



MITRE's Response to the NIST RFI on a National Standards Strategy for Critical and Emerging Technology

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About MITRE

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MITRE's extensive work on critical and emerging technologies provides a deep understanding of the complexities and nuances within, and across, these fields. The combination of this experience with our longstanding systems engineering support to multiple federal agencies allows us to grasp the intricacies of standards development and implementation and serves as the foundation for this response.

Introduction and Overarching Recommendations

MITRE commends the development of the National Standards Strategy for Critical and Emerging Technologies (NSSCET) and the ongoing efforts to create its implementation plan. We do, however, recognize that the current Request for Information (RFI) poses questions that are very detailed in nature compared to the high-level scope of the NSSCET. While responses to these questions will offer valuable insights, the connections between them and the NSSCET's objectives and lines of effort are not always apparent. We suggest a stronger focus on the important intermediate space between the overarching strategy and these finer details. Doing so will help ensure a systematic and comprehensive approach to achieving the NSSCET's goals, rather than merely undertaking a collection of generally supportive activities.

Technology Specificity

The optimal approach to critical and emerging technologies (CET) standards work will vary significantly depending on the individual technology in question, primarily due to the unique characteristics, complexities, and developmental stages inherent to each. Some CETs, such as artificial intelligence, may involve rapidly evolving algorithms and methods, requiring a flexible and adaptive standardization process that can accommodate continuous innovation. On the other hand, technologies like biotechnology may necessitate a more cautious approach to standards development, given the potential ethical and safety implications that could arise.

The nature of the industry and the stakeholders involved also factor into the optimal approach to standards work. Technologies that span across multiple sectors may require a higher degree of collaboration and consensus-building among stakeholders from diverse backgrounds. This

necessitates a more inclusive and comprehensive standardization process that takes into account the varying requirements, priorities, and challenges faced by different industries.

The regulatory environment these technologies will (eventually) be leveraged within can also influence the needed approach to standards development. Markets subject to strict regulations may require a more rigorous and detailed standardization process to ensure compliance with the existing legal framework and to address potential risks and liabilities.

In summary, the optimal approach to standards work must account for the unique characteristics, maturity, industry context, and regulatory environment of each critical technology. An NSSCET implementation plan that is too technology agnostic (which the RFI questions imply) could actually become a hindrance to progress.

Timing

The development and promulgation of standards serves a fundamental role in the maturation of CETs. By establishing a common set of guidelines and best practices, standards ensure consistency, interoperability, and safety across various applications and industries. However, it is crucial to acknowledge that the process of standards development, if not executed properly or at the appropriate time in a technology's lifecycle, can also impede progress. Premature standardization may constrain innovation by limiting the exploration of alternative approaches and stifling creativity. Conversely, delayed standardization may lead to fragmentation and incompatibilities, resulting in increased costs and inefficiencies for end-users and industry stakeholders.

Strategically timing standards activities is key to both accelerating the advancement of a technology and ensuring its proper use. By aligning the standardization process with the technology's maturity and industry readiness, stakeholders can effectively create an environment that fosters innovation, collaboration, and adoption of the technology.

Participation in Standards Development

A key aspect of working on the right standards at the right time in a technology's evolutionary cycle is to also ensure that the right entities are participating. The three major groups identified are:

- Academics. They often primarily focus on advancing new scientific theories, rather than building products or tackling specific operational challenges—activities that typically occur years before standards endeavors¹ commence. As a result, they are not major participants in standardization activities, and their involvement is usually not necessary for these activities to be fruitful. However, the NSSCET could consider implementing *complementary initiatives* during the pre-standard technology advancement stages, which would not only support academics in their research but also help establish norms within an emerging technical community that would facilitate future standardization work. Such initiatives may include fostering research and development, raising awareness and supporting knowledge exchange, and promoting collaboration.

¹ This response, like the NSSCET, is using the definition of standards found in OMB Circular A-119: Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, available at https://www.whitehouse.gov/wp-content/uploads/2020/07/revised_circular_a-119_as_of_1_22.pdf.

- Industry. Industry tends to be the predominant player in standards development organizations (SDOs) because it directly “has skin in the game.” Commercial entities have (or are attempting to create) intellectual property (IP) that they want to monetize as well as having most of the community’s technical expertise and real-world experience. Standards promote industry growth, ensure compatibility or interoperability, and (for those products that align with standards) provide a competitive advantage. One of the most critical aspects of a national standards strategy is ensuring adequate cross-representative participation by commercial entities in SDO activities.
- Government. Federal government entities help ensure that national objectives are met, promote innovation and competitiveness, and facilitate regulatory alignment. They also represent diverse constituencies and focus on public interest and safety. That said, many other standards body participants are often leery of federal participation (especially from intelligence agencies) as there’s a presumption that they’re merely looking for back doors into systems or to influence geopolitics.² Others, however, are incentivized to participate when there is strong government participation (see our response to question #22).

While implementing the NSSCET, the U.S. should:

- Ensure there is a robust ecosystem of research and development (R&D), engineering, and production—particularly from companies working in these areas that are developing IP and turning that IP into licensable patents and products.
- Proactively leverage federal R&D funds to help support standards development and application. Relatedly, consider extending the research tax credit and/or providing supplements to SBIR/STTR awards to cover IP protection and SDO engagement.

Insights from Prior Efforts

The federal government has developed and collaboratively implemented a standards strategy on a CET before, which provides lessons learned for this NSSCET effort. At the time, multiple federal agencies (and private sector security companies) had a need for biometric technologies within their burgeoning (and high-priority) post-9/11 security programs. The technology itself had been widely demonstrated in simple applications but had limited enterprise-level products or operational applications. Standards had begun to be developed but were often in conflict with one another and/or had critical gaps in covering system-wide needs.

The National Science and Technology Council (NSTC) Subcommittee on Biometrics and Identity Management initiated a years-long effort to coordinate interagency/public-private activities to (1) identify and prioritize biometric standards needs, (2) support SDO endeavors in both standards development and conformity assessment, and (3) ensure consistent selection and application of standards throughout federal systems. The NSTC issued a *Policy on Biometric Standards*³ that not only provided general principles that all federal agencies were to follow (internally and with their private sector collaborators) but also an implementation plan that listed

² There is an element of truth to this as government participants need enough high-level situational awareness of what is happening within the relatively closed doors of standards working groups to (a) identify emerging matters of national security opportunity and concern that may not be on U.S. industry reps’ radar; and (b) work with U.S. industry reps to integrate the U.S. Government’s national security interests (which industry may not be sensitive to) into mainstream standards work items.

³ NSTC Policy for Enabling the Development, Adoption and Use of Biometric Standards. 2007. NSTC Subcommittee on Biometrics and Identity Management, https://www.nist.gov/system/files/documents/2021/11/18/nstc_policy_bio_standards.pdf

tasks and supporting actions, as well as roles and responsibilities for those implementing the policy.

Key insights from those that worked on these NSTC endeavors include:

1. **Collaboration is essential:** The success of the NSTC's biometric standards efforts has demonstrated the importance of collaboration among federal agencies, industry, academia, and SDOs. Bringing together diverse stakeholders with different perspectives and expertise ensures a comprehensive understanding of the technology and its potential applications and challenges.
2. **Public-private partnerships (PPPs) are valuable:** Engaging both public and private sectors in the development of biometric standards has proven beneficial. Leveraging existing PPPs to do so enables greater reach with less effort. Partnerships can also facilitate the pooling of resources, knowledge, and expertise from different sectors, leading to more effective and relevant standards.
3. **International harmonization is crucial:** The NSTC's efforts have shown that harmonizing biometric standards on a global scale was vital for enhancing interoperability and facilitating international cooperation. Actively participating in international standards development efforts and promoting globally recognized standards can help achieve this harmonization.
4. **Privacy and security must be prioritized:** The development of biometric standards had to address privacy, security, and data protection concerns. The NSTC's emphasis on these aspects highlights the importance of ensuring that standards promote responsible and ethical use of the technology, particularly in the context of emerging technologies.

(Numerous privacy and data security frameworks are available free of charge to CET engineers to use when developing hardware, software, and networking products and services. These tools include the National Institute of Standards and Technology [NIST] Privacy Risk Framework,⁴ MITRE Privacy Engineering Framework,⁵ and Fair Information Practice Principles.⁶ Privacy and data security solutions work best when embedded into the entirety of the system and software development lifecycle.)

5. **Innovation should be encouraged:** The NSTC recognized the importance of fostering innovation in the biometric field and supporting research and development efforts concurrently with standards development. Encouraging and facilitating innovation through standards development can help drive advancements in emerging technologies and ensure their continued growth.
6. **Open and transparent processes are vital:** Ensuring an open and transparent standards development process allows for input from a wide range of stakeholders, including the general public. This helps create standards that are balanced, fair, and representative of

⁴ NIST Privacy Risk Framework. 2023. National Institute of Standards and Technology, <https://www.nist.gov/privacy-framework>.

⁵ MITRE Privacy Engineering Framework. 2019. MITRE, <https://www.mitre.org/sites/default/files/2021-11/pr-19-00598-5-privacy-engineering-framework-v2.pdf>.

⁶ Fair Information Practice Principles. 2023. Federal Privacy Council, <https://www.fpc.gov/resources/fipps/>.

diverse interests, which is particularly important for emerging technologies that may have significant societal impacts.

7. **Flexibility and adaptability:** As technology evolves rapidly, standards must be flexible and adaptable to accommodate new developments and advancements. The NSTC's endeavors have demonstrated the importance of regularly reviewing and updating standards to ensure their continued relevance and effectiveness.
8. **Education and awareness:** The NSTC's efforts have shown that raising awareness and educating stakeholders about the importance of biometric standards, as well as the technology itself, is crucial for promoting adoption and ensuring responsible use.

By applying these lessons from the NSTC's prior biometric standards endeavors, a strategy for other CETs can be more robust, comprehensive, and well-suited to address the unique challenges and opportunities associated with each technology.

Questions Posed in the RFI

1. Are there potential benefits, opportunities, or risks associated with increased U.S. participation in standards development activities for CET?

Increased U.S. participation in SDOs should be done strategically, as there are potential benefits, opportunities, and risks in doing so.

Benefits

- **Fostering innovation and technology transfer.** Properly focused and timely standards development can boost innovation and support the earlier transition of technologies into application.
- **Global competitiveness and economic prosperity and security.** Active participation in international SDOs can help enhance U.S. competitiveness and ensure its industries will be well-positioned to capitalize as CETs are leveraged in various markets.
- **National security.** Ensure that developed standards align with national security requirements, such as protecting critical infrastructure.

Opportunities

- **Helping ensure a level playing field.** For national SDOs, make certain that the interests of all key stakeholders are represented and considered. For international SDOs, counter the efforts of rogue nations or nations misaligned with U.S. interests and make certain that developed standards are fair and appropriate for all.
- **Promoting collaboration.** Participation in SDOs helps industry advance more efficiently and effectively. For countries, it provides building blocks for broader international agreements.
- **Leadership.** Active participation in SDOs positions companies (and internationally, the U.S.) as a leader in shaping the direction of future efforts in the focus areas.

Risks

- Resource allocation. Effectively participating in SDO activities requires both human capital and financial investments, which can strain budgets and/or divert attention from other priorities.
- IP. Sharing information about technologies and practices as part of SDO endeavors opens risks to IP, potentially exposing companies to theft or misuse of their IP.

2. What are the potential risks or implications of decreased U.S. participation in standards development activities for CET?

The U.S. has been at the forefront of standards development in various technology domains (such as software, transportation systems, financial technologies, internet communications, and e-commerce) for several decades. This leadership has played a significant role in enabling U.S. companies to grow faster and achieve greater success compared to their international competitors. However, decreased participation in standards development activities for CETs would pose potential risks and implications, which may undermine the chances of similar success in the future.

Some potential risks and implications include:

- Loss of global competitiveness: With reduced U.S. participation in standards development for CET, there is an increased likelihood that other countries will take the lead, potentially resulting in standards that do not favor U.S. interests or technologies.
- Slower innovation and adoption: A lack of active U.S. participation in standards development could slow the pace of innovation and technology adoption, as U.S. companies may face challenges in integrating their products and services with global standards.
- Barriers to market access: U.S. companies may face increased barriers to entry in global markets if they are not actively involved in shaping the standards that govern these markets, potentially putting them at a competitive disadvantage.
- Reduced influence on international policy: Decreased U.S. participation in standards development activities could limit the nation's ability to influence international policy and regulations related to CET, potentially leading to unfavorable outcomes for U.S. businesses and national security. Decreased participation could also limit U.S. trade representatives' negotiation posture as new trade agreements are being negotiated and implemented.
- Fragmentation of standards: A decline in U.S. participation may result in the development of regional or country-specific standards, leading to increased fragmentation and complexity in the global technology landscape.

3. What are the most important challenges faced by the private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic

community, and civil society organizations) when participating in standards development activities for CET, and how can these challenges be addressed?

MITRE's overarching observation is that the private sector, especially start-ups and SMEs, face two main challenges: (1) limited awareness of standards development activities, and (2) restricted ability to support such activities due to resource constraints. The lack of participation in SDOs by these entities can lead to larger organizations dominating standards development efforts. To address this issue, it is essential to improve information dissemination and facilitate better organization within the technology community, allowing these smaller entities' perspectives to be considered without requiring substantial effort or investment in complex and time-consuming SDO activities.

A secondary concern for these entities is the protection of their intellectual property rights (IPR). They often worry that participation in SDOs may lead to difficulties in safeguarding their intellectual property. To alleviate this concern, clear policies and guidelines on IPR, as well as legal support and resources, should be provided to help organizations navigate these challenges while participating in standards development activities.

4. How can the U.S. Government establish policies that promote standards development for CET as a critical component of U.S. innovation culture?

MITRE's primary recommendation is for the U.S. Government to proactively establish policies that directly promote standards development and adoption. The previously referenced biometrics work by the NSTC serves as a useful example. At that time, the government was poised to be the primary large-scale purchaser of these new technologies, providing leverage for the NSTC's subcommittee. One of its early actions was to signal its intention to create a *Registry of Recommended Biometric Standards*, which would list the standards that federal agencies were required to use in their systems (unless the agency could document operational inadequacy or fiscal untenability). The registry's use was later strengthened through NSTC policy and presidential directive, driving significant industry participation in SDOs and ensuring that major commercial providers complied with the new standards as soon as possible.

Furthermore, the government can issue policies that encourage federal agencies to support standards development activities in various other ways, such as:

- Raising community awareness and emphasizing the importance of standards development
- Providing resources or incentivizing others to offer resources for standards development
- Leveraging and/or developing PPPs that support standards development activities
- Designing training programs on standards development processes to build capacity
- Fostering international collaboration to align global standards with U.S. interests
- Conducting research and development or data analysis to provide evidence supporting the work of SDOs
- Creating a conducive environment for new standards by identifying and removing adoption and regulatory barriers

By implementing these measures, the U.S. Government can establish policies that promote standards development for CET as a critical component of the nation's innovation culture, ensuring continued growth and competitiveness in the global market.

5. How can the U.S. Government utilize Federal spending on research and development to drive technical contributions for CET standards development activities?

The U.S. Government can leverage federal funding for later-stage R&D (excluding basic research) to stimulate technical contributions to CET standards development activities by incorporating standardization as a crucial expectation within sponsored innovation initiatives. Traditionally, federal research sponsorship has primarily emphasized technological advancement rather than transition, with limited support for involvement in SDOs. By mandating SDO participation for a selected subset of investments, the government can automatically boost engagement in standardization activities.

Furthermore, the federal government can lead by example by requiring a specific subset of its internal researchers or project thrusts to actively engage in SDOs. This strategy will showcase the government's dedication to standards development and inspire other stakeholders to join the effort.

6. How can the U.S. Government facilitate the adoption of standards-based CET by industry stakeholders, including start-ups and small- and medium-sized enterprises (SMEs)?

Our answer to question #4 addresses this for areas where the federal government will be the primary purchaser of new technologies. When that's not the case, recommended ideas to consider when adopting a standard is critically important include:

- Establish programs that raise awareness of important standards and then provide guidance and training on how to implement them.
- Establish PPPs to promote the development, adoption, and implementation of key standards.
- Provide financial incentives, such as grants or tax credits, to encourage stakeholders to adopt certain standards.

7. How can the U.S. Government better support publicly funded and private research in standards development activities for CET?

Both MITRE⁷ and the Special Competitive Studies Project (SCSP)⁸ have emphasized that the key to future success in CETs lies in adopting a more nationally collaborative research model,

⁷ C. Ford et al. A "Horizon Strategy" Framework for Science and Technology Policy. 2021. MITRE, <https://www.mitre.org/sites/default/files/2021-11/prs-21-1440-horizon-strategy-framework-science-technology-policy.pdf>.

⁸ Mid-Decade Challenges to National Competitiveness. 2022. Special Competitive Studies Project, <https://www.scsp.ai/wp-content/uploads/2022/09/SCSP-Mid-Decade-Challenges-to-National-Competitiveness.pdf>.

differing from the traditional Vannevar Bush model employed for the past several decades. The current model suggests that government-funded basic research leads to new knowledge and breakthroughs, which the private sector then independently leverages to create commercial products with practical applications. However, MITRE and SCSP argue that to succeed on CETs in today's competitive international landscape, a greater strategic collaboration between government, industry, and academia is necessary.

By working together and leveraging each other's strengths, these stakeholders can promote innovation, accelerate technology adoption, and enhance economic growth, ultimately contributing to national competitiveness in the global market. To support standards activities in the context of CET, the government should focus on fostering this collaborative research model, facilitating partnerships and cooperation among various sectors to drive more effective and efficient standards development processes.

9. How can the U.S. Government improve communications among the public and private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) to address potential participation gaps in standards development activities for CET?

To improve communications among the public and private sectors and address potential participation gaps in standards development activities for CETs, the U.S. Government can:

- Organize webinars and workshops to educate key stakeholders on the importance of standards development for their future, increasing awareness and encouraging participation in the process.
- Develop centralized online platforms that provide information on SDO activities, tailored to the needs of specific stakeholders so that it's easier for them to access relevant information and engage in the standards development process.
- Establish and, in some cases, lead partnerships to facilitate collaboration and information exchange among impacted entities regarding standards development. This can help ensure that entities from both public and private sectors have a voice in shaping standards for CET, even if they are not directly involved in SDO activities.
- Create an interagency standards team for each CET. These teams would be responsible for obtaining federal consensus prior to each SDO activity, as well as fulfilling the aforementioned tasks for their respective CETs. The NSTC (or NIST's Interagency Committee on Standards Policy⁹) can be tasked with coordinating across these teams.

10. How can the U.S. Government foster early collaboration with private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) stakeholders to identify standards for CET

⁹ Interagency Committee on Standards Policy. 2021. National Institute of Standards and Technology, <https://www.nist.gov/standardsgov/interagency-committee-standards-policy-icsp>. Last accessed October 25, 2023.

that would encourage market and regulatory acceptance as needed? At what stage is early collaboration most effective?

The U.S. Government should foster collaboration with the private sector to identify areas for CET standards focus. However, MITRE suggests that focusing on “early” collaboration may not be the most effective approach; instead, the emphasis should be on strategic timing and focus.

By concentrating on strategically timed and focused collaboration, the U.S. Government can better engage with private sector stakeholders in identifying and developing standards for CETs, ultimately encouraging market and regulatory acceptance as needed.

11. What roles do the academic community and civil society organizations play in standards development activities for CET, and how can they increase their contributions to a private sector-led system?

As noted earlier, academic researchers concentrate on endeavors that occur before the initiation of standardization activities. Consequently, they are not typically significant contributors to such activities, and their participation is generally not essential for achieving successful outcomes.

Civil society organizations are best positioned to contribute to standards activities by helping to ensure that new technologies are leveraged responsibly and ethically. However, their involvement should not be too late, as these protections need to be “baked in” to the systems during design rather than added at the last minute. The U.S. Government can facilitate their involvement by making it easier for them to contribute without having to directly participate (see answer to question #3).

17. How can the U.S. Government work with private sector (i.e., industry, including start-ups and small- and medium-sized enterprises (SMEs), academic community, and civil society organizations) stakeholders to more effectively coordinate with international partners and reinforce private sector-led standards development activities for CET?

The U.S. Government can work with private sector stakeholders to more effectively coordinate with international partners and reinforce private sector-led standards development activities for CETs by:

- Establishing and supporting PPPs: These partnerships bring together diverse stakeholders, including government agencies, private sector organizations, and academic institutions, to exchange information, share best practices, pool resources, and help ensure alignment with national interests in the standards development process.
- Providing technical and policy assistance: The government can support stakeholders by offering technical expertise, guidance, and resources to help them navigate the complexities of international standards development and coordinate with global partners.
- Leveraging diplomatic channels: The U.S. Government can use diplomatic channels to promote coordination and cooperation with like-minded countries and international organizations, advocating for standards that support U.S. and allied nations’ interests and technologies in the global market.

- Promoting the adoption of new standards: The government can encourage the adoption of U.S.-developed CET standards by fostering a favorable policy environment, reducing regulatory barriers, and providing incentives for organizations to engage in standards development activities.

18. How should the U.S. Government share information on standards development activities for CET with like-minded partners and allies?

In addition to the recommendations for questions #17 and 21, the U.S. Government can share information on standards development activities for CET with like-minded partners and allies by leveraging existing abilities to form Cooperative Research and Development Agreements (CRADAs). For example, *10 USC 2350a: Cooperative research and development agreements: NATO organizations; allied and friendly foreign countries* allows the Department of defense to form CRADAs with other nations to improve defense capabilities through the application of emerging technologies. Similar constructs could be used or established with other Departments and Agencies.

21. How can the U.S. Government work with international partners to ensure that standards for CET are developed in a way that supports U.S. interests, including a commitment to free and fair market competition in which the best technologies come to market?

The U.S. Government can work with international partners to ensure that standards for CETs are developed in a way that supports U.S. and allied nation's interests, including a commitment to free and fair market competition, by implementing the following strategies:

- Actively support U.S. representatives in international standards organizations: This can involve helping to nominate experts to serve on technical committees, supporting the representatives' work through PPPs, and promoting U.S. perspectives in relevant forums.
- Advocate for free and fair market competition: The U.S. Government should champion the principles of open, transparent, and market-driven standards development, emphasizing the importance of competition, innovation, and the adoption of the best technologies in the global market.
- Build strategic alliances with like-minded countries: Forge partnerships with countries that share similar interests in promoting open and transparent standards development for CET. These alliances can help build consensus on common objectives and coordinate efforts to influence the development of global standards.
- Leverage analytics capabilities to assess objectives and actions of competing nations: Utilize data-driven insights to understand the objectives and likely actions of nations with competing interests. Share this information with U.S. representatives and international partners to help them prepare and effectively engage in standards meetings.

22. How can the U.S. Government make the United States a more desirable location to hold international standards meetings, events, and activities for CET?

To make the United States a more desirable location for holding international standards meetings, events, and activities for CET, the U.S. Government can adopt a multi-sector, cross-functional, and multi-national approach centered on a PPP model. MITRE's long history of both leading and participating in PPPs can provide valuable insights into various strategies.

A crucial element in this approach will be the involvement of the U.S. Government. As the primary sponsor of early-stage research in CET, the government's collaboration in initial standards work is essential to address concerns that independent efforts could be overshadowed or trumped by subsequent government action. By proactively helping to establish and participate in standards activities, the U.S. Government can alleviate these concerns.

But, as we mentioned earlier, there are also entities that are concerned with the federal government being *too involved*. An answer to balancing these concerns can be establishing public-private partnerships that are hosted and managed by a neutral organization (not the government itself, nor an entity that's a builder, buyer, or investor in the CET). The federal government's support and participation in such endeavors will signal commitment, while having a third-party lead can alleviate apprehension.

An example to underscore this concept is a forum hosted and led by the non-profit Connected DMV, created to make the U.S. the nexus for standards, policy, and cross-sector collaboration on quantum information science and technology—one of the CET priorities. This forum brings together government at various levels, private sector “builders,” academic and nonprofit researchers, private investors, and international partners. Based on many engagements Connected DMV has had with international partners and others in the emerging quantum ecosystem, there is clearly a cross-sector and cross-geography interest in participating in U.S.-based collaboration. However, these partners have consistently told us that the key to ensuring their participation in standards work is the participation of the U.S. Government. They want to see the U.S. Government's (1) commitment, (2) active leadership and partnership, and (3) resourcing and funding before they significantly put their own “skin in the game” on standards activities.

We also can't claim success at the mere creation of a U.S. Government-backed PPP. Achieving success depends on how the model and the partnerships are operationalized, and that means each technical community must address some key disincentives and barriers to U.S.-based collaboration. As Connected DMV has found, emerging technology programs around the world differ generally in their objectives, funding, scope, and focus. However, all share a common goal of advancing technology and leveraging its potential for scientific and societal progress. Most also have similar economic development and national security interests. And more governments and private sector leaders recognize the need for policy, ethics, and standards to be addressed much earlier during the evolution of technology and prior to commercialization. As such, collaboration is imperative. However, several barriers exist that must be understood and addressed to successfully establish the U.S. as the prime driver on standards for emerging technology. They include:

1. Independent national strategies and competing priorities create barriers to collaboration for research and innovation. These differences can result in trade restrictions, or sanctions that limit the ability to cooperate.

2. Cultural differences create communication barriers and differences in expectations for effective collaboration. These differences affect decision making and the prioritization of goals.
3. Resources are not uniformly distributed. Worldwide programs deliver varying levels of national resources for advancing technologies. Discretionary spending and existent infrastructure make some countries reluctant to collaborate given concerns over actual and perceived competitive advantage.
4. Different regulatory frameworks make it challenging to develop technologies in multiple countries, simultaneously causing uncertainty regarding commercial viability.
5. Differing intellectual property laws make it difficult to determine ownership of discoveries and derivative innovations.