Many of the agencies within this group had existing Research and Development portfolios and budgets, and were used to engaging external providers for solutions. Some had previously experimented with challenges and internal pilot programs, enabling a smooth implementation process. There was a high repetition rate with agencies in this group averaging over ten (10) per year.

5.3.4.1 External Trigger (Policy/Legislation)

Introduction of the Open Government Initiative and subsequent passage of the America Competes Reauthorization Act acted as the primary trigger within this group. Through interaction with industry, they became familiar with the emerging trends involving open innovation and crowdsourcing and had an early start. Based on their early knowledge of the mechanisms, some of these agencies ventured to pilot innovation initiatives even before the passage of the America Competes Reauthorization Act of 2010. Thus while the policy and legislation was the primary external triggers, these agencies were poised to adopt because of their knowledge and history with other open innovation practices.

> *We started Open Innovation in 2006, the first government agency to do so. Before that Open Innovation was primarily done in industry. We started crowdsourcing in 2006/2007* (Informant 2)

And later continued…

> *We started much earlier (than other organizations). We understood, we reached out to Proctor and Gamble to understand what worked and what wouldn't. We benefitted from experience. Plus the push from OSTP.* (Informant 2)

> *Well in parallel, we became aware of open innovation techniques, case studies through Harvard Business School. And, we thought that shed our need to open up our problem solving space. And so, we did pilot projects back in 2009, 2010, using open innovation platforms.* (Informant 27)

> *There was a push on in 2004 to get [agency name] the ability to do these kinds of things. The people recognized back in the 1999, 2000, 2001 timeframe that this was an interesting pathway that was not available to federal agencies. And so there was about a 3 year process that [our agency] went through to build the case, and present it to Congress to get the authority to do these kind of competitions and award cash prizes.* (Informant 26)

Others that did not run early pilots were poised to respond to the policy by matching the challenge tool to appropriate problems. This is illustrated in the following quote:

> *So, we were trying out the use of the Prize Authority and the America Competes Act for the first time.* (Informant 17)

5.3.4.2 Organizational Mission and experiences

While the policy was directed at all federal agencies, only a small number were able to respond in a strategic and deliberate manner. These agencies were poised to respond to the policy pronouncements due to previous experiences with pilot programs, or their active and anticipatory pursuit of new approaches to problem solving. Some had major research and development portfolios and it was common practice to engage the services of external partners, providers, and contractors.

Organizational missions covered areas related to research and development primarily in areas related to science and technology. Due to the strategic selection of challenge objectives, they were closely linked to the agency mission and organizational strategy. For example informant 26 explained the deliberate alignment with agency mission and strategy:

> *First and foremost it has to be something that was relevant to our mission. Things that would bring about new capabilities that we don't currently have, or any existing capabilities* (Informant 26)

> *That particular challenge is directly connected to the strategy that had been developed. There's direct connection for the output from that particular challenge to be fed into a future project* (Informant 26)

Linking with mission and operations was not limited to science and technology agencies. Two agencies with a regulatory focus were able to use their innovation portfolios in soliciting software application challenges to empower their constituents to make decisions based on their policies and legislation.

> *We do our own research and development, and issue grants through various mechanisms to outside investigators, and we use contracts for technical development, depending, and small business proposals as well. So we had used a variety of tools, we always have, for new ideas.* (Informant 27)

5.3.4.3 Internal Motivation (problem solving)

Generally these agencies embraced the policy, as they were motivated by the real or perceived advantages of challenges in problem solving and innovation. Some had positive experiences from early pilot programs and easily embraced the new policy. Others had found existing methods inadequate in fulfilling their innovation needs, and embraced the alternative provided by the new policy.

Agencies that frequently outsource to external contractors usually draw from the same regular pool of bidders with similar background and skill sets. Challenges offer a way to reach wider audience with diverse backgrounds, offering the possibility of revolutionary approaches to problem solving and innovation. For example one informant spoke of the desire to reach outside their usual list of contractors to get a more innovative approach to problem- solving:

> *We're interested in getting as many options demonstrated for consideration and ultimate use, as possible. And, we were looking for some out of the box solutions, trying to be different than what we would get from our typical group of people who propose to our contract and grant opportunities.* (Informant 26)

And continued…

> *The reasons that we decided to use the challenge as opposed to setting up some other mechanism, is that one could envision that there's a whole lot of different ways that one could design a software for [the solution]. It was deemed to be a good candidate for doing it as a challenge, rather than doing it by contract, where you would basically be forced to choose amongst all these possible ways of doing it. When you really don't have a good basis for making that particular choice and you only get one possible solution at best for the amount of money that would be invested, as opposed to potentially multiple solutions.* (Informant 26)

Some attempts at innovation require a more open ended approach than the typical requests for proposals (RFP) allow. It may be more fruitful to simply state the desired end results without specifying the approach. Informant 17 spoke of a situation where the typical RFP would have been too restrictive because they did not know how the problem should be solved. Informant 17 articulated that challenges provided the perfect approach for this level of flexibility, since it absolved them of obligations to pay if they did not get the desired end result:

> *We didn't know how to solve the problem, and not such that we could have created RFP, where we were confident would have been the right way to solve the problem. We knew the problem that needed to be solved was […]. What we didn't know was what the best way to go about doing that. And so we wouldn't have been able to say to industry here's what we're looking for […]. Instead we just said here's the end result, and, the beauty of the prize challenge is that you only pay for results. If you're just interested in the result, the prize challenge is perfect for this.* (Informant 17)

Also compared to procurement through RFPs, informant (18) underscored the potential cost savings when using challenges, because you only pay for the outcome:

> *First of all, imagine the dire alternative which is that we would have put out through a conventional procurement process an RFP, that would have been bid on by dozens of vendors, one of whom we would have picked in the hope of being able to actually execute the expectations. And they would have or they wouldn't have, but it would have been a lot more expensive, and taken a lot longer. Instead, the government takes some risk in this, in the sense that we don't even know if anybody's going to respond to the contest. But we minimize the possibility of a failed outcome after a lot of money has been spent... We know what the outcome is before we pay. And we're paying a lot less than I think anybody would have estimated if we had gone through the more conventional process.* (Informant 18)

5.3.4.4 Challenge Characteristics

Agencies within this group were not forced into compliance with the policy, but rather self selected based on their innovation needs. Problems were therefore strategically selected and objectives were skewed toward problem solving and innovation. Agencies within this group had research and development portfolios, and had a common practice of reaching out to external contractors. Some objectives had very practical application such as the development of tools or technologies:

> *We've run a number of different challenges across a wide variety of topics. These include tools or apps or technologies that we want to have developed.* (Informant 9)

The main challenge types in this category were s*ervice* and *operational*. The service challenges solicited software solutions such as mobile and institutional applications meant to provide a service to the agency's constituents. The operational solicited development of solutions more directly related to the core operations of the agency and usually involved some form of scientific or technological innovation.

5.3.4.5 Preparation

One of the major distinguishing factors of this group was their strategic approach to implementation. The first step was the basic understanding of the nature and role of challenges as articulated by informant (Informant 27):

> *I think these are really crucial to be rooted in strategic planning. That, the organization in my opinion, needs to fully understand why they're moving in a particular direction, and if they choose new problem solving tools like this, why they are choosing them. And then to understand where are they applying them for the most effect.* (Informant 27)

They pursued goals of long term integration by first setting up internal policies and guidelines, in direct contrast to ad-hoc trial and error approach used by other agencies.

> *What we're trying to do is more systemic and long term, where we're taking advantage of the support from top leadership, but also trying to do cultural change so that prizes and, and competitions become part of the routine set of tools that one considers in order to accomplish the task that one is assigned. In the long run, eventually you'd like everybody to think, do I want to do this as a contract, or as a grant, or do I want to use this as a prize competition.* (Informant 26)

They used a variety of preparatory initiatives and events such as pilot programs, staff education and training, and documenting procedures. The positive impact of those preparatory steps is evident from the enablers described below.

5.3.4.6 Enablers/Hurdles

The implementation experience was aided by presence of a variety of enablers; the major ones being internal processes, management support, and resources.

Internal Processes

Early pilot projects were used as learning experiences to help the lay out an internal mechanism to guide implementation. For example informant 26 described how his agency collected data from pilot programs to inform decisions and provide guidance on use of the tool.

> *There were about a half a dozen challenges that were initiated with the specific intent of trying to work with different sizes of organizations, different sizes of prize purses. We collect data that you could use to make decisions later on, and for wide dissemination and utilization of the tool.* (Informant 26)

As challenge programs grew, project ideas were being submitted from different parts of the agency. Not all ideas were viable, and failed projects could mean wasted time and money. Some agencies instituted internal mechanisms to weed out potential failures, as illustrated in the following quotes:

> *Not every problem is meant for a Challenge. Agencies have failed when they have not done upfront homework* (Informant 2)

> *Vetting process is used to weed out inappropriate problems. We stopped several because they were not viable* (Informant 3)

> *We have several layers of review. I give it that initial eye test, or schedule, if the idea is completely unworkable, then I will ask that submitter to put a little bit more thought into it, and respond to a specific area depending on what they send me. After that, there is a steering committee made up of individuals from numerous different units within the agency. After that, we can go into full challenge development, and make certain key people at [agency name] are aware of what we're doing. We need to make sure that it's not something that the agency is already trying to do. So we take in all that feedback, and then finally the challenge is approved by [agency head]*. (Informant 9)

For some leading agencies the internal implementation process could be easily identified and articulated:

> *The first process is problem definition. The second process is prize feasibility, and the third process or stage is prize design. So you don't even really get to prize design until you've answered two questions. First, what problem are you trying to solve, and second, is this problem suitable to be solved through a prize?* (Informant 28)

Management Support

Informants spoke of receiving support from the highest levels of their agencies and the importance of that support in moving the program forward.

> *We have a high level executive understanding and support of prize competitions, which is very, very important, and not all agencies have.* (Informant 28)

Positive effects of this support were even more evident when management was directly involved in implementation decisions:

> *We brief top level management at the broad level on the plans for the year. However we do not have to get approval for individual challenges. I can make the decision*. (Informant 2)

> *Now in my case, I'm a senior manager at [agency name], and so after securing the funding, it could be my decision to go ahead.* (Informant 27)

By contrast, the following quote from informant 9 illustrates how the lack of leadership support in a partner agency hindered the whole project:

> *You definitely have to have leadership that is willing to move forward with the challenge process. We worked with another department on a challenge for about a month, and it was pretty well developed. But finally, it appeared that their Secretary's office got cold feet and wanted to pursue solutions through more traditional means. So actually, you have to have buy-in at the executive level.* (Informant 9)

Resources

Agencies executing change enactment had established challenge programs which were running in excess of ten (10) challenges a year. They utilized services of external contractors and non-profit organizations to manage some or all aspects of the implementation:

> *…part of what the contractor does for us, is handle a lot of the challenge logistics, and running the review panels that we use to evaluate the submissions. They already had a platform when they won the bid. And their use of that platform eases the whole panel management process* (Informant 9)

From a contractor's perspective:

> *As part of our relationship with [agency name], not only are we running the competitions for them, but we are also advising them on areas where they can pursue competitions and they can run competitions* (Informant 33)

Financial resources also enabled them to have a dedicated challenge manager to coordinate all implementation events.

5.3.4.7 Execution and Feedback

The challenges in this group generally addressed mission related issues. Early preparation and a strategic approach paved the way for presence of internal processes and other critical enablers. This led to smooth implementation, prompting greater frequency in launching challenges. These agencies had on average over ten (10) challenges per year and advanced towards integration in regular operations.

5.3.4.8 Change Enactment Summary

The following table provides a summary for characteristics of change enactment.

Change Enactment	
External trigger	-Government policy and legislation to introduce this new tool
Internal motivation	-New way of addressing existing problems
Challenge objective and type	-Objective: Directly related to mission/work plan, involved R&D -Type: Operational, Service
Agency Mission and Experiences	-Mission: Emphasis on Science, Technology, R&D, innovation -Experiences: pilot innovation programs
Approach to implementation	-Went through process of learning and documenting steps as an agency
Enablers/Hurdles	- Financial resources: tend to have larger R&D budgets, had funding to do internal pilot programs and offer large cash prizes - Management directly involved in process - Resources: had dedicated challenge manager and also hired third-party providers to run challenge
Execution and feedback	-Established internal processes, so did not encounter many difficulties with challenge execution -Large numbers of challenges, established program

Table 9: Change Enactment Summary

5.3.5 Summary of different enactment types

The table below compares the main characteristics of the three enactment types.

Stages	Inertia	Application	Change
External Trigger	Mandate	Exposure to practice	Policy and Legislation
Internal Motivation	Expedience	Experiment	Problem Solving
Agency Mission	public outreach, some research	Primarily service	Science, Tech, R&D
Agency Experiences (with innovation)	limited	Some experience	Experience with prior pilot programs and innovation portfolio
Challenge Objective	Not directly related to core mission	Mission related	Portfolio of problems directly related to mission
Challenge Type	Mainly awareness (a few research)	Research and Service	Service and Operational
Preparation	Ad-hoc	Ad-hoc but sometimes	Strategic learn-first approach
Enablers/Hurdles	Many hurdles	Many initial hurdles	Many enablers
Execution	Difficult	Difficult at start Gets easier if repeated	Smooth
Feedback	Not often repeated	Sometimes repeated	Often repeated

Table 10: Summary of enactment types

6 Discussion

The objective of this study was to help us understand the motivations, conditions and processes that influence and characterize adoption of challenges in US federal agencies. Challenges fall under the broad umbrella of organizational innovation. Challenges also overlap with open innovation practices because they offer a more open and collaborative path to problem solving and innovation. Concepts from organizational innovation and open innovation literature provided initial direction for the study, while public sector innovation literature was used to highlight organizational characteristics for special consideration.

In this chapter I recap the various findings and discuss to what extent they reflect existing literature, and where they extend the boundaries. The discussion is ordered based on findings for the three research questions.

6.1 Challenge Types and Level of Innovation

The first research question examined the manner in which challenges were being used by the various agencies and sought to establish patterns and explanations. Following analysis and classification of challenges listed on the web platform, four (4) categories emerged namely: awareness, research, service, and operational. These categories were mainly descriptive and grouped based on similarity in objectives, beneficiary type, and submission format. More in-depth analysis revealed different levels of innovativeness, suggesting an innovation continuum among categories.

The Office of Management and Budget (OMB) used the classification by McKinsey and Company (2009) in providing guidelines to agencies on the different ways in which challenges can be employed. McKinsey's grouping identifies six types of prize contests, where each type is

based on a combination of two or more objectives termed *change levers*. For example, exemplar prizes focus attention on particular areas by recognizing accomplishments, and are based on two change levers: i) identifying excellence and ii) influencing public perception. Another prize type-exposition, also focuses attention to ideas and is based on the change levers i) identifying excellence and ii) mobilizing capital. Therefore while change levers help define a particular type, they are not unique to any particular type. By contrast the challenge types emerging from this study are grouped based on primary objectives, and each grouping is formed around one particular objective. For example *awareness* challenges are grouped together because their main objective is to raise awareness on particular topics primarily through creativity contests (such as logos, posters, videos, slogans and photos). While challenges falling under other categories may have some awareness aspect, they would not fall in the awareness category because it is not their primary purpose.

There is a high degree of overlap between McKinsey's *point solution prizes* which aim to find the solution to a well-defined problem, and the newly identified category *operational challenges* which seek to provide a functional solution to a specific problem. The problem in this case is usually science and technology related, requiring a technical solution. While the type descriptions demonstrate similarity between the two, the focus of *point solution prizes* as specified by the change levers is i) to focus a community and ii) to mobilize talent. On the other hand the primary focus of *operational challenges* is to find the solution to a specific problem.

Identification of challenge categories confirms observations from the preliminary analysis of differentiated uses among agencies. As stated in McKinsey (2009), the six prize types are not exhaustive, and new variations were expected with the growing prize industry. While McKinsey's types were based on prizes from the private and philanthropic sectors, the four

emergent types offer a more appropriate representation for challenges because they were derived directly from the data. Thus identification of the four (4) new prize types extends the general literature on prizes, as well as the growing literature on challenges in US government agencies.

Additional findings on the continuum of innovation levels among types helped highlight that different challenge types promote different levels of innovation. While the analysis was not able to offer a specific measure for innovation levels, other factors such as the level of specialized skills, complexity and novelty of solution, served as indicators. This is a key finding because it highlights the extent to which the various challenge types meet the innovation objective of the Open Government initiative. This is reflected in the objectives of the America Competes Act which are "to invest in innovation through research and development…" (America Competes Reauthorization Act, 2010), and also to help agencies "spur innovation, solve tough problems, and advance their core missions" (White House, 2012).

The innovation continuum also confirms preliminary observations articulated in the problem statement, concerning disparities in the types and level of problems tackled by the various agencies. Concern was expressed that some challenges addressed topics which did not facilitate innovation, but essentially maintained the status quo; while others fulfilled the true mandate of tackling difficult and complex problems. The ordering of challenge types as an innovation continuum goes a step further than McKinsey's (2009) grouping which projects the assumption of equality among the various prize types and change levers. No mention is made of different levels of complexity or innovation in McKinsey's grouping. Thus the four challenge types presented in the previous chapter provide a useful tool to help agencies evaluate to what extent their challenges approach the innovation goal.

The placement along an innovation continuum is not meant to suggest that challenges at the lower end should not be pursued. For example *awareness* challenges may be a good fit for agencies with outreach as a big part of their mission, due to the ability to extend the level of participation and outreach. For example in cases where agencies normally held public contests or solicited nominations for awards, challenges could be employed to help the agency better manage the outreach activity. In this scenario, challenge.gov provided a central repository to accept public submissions while incorporating the newer feature of public viewing and voting on submissions. Awareness challenges also have the advantage of less organizational effort and resources, and can be used by agencies as a learning experience and a stepping stone to launching more complex challenges. Unfortunately however, the evidence did not demonstrate that organizations starting with less innovative challenges later move to more innovative ones. This is in line with concerns expressed by administrators of the program that some agencies miss opportunities for innovation by not moving beyond less innovative challenge types. However after just two years of the platform, it may be too early to make a determination of whether implementation of awareness challenges eventually leads to the more innovative categories. This can be monitored in a future study.

The next part of the discussion examines the stages and conditions related to challenge adoption.

6.2 Adoption Model

Response to the second research question involved reconstructing the various adoption and implementation activities and events as reported by informants. The outcome of this analysis is a challenge adoption model consisting of components and relationships that make up the adoption process. The model is data driven and therefore provides a closer representation of the phenomenon under study. It extends the organizational innovation literature by offering a representation specifically relevant to challenge adoption as part of the US Open Government initiative. Model components include stages in the adoption process, as well as variable conditions which influence the stages. The model combines stage model and process research with variance research, to present a more holistic picture of the process. This is a departure from the literature where these two elements are usually explored in separate research streams. Challenges form a subset of open innovation practices, and this model also extends the open innovation and prize literature.

The emergent model breaks down the adoption process into stages, following the trend of stage model research (Wolfe, 1994). Stage models generally present a series of stages connected by unidirectional arrows, suggesting a rigid order from start to end. This level of rigidity is not always realistic in such a dynamic process where there are likely to be variations in the order and timing of activities. The challenge model eliminates the rigidity of stage models by replacing the directional arrows with simple connections indicating relationships between stages. This provides a more dynamic and realistic representation of adoption related activities and events.

6.2.1 Stages in the adoption process

Over the years researchers have offered several variations in classification of innovation stages (e.g. Hage and Aiken, 1970; Klein and Sorra, 1996; Angle and Van de Van, 2000). With such propensity for variation, it is no surprise that a different set of stages emerged in the challenge model. However the question remains, do these differences exist only in terminology, or do they reflect true differences in activities and events? For this part of the discussion a comparison will be made between the stages of the challenge model, and the major adoption sub-processes put forward by Rogers (2003) and others (discussed in chapter 2). These sub-processes are initiation and implementation, and the comparison is illustrated in Figure 4 below.

Initiation

Initiation in the organization innovation literature represents the initial stages where the organization becomes aware of the innovation, matches it with a problem or opportunity, and evaluates costs and benefits in preparation for the adoption decision (Wolfe, 1994, Rogers, 2003). Though individual stages of the challenge model differ from existing models, the initiation sub-process can be mapped to combined activities in two stages of the model: external trigger and motivation. The external trigger is comparable to the awareness stage (different from awareness type challenge) in many of the stage models, and represents how the organization encountered the notion of challenges following the policy pronouncement. As discussed in the previous chapter, organizations encountered challenges through three different external triggers namely: i) mandate ii) exposure to the practice in outside organizations or other government agencies and iii) the policy and legislation. The internal motivation in the challenge model is comparable to the matching and evaluation stages from the literature, where the organization

examines the options and develops the motivation to adopt by matching with a problem or opportunity. Again there are three possible values for motivation namely: i) expedience ii) experiment and iii) problem solving. Thus there are identifiable stages within the challenge model which are comparable with the initiation sub-process from the literature. However the main difference is that while models from the organization innovation literature assume a singular adoption path, the challenge model provides alternate values for each step, setting the stage for different enactment types.

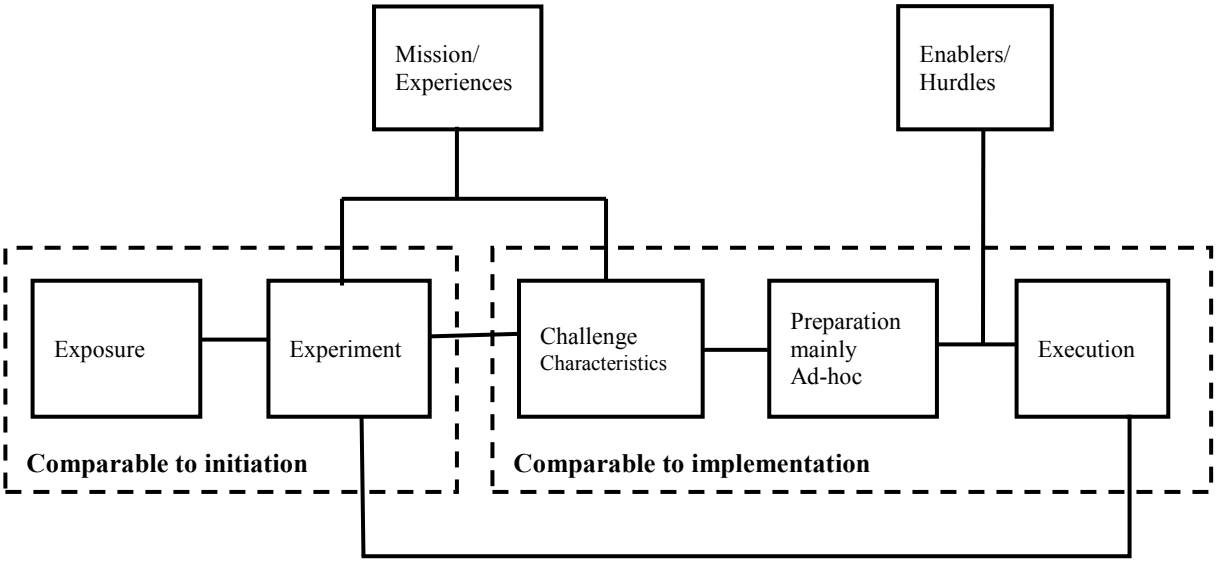

Figure 4: Comparison between Challenge adoption model and Rogers (2003) adoption sub-processes

Implementation

Similarities can also be drawn between the adoption model and the organization literature for the implementation phase. Implementation from the organizational innovation literature covers activities related to modifying the innovation to fit the organization, or within the organization to accommodate the innovation (Rogers, 2003). Challenge implementation starts with selection of challenge characteristics such as the type and problem/issue that will be

addressed. Rogers (2003) also indicates that flexible innovations are more compatible with the organization as they allow significant amounts of re-invention by employees. The typology of challenges presented in Research Question 1 gives an indication of their flexibility to accommodate a wide range of problems from simple to the most complex. Thus the organization can potentially benefit more where challenges are modified to address complex mission related problems, rather than the more generic public outreach situations. The next part of implementation as described by Rogers (2003) is the clarifying process during which employees get a better understanding of the innovation and clear up uncertainties around questions such as how it works, who is responsible, and who it affects. A parallel can be drawn with the preparation stage in the adoption model where the organization takes steps in paving the way for implementation activities. As stated earlier, some organizations take time upfront to allow employees to learn about the process and set out procedures from smooth implementation, while others approach it in an ad-hoc manner of learning while doing. Here again the challenge model makes a departure from the literature by providing two distinct paths which separates organizations that undertake significant preparation from those which do not. The paths continue to define the organization's adoption journey, and are reflected in the degree to which critical enabling factors are present. Inclusion of these variable enabling factors in the adoption model is another departure from the literature which simply focuses on the stages.

One of the motives of the America Competes Act is the long term integration of challenges as a standard problem-solving mechanism alongside more established methods like grants and contracts (White House, 2012). Thus while there is a common objective of routinization and long term integration, these are represented differently in the two models. Rogers (2003) describes routinizing as the last step in implementation where the innovation

eventually loses its separate identity and becomes incorporated into regular organizational activities. For the challenge model, implementation ends when the first challenge is executed (i.e an award is made), and routinization comes after the implementation process has been repeated several times. Thus the number of challenges executed can be used as a proxy for routization in challenge adoption and implementation.

Decision

In the literature the decision is marked by one clear step or go/no-go choice. It is usually made following initiation and before implementation, and is applicable to all adoption scenarios. With challenge adoption there were two decisions. First an authority decision was made by an entity external to the organization (White House OSTP) followed by a contingency decision made at the organization level. Since all agencies received the same authority decision, the differentiating factor would be the contingency decision which was within organizational control. However, this study only focused on adopting organizations, and it was not possible to know what a negative decision might look like, or where exactly the decision point would fall. Thus the challenge adoption model differs from the existing model because it does not contain a decision point.

Judging from the reasons given by informants for their adoption decision, it is tempting to draw a parallel between the agency's internal motivation to adopt and the adoption decision. In that scenario, the motivation provides the closest insight into the driving reasons for adoption. For example inertia enactment was triggered by the directive to execute a challenge. For application enactment the motivation was to experiment with challenges mainly to see what they were like and how they worked. For change enactment the main motivation was the need to

solve particular problems, or innovate in areas where there were gaps. However, before forming any conclusions about the link between the motivation and adoption decision, further study should be conducted to include non-adopters.

6.2.2 Enabling Conditions for challenge adoption

The conceptual framework presented at the beginning of the study (section 2.5) used sensitizing concepts from the three literature streams considered relevant to the study, namely organization innovation, open innovation (and related concepts), and public sector organizations. The concepts selected from the literature were: management support, employee attitudes (NIH syndrome), organizational commitment, nature of problem faced, use of intermediaries and organizational red tape. This conceptual framework provided an important starting point which gave general direction to the study, and specific direction to data collection and analysis. In light of the broad findings which include a challenge adoption model and a typology of enactment, the initial framework diminished in theoretical importance. Notwithstanding, its practical importance cannot be ignored, since it highlights factors within the direct control of the adopting organization which can be adjusted for a more effective adoption process.

While there may be a long list of potential enablers, the top four which emerged from the data are: internal processes, management support, financial resources and human resources. The presence of these factors was found to help implementation, while their absence (or limited presence) was found to hinder the process. Now for a closer look at those factors.

Management Support

The emergence of management support as a critical enabler is consistent with the literature on organizational innovation (Damanpour, 1991, Crossan and Apaydin, 2010) and public sector innovation (Vigoda-Gadot et al., 2005). In both the data and literature, support

from management has been identified as the most critical organizational factor, since it has direct consequences on the remainder of the adoption and implementation experience. Crossan and Apaydin (2010) also underscored the importance of getting support from all levels of management to lead and maintain momentum for the process. The data also gave an indication of differing levels of support at different agencies ranging from leading and driving the effort, to merely approving the process. There were no reported cases of outright opposition but rather skepticism in a few instances. In one case the departure and subsequent replacement of a supportive administrator resulted in changing organizational priorities, and the challenge program was placed on the back burner. On the other hand, initiatives that were management led or driven had greater likelihood of getting organizational resources to enable the process. Thus management support is closely linked with the availability of resources, as discussed below.

Organization Commitment

In the open innovation literature, Chesbrough and Crowther (2006) identified *organization commitment* as a critical enabler of open innovation initiatives. This broad term referred to the general level of commitment the organization displayed towards the initiative, and included a wide range of indicators such as senior management support, funding, innovation champions, revised internal processes, metrics and incentives. In a general sense the data supports the literature in highlighting the importance of having the entire organization prepare to accommodate the adoption process. More specifically the data helped identify which of the list of indicators are the most important to the study context – challenge adoption in public sector organizations.

The specific organization commitment factors which emerged from the data were the availability of human and financial processes, as well as internal processes. Human Resources referred to the presence of specially designated staff with temporary or longer term appointments to oversee the running of challenges. Financial resources refer to funding for challenge-related activities such as prize awards and hiring contractors or intermediaries to undertake the extra steps required for implementation. The emergence of financial and human resources as critical enablers is an indication that challenges have not been fully integrated and routinized into organizational practices, and are still viewed as extra work, requiring extra personnel and extra funding. Therefore it would be interesting to follow whether these factors continue being an issue after a few additional years of challenge use.

Internal Processes

The presence of internal processes did not appear in the initial conceptual framework, but has emerged as important enabler of challenge adoption. Internal processes refer to the establishment and presence of organization policies and mechanisms to guide employees undertaking challenge adoption activities. The absence of adequate internal processes was often a hindrance to implementation. Respondents recounted difficulties caused by the lack of understanding of financial and legal procedures, compounded by an absence organization policies and mechanisms.

The Not-Invented-Here syndrome (NIH)

This factor was included in the initial framework as a major potential hindrance to the adoption process, but did not appear in the data as expected. In the open innovation literature the NIH syndrome was used to refer to internal resistance to outside knowledge (Chesbrough and Crowther, 2006; Huston and Sakkab, 2006). While the existence of NIH was seen as a hindrance

to open innovation practices, its existence was not insurmountable. In one of the studies Huston and Sakkab (2006) reported that the company was able to counter negative effects of the NIH syndrome by shifting the organization attitudes to get buy-in and support from employees.

The data indicated a high level of support from colleagues and non-management employees. This finding is in direct contradiction to open innovation literature where Chesbrough and Crowther (2006) found resistance among employees in private enterprises. The negative NIH syndrome in private enterprises is plausible specifically in the manufacturing and production sector where Research and Development (R&D) employees or entire organizations may be compensated for income generating innovations. On the other hand only a very small number of public sector agencies have R&D staff, and these functions are usually outsourced to private enterprises. Therefore organization culture may already be favorable to external input in the form of grants, contracts, and outsourcing. Further, there is no compensation to individuals or agencies for ground-breaking innovation, which may explain the absence of NIH syndrome.

Organizational red-tape

Organizational red-tape refers to rules that create unnecessary compliance burdens for the organization without contributing to functional objectives (Bozeman and Feeney, 2011). This factor was thought worthy of exploration since public sector organizations are often viewed as bureaucratic and not receptive to change. While some informants mentioned that they were burdened with following specific rules and regulations, organizational red-tape did not stand out as a major hindrance.

This was a study of early adopters, and it is possible that these agencies were able to adopt early on because they have moved away from the typical bureaucratic structures. This is in line with an observation by Vigoda-Gadot et al. (2005) that in recent decades some public

organizations have moved away from the classic bureaucratic structures, making them more receptive to innovation. An alternative explanation is that these agencies were motivated to adopt challenges early because they viewed existing paths to innovation and problem solving as extremely burdensome. This is in line with the finding by Pandey and Bretschneider (1997) that agencies with high levels of red-tape were motivated to innovate as a way of minimizing burdensome effects of the red-tape. While the findings show that red-tape was not a significant hindrance, the data did not reveal the underlying reasons for this. Future studies could try to measure and collect data on the level of red-tape in the organization prior to challenge adoption.

The related concept *organizational processes* (discussed above) stood out as a major enabler (or potential hindrance in its absence). While regular organizational rules did not pose a big threat, the need to follow rules and procedures specifically related to the process of challenge implementation was indeed a burden. An important consideration is the passage of the America Competes Act of 2010 which gave agencies legal authority to run challenges and pay out cash rewards. Prior to this legislation, rules and budgetary regulations of many agencies restricted their ability to run competitions and pay our awards. Prior to the passage of America Competes, other agencies like NASA and Department of Defense modified their governing Acts to give them authority to run challenges. Other agencies which tried to implement challenges prior to passage of appropriate legislation encountered difficulties with existing budgetary rules. This seems to indicate the existence of special legislation including America Competes had gone a long way in mitigating restrictions of these regulations.

6.3 Types of Enactment

The third research question explored the influence of the various adoption and implementation factors on the manner in which the agency enacted challenges. The variations at each stage of the challenge model created the possibility for multiple paths for adoption and implementation. Orlikowski's (2000) framework provided a basis for a typology of enactment which featured three types – inertia, application and change. Though Orlikowski's framework is based on the study of technology adoption in organizations, it is used here to extend the organization innovation literature to the adoption of challenges. Thus a framework developed to explain adoption patterns of a technological innovation has been employed to explain similar patterns in an administrative innovation. Orlikowski's framework recognizes that when the same technology (and by extension innovation) is adopted under different contexts, it results in different adoption experiences and paths. This is a departure from the adoption models presented in the organization innovation literature (see chapter 2), which refer to just one adoption path. This typology of enactment also has practical significance since it can provide insight into which combination of circumstances and conditions result in desired outcomes, and which combinations produce less desired outcomes. It is worth noting that enactment types may change if organizational conditions change.

6.4 Considerations for public sector organizations

Innovation and open innovation practices started in the private business sector before being adopted by public organizations. By the same token, research studies from the private sector are constantly being applied to study these phenomena in public organizations. There are ongoing debates about the merits and shortcomings of applying concepts across sectors which cannot be solved here. However the unique attributes of public sector organizations cannot be ignored.

The findings highlight diversity in adoption patterns and the consequent enactment types. This diversity is a demonstration of the variation in organizational characteristics such as mission, goals, and experiences in public sector institutions. This is in agreement with observations by Caudle et al (1991) of the multiple, often intangible and sometimes conflicting goals of public sector organizations as opposed to the single profit motive in private institutions. The effects of introducing the innovation through a government-wide policy mandate cannot be ignored. In some cases the need to comply with the policy superseded all other motivations, leading to less innovative implementations. In keeping with the profit motive of private sector organizations, it is reasonable to suggest that these less innovative or noncompetitive implementations be more difficult to justify and less likely to be implemented in private firms.

At the individual level the study explored attitudes to embracing outside knowledge, and found that the idea was widely embraced, in contrast to the not-invented-here syndrome. One other potentially important aspect of individual attitudes not explored during this study was the individual motivations to adopt. For example Potts & Kastelle (2010) suggest that sometimes there is a structural disconnect between the political mandate to introduce new initiatives and the employees whose general approach may be less than enthusiastic. Public sector employees may

not be sufficiently motivated to innovate, as there is often no reward at the individual or organization level for being innovative. This is also in keeping with Damanpour & Schneider's (2009) identification of common barriers to innovation in the public sector which include the lack of incentives to innovate, and lack of funding. This is in contrast to private institutions where resources are usually allocated for innovation, as well as financial rewards for innovative organization or group.

7 Conclusion

This was a study of early adopters of challenges within the US Federal Government. The organization innovation literature and open innovation literature provided the initial conceptual direction for the study. Data was collected from the challenge.gov web platform and interviews with challenge managers and administrators from adopting agencies. This chapter presents a summary of contributions to theory and practice, limitations of the study, and directions for future study.

7.1 Contributions to Theory

This study makes several contributions to theory:

1. The development of a typology of challenges consisting four groups based on similar objectives. Though there may be other groupings for prize contests in general, this represents the only grouping to date which is specific to challenges implemented in US federal agencies. The groups have been arranged along a continuum of increasing levels of innovation, indicating that all challenges did not necessarily meet the innovation objectives of the Open Government initiative.
2. The challenge adoption model combines innovation stages with variable conditions impacting the stages. *Stage model research* and *organizational innovativeness research* usually represent separate streams in the organizational innovation literature. In the challenge adoption model they are combined to give a more realistic representation. While the model is based on the organization innovation literature, it highlights stages and conditions which are unique to challenge adoption in US federal government

agencies. Unlike many existing adoption models which display a rigid sequence of stages, this model focuses on the relationships between the various components.

3. This study extends and enriches Orlikowski's (2000) typology of enactment for technology adoption by combining it with factors from a new domain. The incorporation of factors from the challenge adoption model (e.g. external trigger, internal motivation, etc) into each of the three enactment types adds richness to the framework by making it actionable and extending its practical applicability. The incorporation of factors from challenge adoption also boosts the explanatory power of the framework by helping to explain why some enactments lead to major change while others lead to no change. The grouping of agencies based on the three enactment types is one demonstration of the practical applicability of this enhanced framework.
4. Though Orlikowski's framework was developed around the adoption of technological innovations, the findings show that it can be successfully applied to characterize adoption patterns in an administrative innovation. This is another instance where the framework is made more actionable by applying it across the various dimensions of organizational innovation.
5. The use of challenges and prize contests and other open innovation practices started in private organizations and are still relatively new to the public sector. This study helps explain how a private sector innovation has been adopted in the public sector by highlighting the various stages, conditions, and organization reactions. By focusing on early adopters, the study leads the way in exploring open innovation practices in the public sector prior to more widespread adoption.

The findings indicate that the organizational innovation literature is an appropriate perspective to study challenge adoption in public sector organizations. The resulting challenge adoption model matched some foundational aspects from more general adoption models such as the initiation and implementation stages, but diverged in places pertaining to the feedback loop. The similarities with other adoption models developed outside the public sector supports the view expressed by Vigoda-Gadot et al (2005), that existing knowledge from the private business sector can be used to inform public sector innovation research. However there is a need to extend that knowledge to consider specific characteristics of the public sector.

The greatest overall contribution to theory is the recognition that the adoption of challenges differed across agencies based on varying organizational scenarios. Thus even though all agencies faced the same policy pronouncement and type of innovation (challenges), the variations among stages and conditions in the emergent model were sufficient to yield different enactment types. The findings also reflect recommendations by De Vries et al (2014) that the environmental context of external push such as policy and political pressures need to be considered in public sector innovation research. Further, the various factors should not be looked at in isolation, but should also consider linkages and interrelationships among them.

7.2 Contributions to practice

The research findings confirm legitimacy of concerns expressed in the problem statement about disparities in challenge types and innovation levels. They also bring to light the conditions which promote true change and those which simply maintain the status quo (inertia). This provides a starting point for discussion among policy makers and administrators about how the conditions can be maximized to promote true innovation and change. The findings provide a perspective on when and where challenge adoption contributes to the highest level of innovation,

as well as an understanding of the enabling and hindering conditions. At the level of the adopting unit, results can be used to inform decisions and alert prospective challenge managers on critical areas to be addressed.

Based on the interest expressed by the GSA program managers, I compiled the following recommendations which can be used to inform policy and practice. The recommendations underscore the importance of purpose, planning, and support as important precursors to a smooth adoption and implementation process.

1. *Challenges do not fit all situations*

   Challenges were introduced as a tool to spur innovation and should only be used in situations where there is an innovation goal. Before a decision is made to use a challenge, there should be a clear and specific purpose why a challenge will be used and what the agency intends to get out of it. Generally, challenges are most appropriate when there is a clear intended outcome with some uncertainty as to how best that outcome can be achieved. For this reason, agencies seeking to innovate should avoid implementing the common types of awareness challenges involving creativity contests.

2. *Clear decision point needed*

   The internal motivation to adopt is often indistinguishable from the decision to adopt. That means that too often agencies go ahead with challenges once there is sufficient desire (motivation), without going through the requisite evaluation and decision making process. A clear decision point is needed after the motivation surfaces, where agencies examine the feasibility of the idea, weigh the alternatives, and make a definite go or no-go decision.

3. *Management Support*

   The data showed that management support was the single biggest enabler for challenge adoption and implementation. Challenge initiatives originating or strongly supported at top management level are more likely to benefit from resource allocation and organization commitment. For initiatives originating at the program level, it is essential to get buy-in and support from top management in order to secure approval and allocation of resources. Program managers need to sensitize top management from early on the value and potential benefits of this mechanism.

4. *Planning at the strategic level*

   Advance planning and preparation is a critical prerequisite for smooth adoption and implementation. However some agencies made the mistake of quickly rolling out their first challenge without spending time upfront to lay out plans for a sustainable program. At the strategic level, agencies should view the challenge mechanism as a new approach to problem solving and innovation which can potentially replace existing methods. Thus, rather than experimenting with isolated efforts, initiatives should be linked to the organization's mission and long term goals. For example NASA's thriving challenge program began by tackling areas in their strategic plan where they had been unable to make progress over a number of years.

5. *Planning at the operational level*

   This involves working out the details of challenges upfront to avoid uncertainty and ambiguity in later stages. Before launching, each challenge needs to be tested to ensure it is feasible and that objectives are attainable. Staff should be trained in the procedural and legal requirements, and legal counsel should be brought on board early in the process. Human and financial resources need to be identified for tasks such as formulating contest

rules, allocation of prizes, marketing and publicity, responding to queries and judging. To be included in the overall plan is a strategy for how the solutions will be rolled out or deployed after selection of winning entries. Plans should also be made for documenting and debriefing on challenge implementation procedures, with the objective of learning and improving current procedures.

6. *Specially Designated Staff*

   An important output of the planning process should be the identification of human resources to perform challenge duties. From all reports, tasks are time consuming and burdensome when combined with regular duties. These include tasks related to outreach, problem definition, responding to public queries, judging, awarding prizes, and consultation with internal and external partners. While a handful of agencies have specially assigned challenge managers, the majority rely on program managers and regular staff to perform these additional duties. For agencies planning to establish a sustainable challenge program, the appointment of specially designated staff is recommended. An alternative arrangement currently utilized by agencies with larger challenge programs (e.g NASA, ONCHIT) is to form partnerships with third party (for-profit or non-profit) providers. Thus agency staff can focus on planning and coordinating while other tasks can be offloaded onto the external partner.

7. *Documenting and Sharing best practices*

   Challenge execution is an emerging practice with many unknowns. Procedural difficulties encountered in the early stages reportedly became easier with subsequent attempts, underscoring the importance of continuous learning. Agencies can learn from their own experiences as well as the experiences of others by documenting and sharing best practices. So far the GSA, White House OSTP, and HHS have online resources

which other agencies are able to access. There have been calls for a central repository containing resources such as rules, procedures, templates and sample documents which can provide guidance at each stage. Others may benefit from the formation of formal or informal partnerships among staff.

7.3 Limitations

As in any research on real life situations, there were conditions which were out of my control. I had to make decisions and compromises to enhance feasibility of the study, which had consequences for how the results are presented and interpreted. In the interest of transparency I would like to acknowledge the limitations and allow the reader to place the results in context.

One of the limitations is the short time frame covered by the study. The challenge.gov platform was legislated and put into practice just two years before the start of the study, and current users are viewed as early adopters. Huizingh (2010) contends that though lessons have been learned by studying early adopters of open innovation, these lessons are not always applicable to those who adopt later. He theorized that some of the later adopters may not be as excited about the new concepts and practices used by the early adopters, and may not be as willing to change. Therefore at this point it is difficult to predict whether findings will still be applicable a few years from now when new agencies come on board.

The study only presents the perspective of adopting agencies. It would have been interesting to get the perspective of non-adopters as well, particularly concerning the reasons for delayed or non-adoption. This was tentatively added to the initial research design, but presented challenges in identifying and classifying non-adopters. With only 47 implementing units and agencies, the remaining majority fell into the category of non-adopters. At that point it was difficult to identify significant criteria besides non-adoption which could be used to guide

theoretical sampling. An alternative approach was to identify those who had considered or initiated adoption but did not carry out the project. However it was impossible to identify these cases since there was no requirement to inform the GSA during early planning stages. Responsibility for challenge management and adoption varied widely among agencies, and it was difficult to speculate within which program or portfolio it may have fallen within non-adopting agencies. Therefore even if a non-adopting agency was identified, it was not clear which units or individuals should be targeted. In light of these difficulties a decision was taken to focus on adopting agencies only.

Interviews were the primary form of data collection. However interviews rely on the ability of informants to recall past events and are subject to problems of bias and poor recall (Yin, 2009). Recognizing this shortcoming, interview data was corroborated with information from other sources where feasible (Yin, 2009) such as other personnel from the same agency, documentation, and the challenge.gov web platform.

Collecting data from listings on the challenge.gov platform presented some logistical challenges. In most cases challenge listings identified executive departments and parent agencies but not implementing units. For example the listings may indicate that Agency A hosted 10 challenges, giving the impression of an established challenge program. However in reality this scenario may turn out to be a number of unrelated and sometimes isolated implementations undertaken in different units of the agency. In some cases this made it difficult to identify the persons responsible for a particular challenge, and also created difficulties in accurately compiling lists for smaller implementing units.

7.4 Directions for Future Study

This study was an exploratory investigation of an organizational innovation in a relatively new context. Research findings were presented in the form of emergent challenge categories, an adoption model and a typology of varying patterns of adoption among agencies. These findings extend organizational innovation literature to a new context and lay a foundation for the emergent open innovation literature. Further research is needed to test the findings to see if they hold true in similar (and different) contexts like state and local government in the US and other developed and developing countries. A longitudinal study can be used to identify if there are changes in adoption patterns over time among the same agencies, and whether there are significant differences with late adopters.

The subject of this study crossed over several theoretical domains: organizational innovation, public sector innovation, and open innovation. Each of these domains had their own relevance to the type of innovation and the context being studied. It may be argued that any of those theoretical domains could form the main foundation for the study. However in the end a difficult choice had to be made and I selected the organizational innovation literature as the main theoretical foundation. The open innovation literature was introduced to represent the context of the type of innovation, and public sector innovation literature represented the context of the organization. Future research could focus on the public sector innovation literature as the main theoretical foundation, and compare to what extent the resulting models are similar.

This study was limited to examining adopters only. Future research should include non-adopters and try to understand some of the decisions and conditions leading to non-adoption. Comparisons between adopters and non-adopters could also help identify a typology of non-adopters and make appropriate recommendations to help stimulate pro-adoption decisions.

This study highlighted the various challenge types based on objectives and levels of innovation. Keeping in mind that the ultimate aim of the Open Government initiative and challenge program was to help agencies promote innovation, future research should focus on measuring the extent to which the program objectives are met by various challenges and agency challenge programs. This would require the development of metrics to measure success of the initiatives and the extent to which original program objectives are being met.

Results were based on the analysis of informant interviews, which despite triangulation are subject to individual biases and perceptions. As is common in emerging areas of research, there is an absence of metrics to measure the success or failure of challenges, and to what extent they meet stated objectives. Future research could therefore focus on the development of such metrics to assess the impact of a particular challenge on the organization or industry it was intended to impact. While this may not be a simple undertaking, the potential value of measuring impact would make it a worthwhile venture.

8 APPENDICES

Appendix A: Interview Guide

Interviewee background information

1. Before we start, can you tell me a bit about your own background? (your education, work experience, etc.)
2. What is your current role and title at [agency name]? How did you end up in this position?
3. In your own words, how would you describe the mission of [agency name]?
4. And how does your agency accomplish this mission?
   [Prompt: How are they using new media to accomplish this?]

Decision to use Challenge.gov

5. As you know, we are particularly interested in understanding how agencies are using new technologies to come up with innovations. In general, how does your agency come up with innovations, or solutions for problems?
    a. Prompt 1: Do you contract them out to vendors?
    b. Prompt 2: Are there any other internal processes to come up with solutions (from employees for example)?
    c. Prompt 3: Are you looking for innovations within government?
        i. Which agencies do you consider especially innovative?
        ii. What is especially innovative about those agencies?

Process/ Use of Challenge.gov

6. And now thinking about the way you use Challenges and Prizes:
    a. We would like to know a bit more about any challenges that you have worked on, or are currently working on. Thinking of the most recent "challenge" you finished:
        iii. What was the topic (or problem) you were facing?
        iv. How did you make the decision to use a challenge format?
        v. Are you using the challenge.gov platform? If so, how did you hear about it?
        vi. Were there any special initiatives to promote the use of challenges within your organization (e.g. funding, employee incentives, staff deployment, Challenge.gov roadshow)? How did the presence (or absence) of these initiatives impact the effort?
        vii. Who was involved in the decision-making?
            1. Did you need top management approval? If so, how did you convince your manager to approve it?
            2. What were the initial hurdles you had to take?
            3. Were there any existing regulations or rules you had to keep in mind?

4. How would you describe the general attitude of employees to seeking solutions from outside the organization? How did that impact the effort?

b. How would you have tackled this particular problem if you were not running a challenge?

c. Starting out, what were your initial expectations for the success of a challenge?

7. Were there instances when you considered running a challenge and then not gone through with it? Can you please explain why?
8. Overall, what were the most surprising incidences when you started the challenge?

Outcomes

9. Given your initial experiences, how would you define success when running a challenge? (beyond getting submissions at all)
10. What kind of solutions did people submit?
11. How valuable would you say were the solutions?

Implementation of submissions

12. Can you give us a sense of how your agency has used the submissions?
13. If the submissions were not implemented yet, how do you plan to proceed?

Lessons Learned and recommendations for public managers

14. Overall, what is your assessment of using Challenge.gov?
15. In your opinion, are there any types of problems that you think are more suitable for running challenges?
16. In your experience, are there problems which may not work? Can you give some examples?
17. Overall, what would you say needs to be in place to effectively run a challenge?
18. What are the factors/conditions that helped you the most in running a challenge effectively? Anything specific to your agency that others might not have?
19. What are the hurdles that others who are just starting out need to keep in mind or work through? PROMPT: What are your suggestions to overcome the hurdles?

20. Do you have any questions for me?

Appendix B: Interview Guide for Challenge Program Managers

Background/History

1. Who initiated the platform?
2. How does it fit into the OGI? Where is the funding coming from?
3. Can you tell us how you started the work on Challenge.gov?
   - what is your personal background?
   - when/why did you join the team? what is your role/task?
4. What were your goals for the platform when you started out?

Decision to run a challenge

1. What is your marketing plan for the platform? (What role does your unit play in an agency's decision to run a challenge?)
2. In general, who initiates the contact between your office and the various implementing agencies? Prompt : Do they contact you or do you approach them?
3. Once the initial contact is made, what is the nature of your interaction with the users?
4. Who is usually involved in the decision making at the implementing agency? Prompt: e.g. top management, program manager, individual officer?

For those who choose to proceed with a challenge:

1. Do you have a sense of how the use of Challenge.gov is supported in those agencies that are using the platform (e.g. funding, employee incentives, staff deployment, Challenge.gov roadshow)?
2. Are there agencies that are trying challenge.gov informally? (Without direct top management approval?)
3. what are the rules and regulations that agencies have to keep in mind when they using Challenge.gov? Do you educate them in advance or support them to understand what the legal framework is they are operating in?
4. What would you say are:
   a. the main drivers?
   b. the main barriers?

For those who choose not to proceed with the challenge

1. What are some of the reasons given for not proceeding with the challenge initiative?
2. How do they usually proceed from that point?
3. Can you give us a few examples?

Outcomes

1. From your perspective, how would you define success of a challenge initiative? (beyond getting submissions at all)
2. Which agencies do you consider especially innovative?
3. What is especially innovative about those agencies?

Lessons Learned and recommendations for public managers

1. Looking back at the first year of Challenge.gov, are there any types of problems that you think are more suitable for running challenges?
2. In your experience, are there topics/issues that are not suitable for Challenge.gov? Can you give some examples?
3. What are some of the lessons learned? What would you say needs to be in place to effectively run a challenge?
4. For those agencies that are just starting out, do you have any suggestions or recommendations to get people on board?
5. What would you say are you main success stories?
6. What are your plans for the second year of Challenge.gov?

Appendix C: IRB Application

***NOTE* The Principal Investigator (PI) must be a person who holds a faculty appointment or other administrative position of Director or higher. If you have any questions regarding this IRB requirement call the IRB office at 315.443.3013 for guidance.**

Principal Investigator/Faculty Member Information

First Name: Ines	Middle Initial:	Last Name: Mergel
Title: Assistant Professor		
Department: Public Administration and International Affairs	College: Maxwell School of Citizenship and Public Affairs	
Campus Address: 436 Crouse-Hinds Hall,Syracuse, NY 13244		
Campus Phone : 315-443-5100	Fax :	
Email: iamergel@maxwell.syr.edu	Cell Phone (optional):	

Student/Research Staff Information ☐**NA**

First Name: Claudia	Last Name: Louis
☒ Graduate Student ☐ Undergraduate Student ☐ Other:	
Department: School of Information Studies	College:
Local/Campus Address: 245 Hinds Hall, Syracuse, NY 13244	
Local/Campus Phone:	Fax:
Email: calouis@syr.edu	Cell Phone (optional): 315-403-5719

TITLE OF PROPOSAL: Open Innovation in Government: Organizational Perspectives on the Implementation of Web-based Crowdsourcing

NOTE: Collaborative Institutional Training Initiative (CITI) is ***not*** required for research determined to be exempt. CITI is required for researchers involved in expedited or full board studies.

1A. IS IT RESEARCH?

The definition of research as defined by the Department of Health and Human Services (DHHS) regulations: "Research means a ***systematic investigation***, including research development, testing and evaluation, designed to develop or contribute to ***generalizable knowledge.***" 45 CFR 46.102 (d)

To be considered a "systematic investigation", the concept of a research project must:

- Attempt to answer research questions (in some research, this would be a hypothesis).
- Be methodologically driven, that is, it collects data or information in an organized and consistent way.
- Analyze data or information in some way, be it quantitative or qualitative data.
- Draw conclusions from the results.

A. Is your project a systematic investigation? ☒ Yes ☐ No

Please explain: The proposed study seeks to investigate the factors and conditions influencing the implementation and use of web-based crowdsourcing initiatives in public sector organizations. The research model proposes that a combination of organizational, individual and project-level factors influence an organization's implementation decisions. Data will be collected using interviews (outline attached) as the primary data collection strategy, and existing documentation (e.g articles, internal memos, websites, blogs, social media pages) to provide supporting evidence. Respondents include public managers responsible for decision making and implementation of crowdsourcing initiatives at the various implementing agencies. Data analysis will be qualitative, employing both a deductive and inductive approach. Results will provide a better understanding how internal organizational factors influence the decisions to use crowdsourcing in public sector organizations. It will also provide insights into reasons for the variations in the use of the platform among the various agencies.

"Generalizable knowledge" would include one or more of the following concepts:

- The knowledge contributes to a theoretical framework of an established body of knowledge.
- The primary beneficiaries of the research are other researchers, scholars and practitioners in the field of study.
- Publication, presentation or other distribution of the results is intended to inform the field of study.
- The results are expected to be generalized to a larger population beyond the site of data collection.
- The results are intended to be replicated in other settings.
- Web based publication for professional purposes.

B. Will your project contribute to generalizable knowledge? ☒ Yes ☐ No

Please explain: Crowdsourcing is part of a larger trend in open innovation where organizations use the internet to enable the use of outside knowledge in solving internal problems. This emerging phenomenon has had a few success stories in the private business sector, but is still relatively new to the public sector. The results of this investigation are expected to extend open innovation concepts from the private to the public sector context, and help researchers understand what factors play a major role in the decision to use open innovation in government agencies. Results will also help practitioners and policy makers understand the enabling environment necessary to facilitate the use of the particular platform.

*If "yes" to question A. **AND** B. above the activity is considered research. Continue completing the application.*

1B. IS IT HUMAN SUBJECTS RESEARCH?

A. Is the data that is being obtained about living individuals? ☒ Yes ☐ No

B. Are data collected through interaction or intervention with individuals (e.g., interviews, surveys, or any direct contact)? ☒ Yes ☐ No

C. Is identifiable individual private information being obtained (e.g., chart reviews, information from data or tissue repositories)? ☐ Yes ☒ No

D. Are data or specimens received by the investigator with identifiable private information? ☐ Yes ☒ No

E. Are the data/specimens coded with a link back to the individual? ☐ Yes ☒ No

*If "yes" to question A. above **AND** "yes" to one or more questions from B-E in section 1B, the activity is considered human research. Continue completing the application.*

Protocols that do not meet the criteria for *research **AND** human subjects research* need not be submitted to the IRB for review or for a determination that the project falls into an exempt category.

Additional guidance for publically available data:
Some research involves the analysis of data about humans for which the regulatory definition of "human subject" is not met. One example is research that involves only the analysis of de-identified data contained within publicly available datasets (available to any one regardless of occupation, purpose, or affiliation, and those individuals who are responsible for posting the dataset had legitimate access to the data and have employed the necessary mechanisms to ensure the privacy and confidentiality of the individuals about whom the data were collected).

While the activity described above meets the regulatory definition of research, the definition of human subject is not met because data about a living person is not obtained through interaction or intervention, and no private, identifiable information about a living individual is obtained.

2. CATEGORIES FOR EXEMPTION

I/We certify that the above research project involves human subjects only in one or more of the following categories, and will be carried out using standard methods. Please check the number next to category(ies) that is/are involved in the research.[2]

☐ **1.** Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:
(a) research on regular and special education instructional strategies, or
(b) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods, and
(c) the research must not involve prisoners as participants

☒ **2.** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior unless:
(a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
(c) If the research involves children, the procedures must be limited to educational tests and observation of public behavior where the investigators do not participate in the activities being observed.
(d) The research must not involve prisoners as participants.

☐ **3.** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (2) of this section, if:
(a) the human subjects are elected or appointed public officials or candidates for public office; or
(b) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
(c) The research must not involve prisoners as participants.

☐ **4.** Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. [Note: *To qualify for this exemption ALL of the data, documents, records, or specimens must be in existence **before** the project begins.]*
(a) The research must not involve prisoners as participants.

☐ **5.** Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine:
(a) public benefit or service programs;
(b) procedures of obtaining benefits or services under those programs;

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[2] *The Federal Regulations also include a sixth category for exempt research, the Institutional Review Board has the discretion to determine what categories to recognize and does not recognize research under category 6 as qualifying for exemption. If you have questions, please contact the IRB at 315.443.3013 or orip@syr.edu.*

6. Taste and food quality evaluation and consumer acceptance studies a) if wholesome foods without additives are consumed or (b) if food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe by the Food and Drug Administration or approved by the Environment Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

(c) possible changes in or alternatives to those programs or procedures; or
(d) possible changes in methods or levels of payment for benefits or services under those programs.
(e) The protocol must be conducted pursuant to specific federal statutory authority.
(f) The protocol must have no statutory requirements for IRB review.
(g) The protocol must not involve significant physical invasions or intrusions upon the privacy interests of the participants.
(h) The protocol must have authorization or concurrence by the funding agency.
(i) The research must not involve prisoners as participants.

3. SCREENING QUESTIONS

A.	Does any part of the research require that subjects be deceived?	☐ Yes	☒ No
B.	Will research expose human subjects to discomfort or harassment beyond levels encountered in daily life?	☐ Yes	☒ No
C.	Could disclosure of the subjects' responses outside the research reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation?	☐ Yes	☒ No
D.	Will individuals involuntarily confined or detained in penal institutions be subjects of the study?	☐ Yes	☒ No
E.	For research proposed under category 2, will research involve surveys, interview procedures, or observation of public behavior with children where the researcher will interact with the children?	☐ Yes	☒ No
F.	For research proposed under category 4, will any of the data, documents, records, pathological specimens, or diagnostic specimens be collected or come into existence after the date you apply for exemption?	☐ Yes	☒ No
G.	For research proposed under category 4, will any of the information obtained from data, documents, records, pathological specimens, or diagnostic specimens that come from private sources be recorded by the investigator in such a manner that subjects can be identified directly or through identifiers linked to the subjects?	☐ Yes	☒ No

*If you checked **YES** to **ANY** of the questions above, your research is **NOT EXEMPT.** Do not complete this application. Submit an **Application for IRB Expedited and Full Board Review**.*

*If you have checked **NO** to **ALL** of the questions above, your research may be exempt. Please complete the remainder of the exempt application.*

4. RATIONALE FOR EXEMPTION

Please briefly describe the proposed research and explain in clear language why you believe this research should be exempted from IRB review.

Interviews will be conducted with senior public manager in government organizations directly involved in the decision making and implementation of crowdsourcing projects. Many of these officials are part of a community of practice where they commonly share insights into lessons

learned from their projects through a listserv and other organized activities. Questions are targeted at understanding organizational level factors and are not of a political nature. The questions are general in nature and pose no risk to the individuals or their positions.

All participants will be informed about the objectives of the study and will be given the opportunity to sign an informed consent form or opt out. Pemission will be sought from each individual to record the conversation for research purposes. Participants will be assured of confidentiality when reporting findings. All published data will be aggregated at the organizational level and any personal identifying information will be removed.

5. RECRUITMENT

Describe plans for recruitment and how contact will be made:

A list of all crowdsourcing projects undertaken as part of the open government initiative is publicly available on the Challenge.gov website. Projects and agencies will be selected from that list. Names and contact information of persons responsible for the various projects will be obtained from pesonnel at the General Services Adminisration who manage the software platform. Participants will be contacted via phone or email to make appointments.

Will your subjects be recruited through schools, employers, and/or community agencies or organizations, and/or are you required to obtain permission to access data that is not publicly available? If the answer is yes, provide a letter of support from the person authorized to give you access to the subjects or to the data in question. More than one letter may be required.

☒ Does not apply

☐ Letter(s) attached

Comments:

Will this research be conducted in a school or is it funded by the US Department of Education?
☒ **No. (Skip to Section 5)**
☐ **Yes. If yes, complete the form found at:**
http://orip.syr.edu/files/Research%20Sponsored%20by%20the%20US%20Department%20of%20Education%20and-or%20Conducted%20in%20Schools.doc

6. METHODS

Provide a detailed description of what participants will be required to do.

Participants will be required to respond to interview questions concerning their decision making processes and lessons learned in crowdsourcing initiatives. Interviews will be conducted by phone or in person with each interview estimated to last between 30 and 45 minutes. Permission will be sought from each individual to record the interviews. Questions will probe into the general and specific goals of the various implementations, reasons for choosing crowdsourcing over traditional methods, the related decision making process, and the general and specific challenges faced at the organizational, project, and individual levels. Questions will also probe into the outcomes of the initiatives, and perceptions of their level of success. In the case of non-

implementers, questions will be asked to solicit reasons why they decided to stick to the traditional methods and whether they had any future plans to implement. After interviews have been transcribed, some key participants will be contacted to verify accuracy of findings.

Will this research be conducted by SU investigators in foreign countries?
☒ No.
☐ Yes. An additional form related to international research must be completed and submitted with this Application: International Research Appendix.

NOTE: All research measures which will be used during this study including sample questions, questionnaires, recruitment scripts, etc. must be included with the application.

7. INFORMED CONSENT REQUIREMENT

*(This is **not** required for Category 4)*

Please provide a copy of the written informed consent document, or oral consent script, which you will use in your study. Please note this document must include the following minimum required elements:

1. A statement that clearly explains that the study is research. The purpose of the research should be described in lay language, avoiding the use of technical terms and using language appropriate to the targeted subject group.
2. A statement that describes what procedures will be followed, clearly explaining what participation in the study will involve.
3. It must be clear that participation is voluntary and participants can withdrawal from the study at any time without penalty.
4. Contact information for the investigator.
5. For adult participants, a statement that the subject is 18 years or older must appear as part of the consent.

8. SIGNATURES

This is to acknowledge that I take full responsibility for the conduct of the research. **Investigators of studies exempt from IRB review are responsible for the ethical conduct of research and obtaining informed consent when appropriate.** (If this study is being conducted by a student, a faculty member must sign in the space provided).

Signed: _____ Date: _____
(Faculty member)

Name (printed): INES MERGEL

Signed: _____ Date: _____
(Student, if applicable)

Name (printed): CLAUDIA LOUIS

Graduate ☒ Undergraduate ☐

Preferred mailing:
☒ Hard copy campus mail. All correspondence mailed to the PI/Faculty member's address.
☒ Email notification

RETURN ONE COPY OF THE COMPLETED APPLICATION TO:

SYRACUSE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
Office of Research Integrity and Protections
121 Bowne Hall
Syracuse, New York 13244-1200
Phone: 443-3013
Fax 443-9889
orip@syr.edu

Appendix D: Consent Form

SCHOOL OF INFORMATION STUDIES
343 Hinds Hall, Syracuse, NY, 13244 Tel: (315)-443-2911

Organizational Perspectives on the Implementation of Challenges and Prizes in US Federal Government Agencies

My name is Claudia Louis. I am a graduate student at Syracuse University and I am conducting research with Professor Ines Mergel on the use of open innovation platforms in the public sector. The Office of Citizen Services & Innovative Technologies, part of the General Services Administration (GSA), supports our research on the use of challenges and prizes in government. We are interested in gaining a deeper understanding about how federal agencies are using Challenges and prizes. The results of this study will result in my Ph.D. dissertation, academic research articles and potentially a book project. An aggregated version of the research results will also be made available to GSA.

We will ask you about your perceptions concerning the decision to use Challenge.gov (or any similar) platform in your own agency, the types of challenges you have run, your experiences and lessons learned, and how your agency is using the solutions that are submitted to the platform. This will take approximately 30-40 minutes of your time.

The research team has received approval from Syracuse University's Institutional Review Board to make sure that the questions we ask won't harm you or your position. Your involvement in this research study is absolutely voluntary and you can decline your participation at any time. All information will be kept confidential and all identifying details about you or your agency have to be removed before the findings can be published.

We would record our conversation to assure a maximum of accuracy. The recording will be transcribed for data analysis purposes only. Recordings will be retained for one year and will be erased when the study is complete.

If you have any questions, concerns, complaints about the research, contact Professor Ines Mergel at iamergel@maxwell.syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator, contact the Syracuse University Institutional Review Board at 315-443-3013.

==========

Respondent:

All of my questions have been answered, I am 18 years of age or older, and I wish to participate in this research study. I have received a copy of this consent form.
(Please print a copy of this form for your records).

___ I agree to be *audio recorded*

___ I do not agree to be *audio recorded*.

By continuing I agree to participate in this research study.

Appendix E: Recruitment Email

My name is Claudia Louis, and I am a PhD Candidate at Syracuse University. I am conducting research with Professor Ines Mergel on the use of challenges and prizes in government. This is a dissertation project and is conducted in cooperation with the General Services Administration (GSA), Office of Citizen Services & Innovative Technologies.

We would like to set up a short telephone conversation with you to gain a deeper understanding of how your agency is using open innovation platforms (like challenge.gov or other similar ideation platforms). We are very interested in hearing your perceptions concerning the decision to use challenges, your experiences and lessons learned, and how your agency is using the solutions that are submitted to the platform.

I would like to set up a time during the next few weeks for approximately 30-40 minutes.

Would you have time on one of the following dates?

* *A variety of options were provided….*

Please suggest a time that fits best with your schedule and a phone number to reach you. I will be able to accommodate a time that won't interfere with your working hours and we can schedule a time as early as possible in the morning, lunch time, or toward the end of your work day.

Thank you for your time and we look forward to hearing from you!

Regards

Claudia Louis
PhD Candidate
International Fulbright Science and Technology Fellow
School of Information Studies, Syracuse University
245 Hinds Hall, Syracuse University
Syracuse NY, 13244
email: calouis@syr.edu, Louis.claudia@gmail.com
Tel: 315-403-5719
Skype: klawdeeya1

Dr. Ines Mergel
Assistant Professor of Public Administration
Maxwell School of Citizenship and Public Affairs
School of Information Studies
Syracuse University
346 Crouse Hinds
Syracuse, NY 13244
Email: iamergel@maxwell.syr.edu
Tel.: 315-443-5100
Skype: inesmergel

Appendix F: Pre-Interview Procedure

All participants received information on the objectives of the study and were given an opportunity to ask questions or seek clarification prior to interviews. Permission was sought to record interviews and participants were assured of anonymity and confidentiality when reporting. They were given the opportunity to sign the consent form or opt out with no consequences.

A personally addressed recruitment email was sent to each individual on the target list informing them of the research project and soliciting their participation. Interested persons were urged to respond indicating a preferred date and time to be interviewed. A range of available dates and times were provided which included options for before, during and after work hours, and weekends, to ensure all work and travel schedules could be accommodated. Interviews were subsequently arranged for mutually agreed upon times. A second follow-up email was sent to the non-responders about one week after the first email, with a third attempt made by follow-up calls where telephone numbers were available.

All participants received information on the objectives of the study and were given an opportunity to ask questions or seek clarification prior to interviews. Permission was sought to record interviews and participants were assured of anonymity and confidentiality when reporting. They were given the opportunity to sign the consent form or opt out with no consequences.

On the day of the interview, a brief overview of the project was given and contents of the consent form were reviewed with the participant. This was followed by an opportunity to ask questions, seek clarification and sign before the interview started.

APPENDIX G: List of Codes

Node Structure Report

Prizes and Challenges Interviews

Nodes

Nodes\\Agency Characteristics
Nodes\\Agency Characteristics\Mission research and discovery
Nodes\\Agency Characteristics\Mission technical
Nodes\\Agency Characteristics\Misssion Pub Engmt
Nodes\\Barrier Organizational
Nodes\\Barrier other
Nodes\\Barrier Technical
Nodes\\Barrier Technical\Barrier challenge procedures
Nodes\\Barrier Technical\Barrier contest publicity
Nodes\\Barrier Technical\Barrier judging
Nodes\\Barrier Technical\Barrier Platform
Nodes\\Barrier Technical\Barrier Tasks Take Time
Nodes\\challenge admin centralized
Nodes\\challenge admin decentralized
Nodes\\Challenge Categories
Nodes\\Challenge Categories\Category comparisons
Nodes\\Challenge Categories\Category descriptions
Nodes\\Challenge Categories\category preceded Challenge.gov
Nodes\\Challenge Characteristics
Nodes\\Challenge Characteristics\Challenge Description
Nodes\\Challenge Characteristics\Challenge marketing strategy
Nodes\\Challenge Characteristics\Challenge Name
Nodes\\Challenge number executed
Nodes\\Challenge objective
Nodes\\Challenge objective\objective achieve agency mission
Nodes\\Challenge objective\objective agency awareness
Nodes\\Challenge objective\objective build domain specific knowledge
Nodes\\Challenge objective\objective end product
Nodes\\Challenge objective\objective engage broader audience
Nodes\\Challenge objective\objective Engage specific group

Nodes\\Challenge objective\objective no problem faced
Nodes\\Challenge objective\objective other
Nodes\\Challenge objective\objective provide service
Nodes\\Challenge objective\objective solve operational problem
Nodes\\Challenge objective\objective spur innovation
Nodes\\Challenge objective\objective topic awareness
Nodes\\Challenge Submission Format
Nodes\\Challenge Submission Format\submission blueprint technical
Nodes\\Challenge Submission Format\Submission consumer app
Nodes\\Challenge Submission Format\submission institutional software
Nodes\\Challenge Submission Format\submission proposal OR idea
Nodes\\Challenge Submission Format\submission video_poster_slogan_art
Nodes\\Dec_Triggers
Nodes\\Dec_Triggers\Dec_Trig Operational Problem or Issue
Nodes\\Dec_Triggers\Dec_Trig Outreach PR
Nodes\\Dec_Triggers\Dec_Trig outreach problem or issue
Nodes\\Dec_Triggers\Dec_Trig Top Down Mandate
Nodes\\Dec_Triggers\Dec_Trig voluntary Experiment
Nodes\\Decision
Nodes\\Decision preceding Events
Nodes\\Decision\Decision other
Nodes\\Enablers Organizational
Nodes\\Enablers Organizational\Enabler Challenge Champion
Nodes\\Enablers Organizational\Enabler special initiative at agency
Nodes\\Enablers Organizational\Enablers Org Culture
Nodes\\Enablers Organizational\Enablers Prior Experience
Nodes\\Enablers Organizational\enabler---systematic approach
Nodes\\Enablers other
Nodes\\Enablers Project
Nodes\\Enablers Project\Enabler Learn from other gov agencies
Nodes\\Enablers Project\Enabler Publicize contest
Nodes\\Enablers Technical
Nodes\\Enablers Technical\Enabler Challenge platform
Nodes\\Fac Employee Attitude
Nodes\\Fac Employee Attitude\Barrier employee attitude
Nodes\\Fac Employee Attitude\Employee attitude varies
Nodes\\Fac Employee Attitude\Enabler change of attitude pos
Nodes\\Fac Employee Attitude\Enablers employee attitude

Nodes\\Fac External environment
Nodes\\Fac External environment\Enabler external other
Nodes\\Fac External environment\Enabler OSTP GSA support
Nodes\\Fac External environment\Enablers external collaboration
Nodes\\Fac Mgmt Support
Nodes\\Fac Mgmt Support\Barrier Risk averse Mgmt
Nodes\\Fac Mgmt Support\Enabler Mgmt driven
Nodes\\Fac Mgmt Support\Enabler Mgmt Endorsement
Nodes\\Fac Resources
Nodes\\Fac Resources\Bar Resources for prize
Nodes\\Fac Resources\Bar Resources for staff
Nodes\\Fac Resources\Enablers Funding
Nodes\\Fac Resources\Enablers special staff
Nodes\\Fac Strategic
Nodes\\Fac Strategic\Barrier Inappropriate tool for task
Nodes\\Fac Strategic\Barrier No Alignment with mission objectives
Nodes\\Fac Strategic\Enabler align with organization mission or operations
Nodes\\Fac Strategic\Enablers internal collaboration
Nodes\\Fac Strategic\Enablers training and documentation
Nodes\\Future plans for challenges
Nodes\\Problem Faced
Nodes\\Problem would not be tackled without crowdsourcing
Nodes\\Procedures
Nodes\\Recommendations
Nodes\\Recommendations\Rcmd educate staff and management
Nodes\\Recommendations\Rcmd existing resources
Nodes\\Recommendations\Rcmd learn from other agencies
Nodes\\Recommendations\Rcmd legal counsel
Nodes\\Recommendations\Rcmd Mgmt support
Nodes\\Recommendations\Rcmd Other
Nodes\\Recommendations\Rcmd Outreach
Nodes\\Recommendations\Rcmd staff capacity
Nodes\\Recommendations\Rcmd strategic
Nodes\\Recommendations\Rcmd Technical preparation

APPENDIX H: Extract from Data Analysis

Application Enactment

Who and how many	Type of mission, external motivation, internal motivation	nature of problem, approach, type of challenge	Approach	Conditions
Informant 14 (outcome: diff way of doing same jobs)	Outreach mission, motivation reach new people, external exposure to other agencies,	Crowdsourcing ideas, no real problem just desire to engage constituents, employees crowdourced their work to students	Isolated, separate programs within agency	No special funding, more program driven, endorsement from secretary, though not driven from the top , high employee buy-in, encountered legal hurdles and then worked with legal team
Informant 25 (outcome: use public to supplement their manpower	Service mission (maintain public records so public can have access), External exposure to others' use, internal motivation use new technologies to solve a labour intensive problem	Problem: recently released open data was not accessible form to the public, Crowdsourcing identification of census records, have crowd identify and populate record in digital form	Integrated: department has open gov program	Strong management advocacy, open innovation and social media division, have GIFT authority so can accept gifts,
Informant 4 (made same work easier)	Community projects and outreach mission, external motivation: policy push white house meetings/internal motivation: enhance existing labour intensive and inefficient practice	Problem: submit nominations for service awards (was being done before anyway), video contests	Medium (5 challenges) One at a time	Program led-initial mmgmt skepticism, legal barrier with paymnt procedure, so had to give travel awards, employee support, saw examples of others using, hurdle rigid platform
Informant 10	Mission: support and fund research on science and tech for health improvement, external: policy/ internal motivation: fit into bigger project (prob would not have done it,but students came up with very innovative projects)	No problem: just interested in engaging the students and getting them excited about research/ ask students to submit team based projects on --- topic/	Isolated at first (later put procedures to institutionalize across agency	Management endorsement and support, peer support Hurdle: enormous time commitment because it was being done by program officer herself, hurdle: problems with process extremely difficult because lack of internal procedures/First tried before America Competes and lots of problems…problems with rigidity of platform, problem with outreach
Informant 32	Mission: funds research and education in all areas of science and engineering,/External exposure from talks with OSTP/internal:	No problem, trying to jumpstart data application development across the country/research: ideas and white paper	Isolated effort, outsourced the running so did not learn internally	Enablers: challenge run and hosted by external company, champion at management level, resourcces to pay to run challenge, enabler: internal collaboration, employee buy-in/initiated and run by management level employee, brought all internal parties together,

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Education

Ph.D. Information Science and Technology *Spring 2015*
Syracuse University School of Information Studies, NY, USA
Dissertation: A Framework for Adoption of Challenges and Prizes in US Federal Agencies: A Study of Early Adopters

Masters of Business Administration *2002*
Carleton University, Ottawa, Canada
Thesis: An Assessment of Factors Affecting Technology Adoption by Teachers: The Case of Caribbean Secondary Schools

BSc Computing and Management (1st Class Honors) *1997*
Diploma Computer Studies *1993*
University of Technology, Kingston, Jamaica

Research Experience

Research Assistant, Syracuse University *2009-2013*

- Conducted literature review and synthesis on emerging research topics such as: privacy concerns in mobile crowdsourcing, convergence of networks, R&D and Manufacturing, IPv6, Policy Informatics
- Conducted statistical tests, analysis and interpretation on Public Safety Network survey data using SPSS features such as Cluster Analysis and factor analysis.
- Conducted content analysis using QDA Miner software, and participated in interpretation of results and writing for publication on Transnational Civil Society Project
- Designed survey for IT and Culture Project
- Content Analyzed qualitative data from New York State Impact Study using Atlas.ti software

Research Assistant, Carleton University *2001-2002*

- Conducted research, writing and editing on ICT Policy document for Commonwealth Network for IT (ComNET)

Teaching Experience

Teaching Assistant, Syracuse University *2009-2013*

- Independently taught undergraduate course in Organizational Behavior
- Assisted faculty with teaching related tasks including curriculum development, preparation of course materials, grading assignments, facilitating group discussion for the following graduate courses: Strategic Management of Information Resources, Information Policy, Telecommunications and Information Policy, Information and Information Environments

Secondary School Teacher, Ministry of Education, St. Lucia *1994-1999*

- Instructed students in Information Technology, Principles of Business, Mathematics, Sciences at Corinth Secondary School
- Provided technology and clerical support to Principal's office
- Collated and compiled monthly and annual school statistics for submission to the Ministry of Education

- Coordinated UNESCO club activities for students including participation in local and international science and environmental projects

Adult Trainer (Adjunct)

- Computer Fundamentals, CXC Information Technology *1997-1999*
  INTRAMACS Caribbean, Castries and ISIS Training Centre, Castries
- Information Management, Management Information Systems
  Institute of Business and Technology, Castries

Academic Awards and Scholarships

- International Fulbright Science and Technology Fellowship for PhD studies *2007-2010*
- PhD Fellowship, Syracuse University *2010-2013*
- Phi Beta Delta International Honor Society, Syracuse University *2010*
- Canadian Commonwealth Scholarship and Fellowship for Graduate study *2000-2002*
- Most Outstanding Student Award, Computer Studies Program *1992*
- St. Lucia Government National Training Award *1991-1993*

Professional Work Experience

Ministry of Education, HRD and Labour, Castries, St. Lucia

Systems Administrator (Software and Training Projects) *Sep 2013 – Present*

- Managing transition of school management software from stand alone to web-based system at all secondary schools, including training and support for school coordinators (ongoing)
- Administration of secondary schools website competition (ongoing)
- Active participation in consultation activities and working groups for 5 year Education Sector Plan (ongoing)
- Supervised department for one month in absence of IT Manager
- Prepared department budget for current financial year
- Coordinated and compiled ministry submissions for government web portal
- Made recommendations on purchase of hardware devices and software for schools
- Provided support for administration of school laptop project

Manager (Acting), Information Technology Unit *Nov 2006- Aug 2007*

- Executed administrative and supervisory duties of the Unit
- Prepared annual budget and expended quarterly allocations
- Managed deployment of IT resources and staff to serve 150 schools and administrative offices
- Supervised and evaluated staff
- Conducted screening interviews and made recommendations for hiring staff
- Served on Ministry Budget Committee and Department Tender's Board
- Represented Ministry of Education on government wide IT initiatives

Systems Administrator (Software and Training Projects) *2000, 2002-2006*

- Played leading role on implementation team for Education Management Information System
- Assessed and evaluated information systems needs of the Ministry
- Prepared requirements specifications and evaluated vendor bids for procurement of hardware and software for Ministry offices and schools
- Obtained external funding for computers to support EMIS administration in schools
- Conceptualized and managed project for production and sale of interactive CDs for students preparing for Common Entrance Exams

- Planned and organized IT training programs for Ministry staff and teachers
- Participated in planning and development of original Ministry website

Publications / Conference presentations

Louis, C., Mergel, I., Bretschneider, S., and Smith,J. (2013). The Challenges of Challenge.gov, Public Management Research Association Conference, Madison, WI, June 20-22

Wang, Y., Huang, Y., **Louis, C.,** (2013). Respecting User Privacy in Mobile Crowdsourcing, *SCIENCE*, *2*(2), pp-50

Wang, Y., Huang, Y., **Louis, C**., (2013). Towards a Framework for Privacy-Aware Mobile Crowdsourcing, In *Social Computing (SocialCom), 2013 International Conference on* (pp. 454-459). IEEE.

Louis, C. (2012, October). Drivers for public sector contests, In *Proceedings of the 6th International Conference on Theory and Practice of Electronic Governance* (pp. 464-465), ACM.

Kuhn. A. and **Louis. C.,** (2012). Dynamic Capabilities and Maintenance Work: New Strategy Perspectives for e-Government, eGov Präsenz (2/12)

Cogburn, D.L., Zakaria, N., Khadapkar, P.S., and **Louis, C**. (2012). Examining Cultural Impacts on Distributed Decision-Making Processes using keyword analysis and Data Mining Techniques, International Journal of Business and Research, Vol.6, No.3, pp.313 – 335

Louis, C. and Grant, G. (2010). An Assessment of factors affecting technology adoption by teachers: The case of Caribbean Secondary Schools, International Conference on Information Resources Management (Conf-IRM), Montego Bay, Jamaica, May 16-18

Committees and Service

Syracuse University

- Personnel Committee, School of Information Studies, *2012 -2013*
- VP Education, SU Toastmasters Club, *2011*
- Peer Assistant for new international students, *2010*
- Program representative on Graduate Students Organization, *2010-2011*
- Search Committee, School of Information Studies, *2010*
- Brown-Bag Planning Committee, School of Information Studies, *2008-2009*
- Doctoral student representative on School PhD Committee, *2007-2008*

St. Lucia

- Steering Committee Education Sector Development Plan, August 2014 -
- National Volunteer, Cricket World Cup, 2006-2007
- UNESCO Communication and Information Sub-Commission *2005-2007*
- Knowledge Management Working Group, Ministry of Education, *2004-2006*
- OECS Education Reform Unit Technical Advisory Committee for ICT in Education, *2000*