

Managing Innovation Prizes in Government

By Luciano Kay

This article is adapted from Luciano Kay, “Managing Innovation Prizes in Government” (Washington, DC: IBM Center for The Business of Government, 2011).

Prizes are incentives that have long been used by public or private sponsors to elicit effort of individuals and organizations. For instance, in the 18th century, prizes were used to encourage basic research by compensating research results with monetary rewards or medals. Prizes also helped in the initial development of the aviation industry in the early 20th century. Notable prizes in history are, for example, the government-sponsored prize offered by the British Parliament in 1714 to the first to invent an instrument for accurately measuring longitude at sea, and the privately funded Orteig Prize for the first aviator to fly nonstop from New York to Paris (won in 1927 by Charles Lindbergh).

More recent initiatives at the federal level include Challenge.gov, an online platform administered by the U.S. General Services Administration (GSA) to gather the public’s ideas and talent through challenges and competitions. More than 20 departments and agencies have already launched competitions through this platform. The prizes analyzed in this report, however, are typically on a larger scale and seek to harness different types of resources to advance the sponsor’s goals.

Prizes can be structured in different ways:

- In **“first-to-achieve”** prizes, the challenge is usually defined as a concrete technological goal that entrants have to achieve before the deadline or expiration date to claim the cash purse. The first entrant to achieve the challenge is considered the winner.
- In **“best-in-class”** prizes, the challenge is defined as a set of minimum standards of performance that entrants have to attain to be eligible to claim the cash purse. In this case, the winner is the entrant that performs the best according to those standards.

In “best-in-class” prizes, there is typically a main public event organized by the sponsor in which all participants come together to compete to claim the cash purse. In this case, the challenges may also be defined as a set of intermediate milestones or qualifying rounds to guide the effort of the participants and permit only the most qualified entries to be selected for a final challenge. If no participant achieves the minimum standards required by the sponsor in that final event, the prize is considered expired.

On the other hand, prize competitions can be structured to award all the prize money to the winner (“winner-takes-all” competitions) or may offer additional rewards for the second or third place winners as well.

Three Case Studies of Prizes

The experiences, lessons, and recommendations presented in this report are based on three case studies of recent aerospace and defense prizes widely regarded as successful programs. They are the Ansari X Prize, the Northrop Grumman Lunar Lander Challenge, and the DARPA Grand and Urban Challenges. Table 1 presents a summary of information about these prizes. The research findings of these case studies and associated insights are the result of a research project the author undertook to examine the potential of innovation inducement prizes as policy tools.

The experience, lessons, and recommendations presented in this report are based on the study of the three aerospace and defense prizes discussed in the previous section, as well as insights from the broader prize literature. Following are the best practices in designing, implementing, and evaluating a prize program.

Designing the Prize

Design is the pre-prize stage of prize programs. It defines elements such as the prize challenge, the prize reward, the eligibility to compete, the rules of the competition, and the sources of funding for the program. The design should also

Table 1: Summary of Information for Prizes Analyzed in this Report

	Ansari X Prize (1996-2004)	Northrop Grumman Lunar Lander Challenge (2006-2009)	DARPA Challenges (2004, 2005, 2007)
Prize challenge	First non-governmental organization to launch a reusable manned spacecraft into space twice within two weeks	Build and fly a reusable, rocket-powered vehicle simulating a flight on the moon within pre-specified timeframe and performance, and in a designated location	Build an autonomous vehicle and complete a pre-specified course demonstrating ability to operate safely and effectively with other vehicles
Sponsor / administrator	X Prize Foundation (sponsor and manager) with funding from the Ansari family	NASA and Northrop Grumman Corp. (sponsors) / X Prize Foundation (manager)	DARPA (U.S. Department of Defense)
Prize purse	\$10 million	Level I: \$350,000 for first place, \$150,000 for second place Level II: \$1 million for first place, \$500,000 for second place	\$1 million (2004); \$2 million (2005); \$2 million for first place, \$1 million for second place, \$500,000 for third place (2007)
Prize type	First-to-achieve prize; medium- or long-term prize	Best-in-class prize; multi-year prize with purse rollover	Best-in-class prizes; short-term prizes, similar challenges
Prize entrants	26 teams from seven countries	12 U.S. teams	All U.S. teams; Finalists (Applicants): 15 (104) in 2004; 23 (195) in 2005; 11 (89) in 2007
Prize winners	Scaled Composites, from Mojave, California (\$10 million)	NGLLC 2006 and 2007: No winners NGLLC 2008: Armadillo Aerospace from Rockwall, Texas: Level I (first place) for \$350,000 Masten Space Systems from Mojave, California: Level I (second place) for \$150,000 NGLLC 2009: Masten Space Systems from Mojave, California: Level II (first place) for \$1 million (2009) Armadillo Aerospace from Rockwall, Texas: Level II (second place) for \$500,000 (2009)	Grand Challenge 2004: No winners. Grand Challenge 2005: Stanford Racing from Stanford, California (\$2 million) Urban Challenge 2007: Tartan Racing from Pittsburgh, Pennsylvania (first place) (\$2 million) Stanford Racing from Stanford, California (second place) (\$1 million) Victor Tango from Blacksburg, Virginia (third place) (\$500,000)
Similar prize examples	Automotive X Prize (2010); Google Lunar X Prize (ongoing)	Power Beaming Challenge (2005, 2006, 2007, 2009, 2010)	Wearable Power Prize (2008)

Source: Author's analysis and sources cited in text



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consider the intellectual property rights of the prize technologies and regulatory frameworks.

Defining the prize challenge. Prizes can address diverse topics and types of achievements depending on the ultimate goals of the program. For example, a prize challenge may require the participants to deliver a prototype that performs according to certain standards, create a new method to solve an old technical problem, or accomplish a feat that involves the development and/or application of technology. Both the challenge and the lead time for technology development focus the effort of prize entrants and affect the approaches and solutions they come up with. Challenge definitions that are sufficiently vague incentivize the use of diverse approaches to technology development and problem solving, but also make it difficult to predict what the characteristics of the program's ultimate technology achievements will be. More detailed rules and technical specifications focus the R&D effort at the cost of less diversity and creativity.

Setting the prize reward. In prize programs, sponsors pay only for concrete results that satisfy the requirements of the prize challenge. Still, recent experiences show that the cash purse generally covers only part of the R&D costs to win the prize. For example, Scaled Composites spent about \$30 million to win the \$10 million Ansari X Prize (Linehan, 2008) and Masten Space Systems spent about \$2.5 million to win \$1.15 million in the NGLLC (Morring, 2009). This suggests that prize entrants are motivated not only by cash rewards, but also by other incentives implicit in these competitions. Prizes may offer the opportunity to increase knowledge, gain credibility or boost one's reputation, or pursue commercial opportunities linked to the prize technologies, among other benefits. Such diverse incentives may even be the prime motivator attracting unconventional entrants, rather than the monetary rewards (Kay, 2010).

Defining who is eligible to participate. Sponsors decide who is eligible to enter and participate in their prizes. In government prizes, agencies must first define whether the prize is

open to, for example, the agency's employees and contractors, or to international entrants as well. In addition, agencies may define a target community or types of entrants that should be engaged in the program.

Crafting the Prize Rules

The rules of the prize contain key information about the competition, such as a detailed definition of the prize challenge, the deadline or expiration date, the eligibility requirements for entrants, and other requirements to comply with existing regulations. These aspects are discussed throughout this report. Maintaining a clear and adequate set of rules is very important for having a successful prize competition. The rules that describe a winning entry are particularly important. While the program manager and his collaborators can design these rules, some technical aspects may require external assistance or consultation with experts.

Securing program funding. The most significant cost of implementation of a prize program is, in principle, the cash purse. Administration costs may be significant, too, depending on the scale of the program, the number of participants, and the sponsor's approach to implementing the prize. Prize sponsors may use their own funding and/or get financial support from third parties. Registration fees to enter the competition and media rights resulting from media coverage of prize events may also support the execution of prize programs. Depending on the configuration used to implement the prize, different cost-bearing structures may be utilized.

Assigning intellectual property rights. The scholarly literature generally considers that prizes are superior to other R&D incentives when they place the intellectual property (IP) rights to the winning entry into the public domain, allowing the adoption, diffusion, and improvement of the prize technology. However, in practice, prize sponsors may relinquish IP rights to entrants to allow the pursuit of commercial opportunities and promote entrepreneurship.

Table 2: Recommended Checklist for Prize Design, Implementation, and Evaluation

Prize Design	
✓	Prize challenge that is exciting, ambitious yet doable, clearly defined and easy to communicate, sufficiently vague as to allow innovation and creativity, and preferably aligned with commercial opportunities
✓	Cash purse that covers only part of the expected costs of technology development and is balanced with commercial opportunities and other non-monetary benefits of the competition
✓	Prize rules that are simple, unambiguous, transparent, easy to understand, and comply with existing regulations
✓	Scheme to finance program costs that considers existing authorities and possible alternative funding from private sources
Prize Implementation	
✓	Proper use of collaborations and partnerships with individuals and organizations to design, implement, and evaluate the program
✓	Strategic prize announcement that reaches out to broader audiences and makes the prize visible
✓	Proper plan of action to manage the competition, gather feedback from prize entrants, and maintain public engagement
✓	Simple and transparent criteria to select the winning entry and objective and independent judges for the competition
Program Evaluation	
✓	Proper evaluation plan to assess effectiveness and efficiency of the program
✓	Evaluation metrics such as technological achievements, investment leverage, prize participation, entrepreneurship, public perception, program continuation, and other outcomes

Implementing the Prize

The implementation of the prize is the actual execution of the competition or prize stage. It requires attention to numerous factors such as collaborations and partnerships with organizations involved in the program, announcement of the prize, administration of the competition, selection of the winning entry and final award, and use of the results. Each of these elements is presented in this section as recommended steps for designing a successful prize program.

Seeking collaborations and partnerships. Depending on their experience and the scope and scale of their prize programs, sponsors may collaborate and partner with external individuals and organizations at different stages of the prize program. This allows access to existing expertise and resources, reduces project risks, and increases the program's impact. In the case of government prizes, agencies can play different roles in designing and implementing the program.

Announcing the prize and making it visible. The resources and timing with which a prize is launched can significantly influence the results of prize programs. Sponsors generally seek to use all the available resources to make a "big splash" with the announcement, promising an exciting competition and seeking to engage both potential entrants and broader audiences as well. The public relations effort thus becomes a key element of a successful program.

Managing the competition. The sponsor, or the administrator chosen for the competition, must continually assess the activities of the participants and the feedback provided by them during the execution of the program in order to anticipate potential problems and maintain an exciting competition with the engagement of the media and the public.

Selecting a winner and awarding the prize. Determining a winner is a very important part of the prize program. Ideally, prizes have to select a winner to be able to inspire the public

and be regarded as a successful program. Award ceremonies are both the formal recognition of the achievements of the winner, and an opportunity to further communicate the achievements of the program and demonstrate the transparency of the prize process. There have been cases in which no participant met the technology performance requirements or claimed the cash purse before the prize expiration. Such prize programs may nonetheless have significant outcomes.

Utilizing the results of the competition. Prize competitions may result in technical innovations valuable to the sponsor even when programs are not aimed at developing specific technologies. Depending on the assignment of IP rights, the sponsor may license the technologies or further develop them with more traditional means such as contracts or grants. Program managers should be aware that participants' entries may range from the obvious to the very creative, and may include experimental technologies that are not ready for immediate use. Only multi-year competitions make technological products more predictable when they have returning participants that work on converging solutions over time.

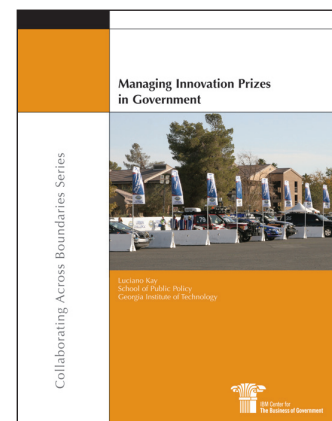
Evaluating the Prize

The evaluation of the prize program, which is the post-prize stage, seeks to measure the effectiveness and efficiency of the program according to its goals.

Defining criteria for evaluation. Innovation prizes are not the best policy approach in all circumstances and their impacts should be evaluated considering the potential contributions of this type of instrument. The three aerospace and defense prize programs all had ambitious goals in the technology development, R&D investment, entrepreneurship, and S&T awareness dimensions, albeit with different focuses. In addition to other, more specific goals, the Ansari X Prize focused on changing public opinion about the possibilities of the aerospace industry, while the DARPA Challenges focused on developing the capabilities of autonomous vehicles to operate safely. The NGLLC focused on the commercial development of rocket technologies. ■

TO LEARN MORE

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- In .pdf (Acrobat) format at the Center website, www.businessofgovernment.org
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