

# The Impact of Using Challenges and Competitions in the Workforce

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## ABSTRACT

Federal agencies are seeking new ways to innovate, procure and enhance enterprise capabilities. Competitions are one tool that federal agencies can use to drive innovation and solve mission-centric problems—whether technical, scientific, or creative. In this paper we present an examination of several approaches to foster open innovation through challenges and competitions in support of key business operations in the workforce. We highlight specific examples of their use in “real world” environments and provide an assessment of applicability, benefits and challenges for implementation in large organizations.

**Keywords:** Continuous Innovation, Challenge-Based Acquisition, ChBA, Competitions, Gamification

## 1. INTRODUCTION

In a previous paper, we introduced several alternative approaches as well as advantages and limitations related to using competitions and games as a method to advance research and acquisition for continuous innovation [2]. We proposed that an effective way to motivate crowds of innovators is to provide a challenging game or competition to achieve results. Additionally, we showed that competitions are an effective technique for maturing state-of-art research or for executing down-selects in acquisition processes [9]. These findings were in line with recent Government guidance for increased use of challenges and prizes to develop new tools and approaches to improve open government. [12]

In this paper we present a follow-on examination of several approaches to foster open innovation through challenges and competitions in support of key business operations in the workforce. We highlight specific examples of their use in “real world” environments and provide an assessment of applicability, benefits and challenges for implementation in large organizations.

## 2. BACKGROUND

In the past conferences, we discussed approaches to foster open innovation, including the use of crowds and social media for continuous innovation [2, 3]. Specifically examined were, emerging trends and technologies that would have an impact on open innovation, as well as an examination of the evolution of innovation to understand attributes and patterns for its success and/or failure. We found that with the emergence of social computing, an explosion of open innovation can be seen through the combination of gamification, crowdsourcing, and competitions [6, 7]. In fact, since 2010, over 58 federal agencies have run more than 300 challenge competitions [13, 14].

Government and industry have long used challenge-based acquisition (ChBA) to spur technology. For example, the Defense Advanced Research Projects Agency (DARPA) has encouraged advances in unmanned ground vehicles by sponsoring three Grand Challenges with multi-million dollar prize pools [5]. More than 100 teams showcased their ideas for autonomous automobiles in the 2004 Challenge. In 2012 DARPA launched its Robotics Challenge to promote the development of autonomous robotics. The National Aeronautics and Space Administration’s (NASA) Centennial Challenges have triggered an outpouring of creative solutions from students, citizen inventors, and entrepreneurial firms for technologies such as lunar landers, space elevators, fuel-efficient aircraft, and astronaut gloves. The Department of Energy has sponsored the L Prize, designed to spur the development of high-quality, highly efficient solid-state lighting products to replace today’s inefficient light bulbs. The Environmental Protection Agency has used prizes to encourage students and others to develop videos to promote environmental stewardship. [12]

Such challenges bypass traditional federal acquisition methods built around stringent specifications, lengthy development cycles, and arms-length vendor relationships. Instead, the ChBA process promotes a competitive environment, demonstrated performance, and an increased partnership with industry.

In recent years, MITRE has collaborated on ChBA initiatives to promote advances in improvised explosive device detection and network integration evaluation [8]. We're working with our sponsors to continue to integrate ChBA into their acquisition processes, policies, and guides. MITRE is also partnering with other Government customers to support the wider use of challenge-based acquisition [1]. In this paper, we will focus on the use of challenges and competitions, and how they can be used to foster a robust acquisition strategy.

### 3. THE POWER OF THE CHALLENGE

Traditional acquisition processes often require a deep understanding of requirements and a profound knowledge of the potential solutions that are available in the market place. Traditionally federal acquisition approaches tackle this challenge by conducting a market analysis prior to formal acquisition activities. The results of these analyses are then used to scope the technical procurement approach. There are instances when the lack of understanding of the potential solution space may preclude the development of a market analysis. In these cases, the use of challenges or competitions has proven useful. Some have even chosen to conduct ChBAs in a contest-like manner to encourage greater innovation and private sector participation, when the payment of a prize is for a good or service for the benefit of the government. At its core, the use of ChBA, allows the government to communicate its needs through challenges that are analogous or identical to a desired capability. Then, industry would respond to the challenges without extraneous constraints. In turn, these challenges can abstract away irrelevant concerns and can in many cases be substitutes for loose requirements [11].

In our experience, we have observed the use of such methods in support of common business operations throughout the workforce:

- **Innovation:** seeking to spark new ideas to hard problems.
- **Acquisition:** seeking new ways to acquire capability.
- **Capability Assessment and Evaluation:** Assessing user experience or functional utility and readiness of products and capabilities.
- **Hiring Qualified Employees:** seeking new approaches for finding and evaluating high quality candidates, conducting interviews and hiring to build corporate talent pipelines.

The basis for ChBA can be found in the application of game theory, or “gamification” [10]. Gamification is the

use of game thinking and game mechanics in non-game contexts to engage users in solving problems. Gamification has been studied and applied in several domains, such as to improve user engagement, physical exercise return on investment, data quality, timeliness, and learning. A review of research on gamification shows that most studies on gamification find positive effects from gamification.

### 4. EXAMPLES IN THE WORKFORCE

There are many examples in literature of organizations using challenges and competitions [4]. In this section, we provide several examples based on our personal experience of using such methods in support of key business operations in the workforce, specifically in the Government or our own organization, MITRE.

**Innovation:** The following are example highlights a Government project seeking to spark new ideas to hard problems.

Challenge.gov is a government challenge framework administered by the US General Services Administration (GSA) and based on the commercial Challengepost.com technology [13, 14]. Challenge.gov is a collection of challenge and prize competitions, all of which are run by more than 50 agencies across federal government. These include technical, scientific, ideation, and creative competitions where the U.S. government seeks innovative solutions from the public, bringing the best ideas and talent together to solve mission-centric problems.

The Challenge.gov platform provides a central, online space for agencies to post challenges, and at the same time, allows the public to find federal challenges. This is the one-stop repository for the public to discover and engage with federal agencies that are running crowdsourcing competitions. As part of this, the Ideation competition platform is designed for agencies to host crowdsourcing contests that solicit ideas and concepts from the public. All of these competitions are listed on challenge.gov.

**Acquisition:** The following example highlights a Special Operations Command (SOCOM) Government project using challenges and open innovation as part of seeking new ways to acquire capability.

SOCOM has a long-term goal to develop technologies to meet Special Operations Forces (SOF) mission requirements. The Tactical Assault Light Operator Suit (TALOS), is a vision to integrate science and technology (S&T) capabilities into an integrated suit that better protects a warfighter and/or first responder. The intent is

to accelerate the delivery of these innovative capabilities to the warfighter. Prior studies and analysis have determined a number of technical challenges exist that require improvements in equipment for future missions, such as 1) balancing the trade space between weight, protection, power, mobility, 2) cost, and 3) system component integration. A TALOS suit would comprise layers of smart material, sensors, communications radios and other capabilities for better enabling and protecting soldiers during combat situations [16]. Example technologies being explored include, but are not limited to advancements in:

- Advanced Armor
- Mobility/Agility
- Situational Awareness (SA)
- Light/Noise Disciplines
- Command, Control, Communications & Computers (C4) Integration
- Individual user helmet displays
- Power generation and management
- Thermal management of suit occupant
- Medical Services

The Government is seeking innovations from industry, academia, individuals, and Government Labs capable of providing the design, construction, and testing of TALOS related technologies. It is an interactive process designed to assess the viability of technologies while simultaneously refining user requirements. They are using Google hangouts, monster garage “hackathons”, and technology workshops to motivate the entire community to team and work together throughout the innovation process. As solutions mature, the most viable options will be selected as the reference implementation for acquisition.

**Capability Assessment and Evaluation:** The following example highlights the use of challenge events by a Government Intelligence Community Sponsor to assess user experience or functional utility and readiness of products and capabilities.

By using challenge events, vendors can show that they understand and can demonstrate the capability sought by the Government. Vendors are asked to prove the technical applicability and user functionality of their solutions to fill the Government need based on the outcome of the challenges. The overall challenge itself is typically comprised of one or more events that exercise various aspects of a solution, such as an Interfaces, Usability and Security.

In this example, the Government used an Interface Challenge to perform a Technical Assessment of the

vendor’s ability to successfully integrate their solution into a Government’s virtual test environment, and demonstrate their technical ability to integrate and perform necessary functionality based on the criteria established by the government. The Government then conducted a Usability Challenge focused on evaluating a User Assessment of a vendor’s ability to demonstrate their solution in the Government’s virtual test environment while proving operational capability through user driven scenario based execution. The intent of the Usability Challenge is to determine if the solution is functionally relevant, performs efficiently and is aesthetically appropriate from a user perspective based on predetermined user scenarios. Finally, the Government also conducted an Operational Security Challenge to perform an Information Assurance (IA) Assessment of the vendor’s ability to integrate their solution into the Government’s operational test environment and prove compliance with the Government policy and security requirements. The use of commercial cloud services and formal usability testing methods (e.g. Morae and standard surveys) were used to capture user experience. The results from all events are being used to evaluate and select the capabilities and how to use them.

**Hiring Qualified Employees:** The following example highlights MITRE’s Cyber Capture the Flag (CTF) competition [15], a corporate initiative aimed at adopting new approaches for seeking and evaluating high quality candidates, conducting interviews and hiring to build corporate talent pipelines.

The world today is hypersensitive to cyber security issues and as such employers are seeking expertise to help meet the demands on protecting their corporate assets. Finding high quality candidates for a cyber talent “pipeline” can be a challenge. Many potential employees claim to have knowledge relating to this field, made apparent by the abundance of certification acronyms present on many resumes. In order to better assess this field of applicants, it is believed that the interview process can be streamlined through the process of gamification, whereby applicants are asked to prove their technical abilities by competing in a hands-on capture-the-flag (CTF) style competition.

Using gamification as a hands-on interview will enable potential employers, especially within MITRE, to quickly identify top talent in the field of cyber security, allowing the corporation to maintain its high standards for hiring. The CTF is an annual nationwide cyber competition for high school and college students, where teams compete to solve realistic cyber problems in order to gain ranking in the game. Student performance is measured throughout the game and used as part of the evaluation process. Top teams and students win scholarships, training and intern job offers. The use of this system to hire talented,

knowledgeable employees would greatly increase the Assured Computing core competency area of the organization.

## 5. RETROSPECTIVE

In this section, we briefly discuss our assessment of potential benefits and challenges associated with utilizing competitions and challenge events in the work environment.

As discussed previously in [2], there are numerous challenges to innovation, related to idea generation and solution development, sponsorships and funding, scalability, customer outreach, competition and timeliness.

To address these innovation challenges, competitions and challenges are one tool that federal agencies are using to drive innovation and solve mission-centric problems—whether technical, scientific, or creative. As discussed in [12], some of the potential benefits include:

- Establishing an important goal without having to choose the approach or the team that is most likely to succeed;
- Paying only for results;
- Highlighting excellence in a particular domain of human endeavor to motivate, inspire, and guide others;
- Increasing the number and diversity of the individuals, organizations, and teams addressing a particular problem; or promote the challenge to national or international significance;
- Improving the skills of the participants in the competition;
- Stimulating the private sector investment that is many times greater than the cash value of the prize;
- Furthering a federal agency's mission by attracting more interest and attention to a defined program, activity, or issue of concern; and
- Capturing the public's imagination and perception of what is possible.

We have seen our customers take the plunge into challenge-based procurement. In some cases such as TALOS, it makes a lot of sense since the general concept of the procurement is so complex and the solution space is widespread. Here, the ability to tap into the collective knowledge and experience of industry and academia in the form of technically compartmented challenges helps to displace the lack of information that may exist on the programmatic side.

Other customers have found ChBA processes to be more complex than expected. More traditional programs of record have attempted ChBA, only to revert back to more traditional approaches due to limitations and concerns expressed by their contracting and legal departments.

In some cases a happy medium was found by maintaining the traditional approach to the procurement solicitation process, while injecting key aspects of ChBA. In these cases, challenge problems were introduced and conducted as part of the overall solicitation proceedings.

We have found that there is no “best approach” to ChBA. Ultimately, the correct course of action will be dictated by the program/project in question. It's tolerance to technical scrutiny will have to be weighed against its need for innovative solutions.

## 6. CONCLUSIONS

This paper presents an examination of several approaches to foster open innovation through challenges and competitions in support of key business operations in the workforce.

In particular, such approaches are appropriate for projects that can be characterized by one or more of the following properties:

- Rapid schedule demands or responding to an urgent requirement,
- Responds to incremental capability needs,
- Depends on emerging or uncertain technology,
- Seeks attention of non-traditional innovation sources,
- Expects a short product life cycle or rapid refresh rate,
- Requires simultaneous industry and Government solution discovery, or
- Wishes to pay only for results.

We have highlighted specific examples of their use in “real world” environments and provide an assessment of applicability, benefits and challenges for implementation in large organizations.

## 7. REFERENCES

- [1] MITRE Strategy for Challenge-Based Acquisition in the Government, The MITRE Corporation, <http://www.mitre.org/capabilities/acquisition-effectiveness/acquisition-initiatives/challenge-based-acquisition>.

[2] Cherinka, R. and J. Prezzama, *Emerging Trends, Technologies and Approaches Impacting Innovation*, International Multiconference on Engineering and Technology Innovation, IMETI 2013.

[3] Cherinka, P. Wahnish, J. Prezzama, *Fostering Partnerships between Industry and Academia to Promote STEM at the Secondary Educational Level*, EET Plenary Presentation, July 2012.

[4] Cohen, L., *To the Point: Leverage the Power of the Collective Without Getting Lost in the Crowd*, Gartner Symposium/ITxpo presentation, 21-25 October 2012.

[5] Defense Advance Research Projects Agency (DARPA), [www.darpa.mil](http://www.darpa.mil).

[6] Griliopoulos, D., *The Madness of Crowdfunding*, Maximum PC Magazine, pp 45-51, March 2013.

[7] Howe, Jeff, *Crowdsourcing, Why the Power of the Crowd is driving the Future*, <http://www.crowdsourcing.com/>.

[8] JIEDDO Robotics Rodeo Challenge, 2012, [http://www.army.mil/article/83762/Robotics\\_Rodeo\\_highlights\\_advances\\_in\\_life\\_saving\\_technologies/](http://www.army.mil/article/83762/Robotics_Rodeo_highlights_advances_in_life_saving_technologies/).

[9] Kickstarter Online Funding Platform, [www.kickstarter.com](http://www.kickstarter.com)

[10] Sloane, P., *A Guide to Open Innovation and Crowdsourcing: Advice from Leading Experts*, Kogan Page Publishing, 2012

[11] Weatherly, Richard PhD and Wydler, Virginia, *Challenge Challenge -Based Acquisition: Stimulating Innovative Solutions Faster and Cheaper By Asking the Right Questions*, 13 August 2012

[12] Zients, Jeffrey D., Deputy Director for Management (OMB), *Guidance on the Use of Challenges and Prizes to Promote Open Government*, 8 March 2010.

[13] US Government [Challenge.gov](http://challenge.gov) online competition website for challenge and prize competitions, [www.challenge.gov](http://www.challenge.gov).

[14] Commercial [challengepost.com](http://challengepost.com) online competition website for challenge and prize competitions, [www.challengepost.com](http://www.challengepost.com).

[15] MITRE Capture the Flag Competition (CTF), The MITRE Cyber Academy Website, The MITRE Corporation, 2014, [www.mitre.cyberacademy.org](http://www.mitre.cyberacademy.org).

[16] TALOS - Tactical Assault Light Operator Suit - July 2013 Demonstration Recap, <http://www.youtube.com/watch?v=ePI9TC2ySUY>.

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