

Changing Culture Through Visionary Thinking

Applying the DARPA Hard Test for Innovation

Tamara Carleton

Changing an accepted organizational culture can feel like rolling rocks uphill. It can seem impossible to escape the inertia built up over decades of accrued behavior and entrenched beliefs. Yet an evolving, dynamic culture is critical to success in today's world. How do leaders find the right balance between reinforcing a strong existing culture and stretching people's ability to accept change?

We can find a model of successful cultural change practices in an unlikely place—a US government agency. My research into DARPA—the Defense Advanced Research Projects Agency—explores how the agency has steadily pursued radical innovation since its founding 57 years ago (Carleton 2011). DARPA uses its program visions as a way to drive quick change without upsetting the organization's broader internal balance. The focus on vision at a program level empowers DARPA's dense layer of middle managers, called program managers, to consider new ways of working and thinking. In particular, DARPA has embedded the concept of "DARPA Hard" within its organizational culture, so much so that this term has established an internal standard for ideas intended for big change. For those looking to drive similar breakthrough success, I believe "DARPA Hard" can be a powerful tool to drive change.

How DARPA Works

DARPA was born out of crisis. The Soviet Union's launch of the Sputnik satellite in 1957 took the United States by surprise, generating a sense of urgency that approached panic. The prospect of falling behind the Soviets in the space race

spurred quick action. The American government responded by creating a new federal agency under the US Department of Defense (DoD) with a mandate for disruptive innovation—not just to win the space race but prevent any future technological surprises. Today, DARPA serves as the DoD's primary innovation engine, focusing on projects that are "finite in duration but that create lasting revolutionary change" (DARPA 2015).

Operating with a sizable budget—just over \$2.9 billion for fiscal year 2016 (DoD 2015)—the agency has built a strong record of wins, including the development of ARPANET (the precursor of the Internet), speech recognition, shape-alloy material science, aircraft stealth technology, mechanical exoskeletons, bionic arms, telerobotic surgery, medical ultrasound, and the Global Positioning System (GPS), among other world-changing innovations. The catalog is so impressive that many R&D groups have looked to DARPA as a proven model of successful disruptive innovation (Bonvillian 2006; Belfiore 2009). That DARPA has been able to plant innovation so thoroughly into its culture is remarkable because, at its core, it remains a federal agency—one that manages to circumvent its own inherent bureaucracy.

At DARPA, every employee contributes to the agency's cultural ethos and helps define its vision. That vision can be captured in the phrase "DARPA Hard," which I heard repeatedly during my research into the agency's culture. While the phrase was coined within the last decade, the fundamental concept has existed since DARPA's founding in 1958. "DARPA Hard" sums up both the kind of work DARPA does and the way program managers approach their work.

As a description of DARPA's work, DARPA Hard characterizes the kinds of ideas the agency pursues—challenges so complex, complicated, and difficult that only DARPA will take them on. DARPA Hard ideas are high risk and high reward. These are big visions, beyond the agency's existing capability. DARPA Hard ideas sit at the intersection of multiple fields, or aim to create an entirely new discipline or paradigm. They promise to profoundly change

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how people think or behave. These ideas are far-reaching, technically challenging, multidisciplinary, and above all actionable. Taken together, in the context of the agency's culture, these dimensions lead to truly culture-changing innovation.

The Four Dimensions of DARPA Hard

For program managers, DARPA Hard crystallizes the expectation that they will introduce new visions regularly and then act on those visions to catalyze radical change in their technical areas. This energy for change creates a spillover effect, as every program manager becomes a change agent across the entire organization, aiming to influence agency leadership and ultimately other government officials to accept the big visions they propose.

The defining characteristic of DARPA's culture, then, is a focus on the big vision—the almost impossible. While other organizations may not be reaching as far out as DARPA, this kind of visionary thinking is what drives radical innovation, and the culture change often needed to support it. Thus, organizations seeking to drive change and ramp up innovation should be asking themselves two questions:

- Is our thinking visionary enough?
- How can our vision change our culture?

Thinking in terms of DARPA Hard can help answer those questions. Drawing from my DARPA research and as a core part of my work today helping organizations drive cultural change, I have created the DARPA Hard Test as a simple tool to help any group embrace a DARPA Hard mindset.

The DARPA Hard Test assesses an idea across the four dimensions of DARPA Hard:

- *Far-reaching* ideas require a completely new mental model. An idea that scores low doesn't aim to alter how people behave; it represents an incremental change, a product fix or additional feature. An idea on the opposite end of the scale creates a complete paradigm shift.
- *Technically challenging* ideas reach beyond the edges of what is currently technically possible, requiring new knowledge for their implementation. Ideas with low scores add no new knowledge to a field or industry, while ideas with high scores pioneer major advancements.
- *Multidisciplinary* ideas require the integration of multiple, disparate bodies of knowledge. Ideas with low scores sit completely within one area or class of knowledge.

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- *Actionable* ideas are not magical or hypothetical; there is a clear path to the goal, a path on which progress can be made today. Ideas with low scores may sound great on paper, but there is no clear path forward; these ideas remain as fantasy or rhetoric. High-scoring ideas galvanize a team and set change in motion.

Ideas are scored on each dimension on a scale of 1–7, with 7 being the highest score (Table 1). The scales are relative rather than absolute, encouraging users to truly consider the nuances between the intervals. One team may score an idea as a 5 on the far-reaching dimension, while another feels it's closer to a 3. That is fine. The real benefit in this type of diagnostic is the discussion and insight that it generates, as teams consider questions such as, what does a 5 feel like to us? Do we feel more comfortable at a 2 or a 3? What level suits the nature of our work?

The US moon landing is a powerful example of a DARPA Hard idea. In May 1961, when President John F. Kennedy announced the goal of sending an American to the moon and bringing him safely home before the end of the decade, he was motivated by political pressures, not technical realities.

As part of validating and calibrating the DARPA Hard Test, I asked a small panel of experts from across academia and industry to score the moon landing, among other well-known examples, on the scales. It was important to have agreement across the four scales, so that the low and high endpoints would make sense for a majority of users. The panel's assessment of the moon landing against the dimensions of the DARPA Hard Test reveals how challenging the mission really was (Figure 1).

Was the vision for the moon landing far-reaching? It wasn't completely outrageous. Russia had already put a satellite into orbit and a man in space, and other precedents existed. The experts scored the moon landing at a 5 on the far-reaching scale. Technically challenging? While American engineers had a fair amount of technical knowledge, this idea presented enormous challenges. The experts averaged a score

TABLE 1. The dimensions of DARPA Hard

Dimension	Scale (1–7)	
	Score 1	Score 7
Far-Reaching	Requires no change in how people think about solution	Requires a paradigm shift in how solution is viewed
Technically Challenging	Requires no new technical knowledge	Requires major advancements in technical knowledge
Multidisciplinary	Requires only one class of knowledge	Requires multiple, distinct bodies of knowledge
Actionable	Requires so much clarification that the next step is another meeting	Requires little effort to begin moving toward a solution

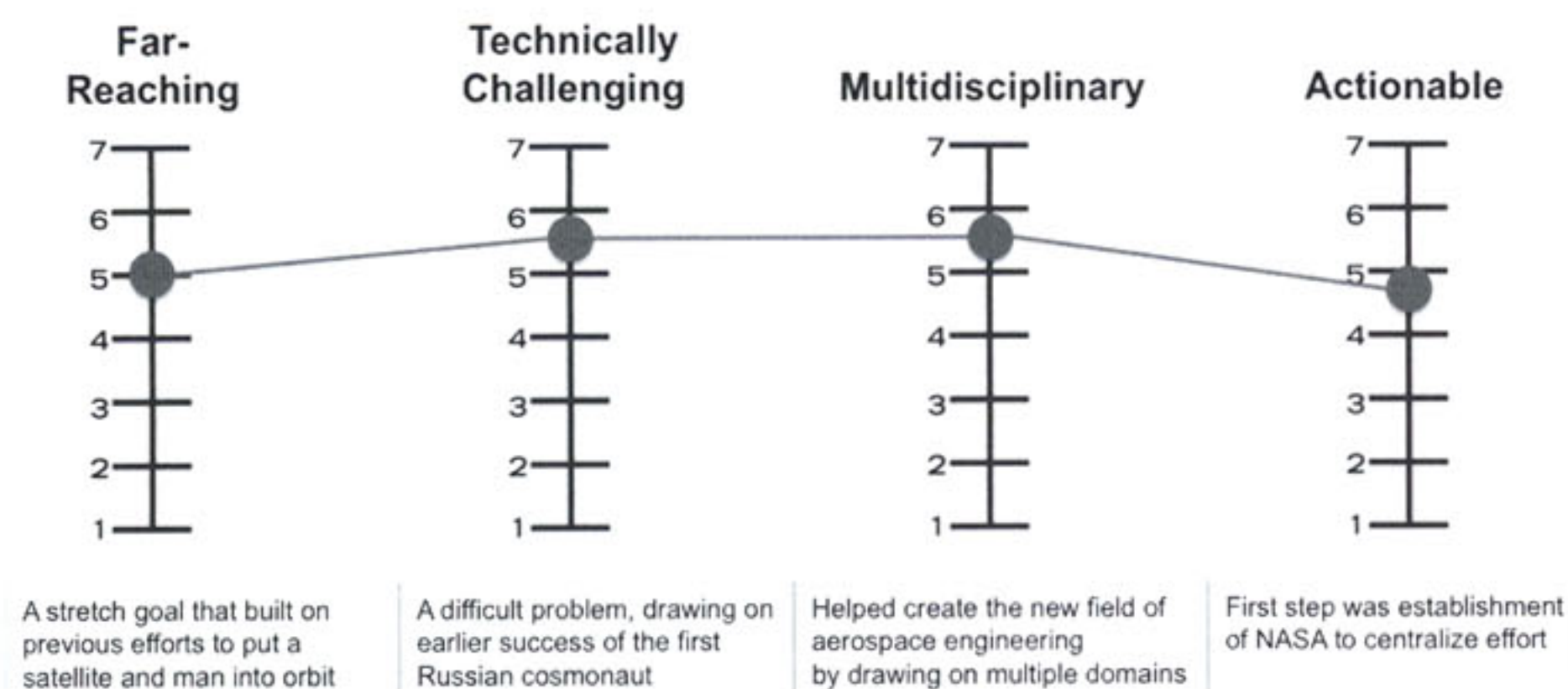


FIGURE 1. DARPA Hard scoring for the moon landing

of 5.5. Multidisciplinary? Actually, the drive to put a man on the moon drew on so many other fields—such as materials science and statics—that it ultimately created an entirely new discipline, aerospace engineering, that integrated knowledge from all of these areas. The experts averaged 5.5. Actionable? The US government rapidly proved its commitment by establishing a new space agency, NASA, to organize the effort and map next steps. While much planning was still needed, the clear first step put the initiative at nearly a 5 on the Actionable scale.

The United States achieved this vision in July 1969—eight years after Kennedy’s announcement—when Neil Armstrong and Buzz Aldrin became the first humans to step on the moon. The effort contributed a new term to the language: *moonshot*, used to describe an ambitious, exploratory, and groundbreaking project.

Implications for Changing Culture

While embracing a version of DARPA Hard may represent a culture change for an organization, it won’t in itself create that change. It takes time to change any culture. But the DARPA Hard concept can help cultivate in teams an ingrained readiness to change, a willingness to embrace the difficult challenges ahead. The objective is to develop an internal mindset that shifts “we should change” to “we want to change,” so that a group’s immediate reaction to any new idea is enthusiasm.

Habit formation is the process by which new behaviors become automatic. Using the DARPA Hard Test repeatedly can help build new habits, prompting behavior change and inculcating the beliefs and attitudes that are the basis of any cultural transformation. And at a first pass, before you attempt to decree your company’s equivalent of DARPA Hard, the tool allows you to assess reasonable goals for change.

As part of that change assessment, the DARPA Hard Test can help an organization incorporate several elements required in driving organizational change:

1. **Involve everyone.** The DARPA Hard Test is designed to reflect a collective viewpoint across four related scales. In group discussions, the tool allows the voice of the employee to be integrated into the discussion about an idea’s in-

novation potential (or lack of it). Junior workers can communicate upwards about how their efforts feed into the strategic map. Input can be solicited from people outside the team, such as strategic partners or vendors, to see how they might score an idea. Used consistently over time and across business divisions, the tool reinforces the importance of engaging multiple views.

2. **Foster a long-term mindset.**

The DARPA Hard Test considers the long-term impact of an innovation idea.

It’s easy for teams to get swept away with an idea’s technical merits or a project’s short-term objectives; by being asked to think about a vision over time, team members are prompted to consider the mid- and long-term implications of what they propose. This long-term mindset is valuable for understanding how an innovation may unfold over time and also for moving change forward.

3. **Create ownership.** The DARPA Hard Test requires discussion in order to set scores for each dimension. Teams cannot remain passive; they must actively talk through the finer points of ideas, which encourages them to open up about what they think is important and why. The more they discuss, the more they feel a sense of attachment to what they can do. The DARPA Hard Test offers a way for team members to feel like a part of a greater whole because it solicits their input to the overall decision making about a project portfolio.

4. **Take a holistic view.** Because the scales are relative, the DARPA Hard Test offers a holistic view not provided by purely financial metrics. Seeing the range of scores across a portfolio can help executives compare different businesses and product lines. Observing how scores fall within certain parameters or differ widely at specific points, an executive can ask, should we be engaging in more visionary thinking for this market? What is our comfort level for our industry? Do we want to have that larger potential impact? How might we consider staging a project’s mini vision into a bigger vision in the mid and long term?

5. **Communicate change.** Business leaders often struggle to articulate how and where a new program sits alongside other work, and while the strategic case may be obvious to them, it may not be as clear for those at the operational level. The DARPA Hard Test introduces a common language and a simple visual that summarizes a program’s potential across four measures; discussion around the tool can help communicate how those measures relate to the business’s strategic goals. The tool also enables someone to respond and ask deeper questions such as, what would a level 6 project entail? What would make this idea more actionable?

Visionary Thinking and Culture Change

Visionary thinking affects organizational culture because if people see they can do more, they will do more. Visionary thinking expands our imagination and, more importantly, spurs innovative action.

At a recent innovation workshop with a major pharmaceutical company, I asked each team to assess one of its current R&D projects using the DARPA Hard Test. Across their projects, all but one team scored their projects similarly—between 2 and 4 on all of the scales. Everyone was delighted because they could see that they shared a similar outlook for their work. The scoring showed that they had a common understanding of what each dimension entailed and where their projects sat on the spectrum.

The group then had a stimulating conversation about why one team had scored its project differently, which raised good questions about the overall group's long-term R&D strategy, project portfolio mix, and internal obstacles. Everyone considered a range of questions: Should they take on this team's project if it fell outside the usual range for the company's portfolio? Was this idea beyond the comfort zone for what the organization could support?

The group's manager was part of the discussion, and he found it helpful to hear from those directly involved in the project. The team had previously struggled to explain why this project felt more challenging than other R&D efforts. Now, seeing how multiple projects compared, the manager was able to put the team's comments in context, and he had a way to speak to senior leadership about the importance of this unusual project.

Of course, culture change doesn't occur overnight; it emerges through multiple steps that push forward a new way of thinking. Going forward, the group's manager reflected more: If the group did pursue this new type of project, should it recruit a different type of champion, one who could help drive the cultural change they desired? How could the group think a bit more strategically about this idea if it offered a bigger impact? Who else would pursue this idea if they didn't, and what might be the opportunity cost?

By asking these questions, the group's manager broadened his thinking about what could be done next, and he was able to engage all the members in his group in helping to develop that bigger perspective. Using the DARPA Hard Test gave him a constructive way to encourage more visionary thinking within his group and also to prompt awareness about taking on more visionary projects that would test the company's current cultural norms in R&D.

Finding Your Next Moonshot

The DARPA Hard Test offers one tool to assess a program's potential for transformative change and encourages visionary

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thinking. While not every idea can or should score a 7 on the DARPA Hard Test, the basic philosophy can be applied to any type of initiative. Where does your project or program sit along the four dimensions? Does it feel far reaching? Does the technical challenge lie in inventing new knowledge, in the integration of multiple components, or in a different type of complexity? How would a multidisciplinary partnership impact progress? Is your team stymied because the idea may not be that actionable?

You can even apply the test to your own work, asking, am I being visionary enough? Am I thinking and acting like an innovator? What project stories am I telling to arouse and model change? What are my team's project stories that should be told to others outside our group, especially to those in senior leadership?

DARPA has had over 50 years to build a culture that nurtures disruptive change. The DARPA Hard Test can help any type of organization consider what it is doing—and what it might do differently—to create such an innovation culture for itself. By using the DARPA Hard Test, we all can learn basic lessons about culture change, and also how to think about our next moonshot.

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