MITRE | SOLVING PROBLEMS FOR A SAFER WORLD™

IMPROPER INFLUENCE IN FEDERALLY FUNDED FUNDAMENTAL RESEARCH

CONTENTS

EXECUTIVE SUMMARY

Great Power competition has expanded the range of concerns and the level of risk for the integrity of federally funded fundamental research.[1] While international collaboration adds value in many ways to the scientific enterprise, it also creates the possibility for improper foreign government influence, ranging from the misdirection of research to the actual theft of data and ideas. The **federally funded fundamental research enterprise (F3RE)**, consisting of funded research scientists, the universities at which they work, federal grantmaking agencies, and federal oversight and enforcement entities, seeks to become more resilient to improper foreign influence by improving its ability to:

- **Identify improper foreign government influence risks** to federally funded fundamental research.
- Employ effective tools and processes to **counter improper foreign government influence**.
- Take an **integrated approach** to resist improper foreign government influence on federally funded fundamental research while balancing it with the need to **maintain the core principles and values** of the enterprise, and continue to attract the best and brightest students and researchers to the U.S.

In order to better understand what has made the problem difficult to solve, desired improvements, and possible courses of action to improve the situation, The MITRE Corporation conducted interviews with 157 individuals in 65 interview sessions over eight weeks in July and August 2020. Interview participants represented a variety of F3RE stakeholders, including 19 universities and eight federal agencies. These interviews identified areas of consensus across the F3RE, "gray areas" of uncertainty, the barriers to improvement, and a variety of concrete proposals. The findings and recommendations in this report are partly what MITRE heard in these interviews, and partly the results of MITRE analysis based on the content of these interviews.

The **federally funded fundamental research enterprise (F3RE)** consists of funded research scientists, the universities at which they work, federal grantmaking agencies, and federal oversight and enforcement entities.

Principal Findings

- There is **broad understanding across F3RE stakeholders about the potential negative impacts** of improper foreign government influence on federally funded fundamental research.
- There is consensus among stakeholders that ensuring the openness of the U.S. F3RE and its ability to attract the best and brightest scientists from around the world is a top priority and that **any potential course of action must be balanced** against those goals.
- F3RE stakeholders concur on several new courses of action to address improper foreign government influence, indicating that **existing courses of action are not completely effective**.
- **Collaboration** between U.S. and foreign entities, both formal and informal, is perceived by most stakeholders as the primary mechanism through which foreign governments exert improper influence on the F3RE.
- There is widespread general understanding across U.S. F3RE stakeholders of a definition of improper foreign government influence on Federally funded fundamental research in the most egregious cases, but **individual principal investigator researchers (PI) continue to perceive a large gray area** when presented with a specific international collaboration opportunity.
- Many universities feel that they are unable to make **informed decisions** regarding particular opportunities for international collaboration because:
  - The line between proper and improper collaboration is unclear and changing.
  - They lack the resources to obtain the data necessary to inform a correct decision.
  - They perceive that the grant-making agencies fail to understand the value of international collaboration.
  - They perceive that Federal enforcement is based upon compliance with rules rather than reduction of risk.
- Existing processes focus on disclosures made as part of a grant application, but **many risks arise at later points in the grant-and-research lifecycle**.
- The widespread perception that enforcement efforts are focused on specific countries rather than on improper actions and behaviors creates a **hostile environment** for valuable foreign science, technology, engineering, and math (STEM) talent in the F3RE.
- Academic stakeholders believe that they could more **effectively resist improper foreign influence** if the federal government provided:
  - Greater consistency across agencies with respect to disclosure requirements and the extent to which universities should scrutinize their faculty, students, and visitors.
  - Timely access to data about new and emerging foreign influence risks.
  - Coordination of information regarding the behavior of specific foreign collaboration partners.

"Fundamental research means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons."

– NSDD 189 NATIONAL POLICY ON TRANSFER OF SCIENTIFIC, TECHNICAL AND ENGINEERING INFORMATION, 9/21/1985 (THE WHITE HOUSE, SEPTEMBER 1985) HTTPS://CATALOG.ARCHIVES.GOV/ID/6879779

CHARACTERISTICS

- Unclassified, non-CUI, extramural research funded by the U.S. government through Federal grants and conducted at U.S. universities.
- Fundamental Research Exemption applies.
- Knowledge generated by fundamental research could have a wide variety of future applications.

Recommended Courses of Action

- Extend the consideration of improper foreign influence from the grant application process to **the entire grant-and-research cycle**.
- Replace the existing rule-and-compliance-based approach with a **risk-reduction-based approach**. Such an approach would include:
  - Policy and guidance documents created collaboratively with stakeholders across the F3RE that define the risks of greatest concern and relate them to both national security and scientific progress. It is essential that such policy documents take account of the concerns and incentives of all the major participants in the F3RE.
  - Alignment of specific disclosure requirements to these policies.
  - Alignment of university processes to reducing the most significant risks.
  - An education campaign based upon these policies aimed at helping PIs understand whether a particular collaboration opportunity poses significant research integrity risk.
- To the greatest extent possible, **align the policies, data and disclosure requirements, on-line forms, and guidance** regarding research integrity of the major federal grant-making agencies, so that:
  - Education of researchers on reducing improper foreign government influence risk can be uniform, regardless of the agency making the grant.
  - The cost to universities of a proactive risk reduction program and of monitoring and certifying compliance would be minimized
  - The costs of developing tools, processes, and data management systems could be spread across multiple Federal agencies, and across multiple university components
- **Create an information sharing and analysis center** that would enable all parts of the F3RE to share up-to-date information on evolving risks, threats, and risk-mitigation strategies.
- **Create and make use of metrics and indicators** for:
  - The extent to which agreed-upon courses of action are actually implemented.
  - The impact, efficiency, and effectiveness of risk reduction efforts.
  - Improvement of PI understanding of where to draw the line between proper and improper international collaboration.
  - The extent to which these research integrity efforts reinforce the continuing preeminence of the U.S. in fundamental scientific research.

MITRE concurs with past studies that have proposed a risk-based approach to mitigating this threat. However in order to be effective, this approach must focus on identifying new and emerging risk and must be coordinated and implemented consistently, across the full community of stakeholders in the F3RE. To build a capacity for resilience the F3RE should adopt a standardized approach to assessing improper foreign government influence risk based on timely access to data that is shared across government and academia.

INTRODUCTION

In May 2020, MITRE, which operates seven federally funded research and development centers (FFRDC) on behalf of federal agencies, initiated a research study to examine the threat of improper foreign government influence on the integrity of federally funded, fundamental research in the context of the Great Power Competition (GPC).[2]

MITRE engaged with federal and academic stakeholders across the U.S. federal grants community to collect data that would enhance existing understanding of this problem space and investigate opportunities to increase the resiliency of the federally funded, fundamental research enterprise (F3RE). MITRE consulted with the National Science and Technology Council (NSTC) Joint Committee on the Research Environment (JCORE) and representatives from member agencies who were advisors to the study. MITRE interviewed federal agency personnel who work in grants management, administration, and oversight, grant recipients in public and private universities of various sizes, as well as representatives from other federal agencies with interest in this problem space.

This report is intended to provide the MITRE perspective on the key findings from stakeholder interviews, identify the challenges and opportunities that emerged from this study, and provide a set of recommendations for action for the grants community to consider that have significant potential to **increase the resiliency of the U.S. F3RE to improper foreign government influence while maintaining the core principles and values of the enterprise**.

MITRE is a not-for-profit organization chartered in the public interest to address issues of national importance. Through public-private partnerships and the federally funded R&D centers we operate, we work across government and with academia and private industry to tackle challenges to the safety, stability, and well-being of our nation. Our expertise is in "systems of systems" thinking and the interrelationship between technology and people. MITRE designed, conducted, and funded this study independently, without financial support from the federal government or any other entity involved in the grants or academic community.

MITRE engaged with federal and academic stakeholders across the U.S. federal grants community to collect data that would enhance existing understanding of this problem space and investigate opportunities to increase the resiliency of the federally funded, fundamental research enterprise (F3RE).

The scope of the problem space under examination in this study was limited to the U.S. F3RE which includes unclassified research conducted at U.S. universities through the award of federal grants. MITRE adopted the definition of fundamental research documented in the September, 1985 U.S. National Security Decision Directive (NSDD) 189 as, "basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons."[3]

The MITRE team for this effort brought together expertise in grants management, fundamental research execution, data analytics, intelligence analysis, business process, systems analysis, and human and organizational systems. During this study, MITRE:

- **Applied systems engineering approaches, frameworks, and models** to the problem space.
- Leveraged MITRE's unique role as an operator of FFRDCs to **engage stakeholders across government, academia, and non-governmental organizations**.
- **Expanded on the findings of previous reports** by:
  - Directly engaging new and existing stakeholders to collect data.
  - Deconstructing the actions, reactions and behaviors that have made this problem difficult to solve.

The MITRE study identified areas of consensus among stakeholders about the nature and potential negative impacts of improper foreign government influence activities identified to-date, but different perspectives about the effectiveness of existing and planned efforts to mitigate risks. The study also identified several gaps and challenges in current mitigation approaches including lack of a risk-based perspective when evaluating international collaboration opportunities, a lack of data sufficient to evaluate risk, and the existence of a gray area of understanding among grant recipients about improper foreign influence activities, individual risk, and impacts to national security. Most importantly, study results identified the lack of an effective, systemic approach to identify, counter and deter improper foreign influence on the F3RE.

Specifically, MITRE's stakeholder interview data confirm that:

- There is a consensus among stakeholders that ensuring the openness of the U.S. F3RE and its ability to attract the best and brightest scientists from around the world is a top priority and that **any potential course of action (COA) must be balanced** against those goals.

WHAT IS THE THREAT TO RESEARCH INTEGRITY?

In 2018, the U.S. government spent $71.3 billion, 58.6% of all federal research and development (R&D) obligations, to award grants to U.S. colleges, universities, and laboratories for fundamental research in science, technology, and engineering. The U.S. F3RE is open and collaborative by nature and attracts scientists and scientific institutions from other countries to collaborate on U.S. research initiatives. The results of fundamental research activities are shared broadly through publication and play a critical role in the advancement of basic scientific knowledge. These advancements impact U.S. policy, national security, and economic prosperity.

Since 2017, there has been a rise in publicized incidents identified as improper foreign government influence that negatively impact the F3RE. These practices and behaviors:

- Run counter to the core principles and values of the U.S. R&D enterprise.
- Include activities not previously included in the definition of threats to research integrity, which focused on research misconduct: falsification, fabrication, and plagiarism.
- Differ in nature from traditional theft, fraud, waste, and abuse that can occur in the federal grantmaking space.
- Are unethical in nature and raise the specter of bias, such as conflict of interest (COI), conflict of commitment (COC), and other behaviors driven by surreptitiousness, dishonesty, and avarice.
- Introduce tension between national security and the collaborative nature of the U.S. F3RE.
- Diminish the incentives and abilities of the U.S. to foster an open national research environment and attract top foreign talent.

- Most stakeholders perceive collaboration between U.S. and foreign entities, both formal and informal as the **primary mechanism** through which foreign governments exert improper influence on the F3RE[4].
- There is widespread general understanding across U.S. F3RE stakeholders of a definition of improper foreign government influence on federally funded fundamental research in the most egregious cases, but **individual principal investigator researchers (PI) continue to perceive a large gray area** when presented with a specific international collaboration opportunity.
- There is **broad understanding across F3RE stakeholders about the potential negative impacts** of improper foreign government influence on federally funded fundamental research, but individual PIs do not always believe that their specific research collaboration activities could lead to such outcomes.
- F3RE stakeholders concur on several new COAs to address improper foreign government influence, indicating that **existing COAs are not completely effective**.
- Factors that have made this challenge **difficult to solve** include:
  - Lack of coordination and inconsistency among federal agencies with respect to disclosure requirements and expected level of scrutiny.
  - Lack of timely access to data about new and emerging improper foreign influence risk.
  - Inconsistent understanding across stakeholders of the most threatened research and most significant threats.
  - COAs developed using a retrospective vs. proactive approach.
  - Perceptions that enforcement efforts are focused on specific countries vs. actions and behaviors, which create a hostile environment for valuable foreign science, technology, engineering and math (STEM) talent in the F3RE.
  - A rules-based vs. risk-based view of the problem space.
  - Lack of resources and coordination among stakeholders to adequately evaluate the risk of collaboration with any specific foreign collaboration partner.

MITRE recommends four COAs to address foundational gaps that challenge stakeholders' ability to identify, counter, and deter improper foreign influence risk. In parallel, MITRE recommends a set of nine metrics and indicators to track the impact and effectiveness of these and other COAs over time.

"That is a big part of the challenge. No clear definitions of what constitutes improper foreign influence, what it looks like, how to identify it. Unlike improper research misconduct which is clear (plagiarism, etc.). We need clear definitions."

– GRANTMAKING AGENCY

"When universities accept students that will go into the laboratory for research, they should have training and sign some kind of paperwork. A CDA [confidential disclosure agreement] should be basic and require disclosure of conflict of interest and whether they are in a relationship with a lab in China or India."

– PRINCIPAL INVESTIGATOR

Study Objectives and Purpose

The objectives of the study were to assist the F3RE to become resilient to improper foreign government attempts to influence federally funded fundamental research by identifying opportunities to improve the enterprise's ability to:

- **Identify** improper foreign government influence risks to federally funded fundamental research.
- Employ effective tools and processes to **counter** improper foreign government influence.
- Take an integrated approach to **deter** improper foreign government influence on federally funded fundamental research while balancing the need to maintain the core principles and values of the enterprise, and continue to attract the best and brightest students and researchers to the United States.

The purpose of the MITRE study was to directly engage new and existing stakeholders to collect data and expand on the findings of previous reports, deconstruct the actions, reactions and behaviors that have made this problem difficult to solve, and identify those COAs with significant potential to increase the resiliency of the U.S. F3RE to improper foreign government influence.

Approach

MITRE conducted interviews with 157 individuals in 65 interview sessions over eight weeks in July and August 2020. Interview participants represented a variety of F3RE stakeholders, including 19 universities (17 public and two private) and eight federal agencies. Participating federal agencies included the five grantmaking agencies that account for the largest amount of funding for fundamental research.

Participants were solicited for participation through direct or indirect MITRE outreach and outreach support from the Federal Demonstration Project[5] and are not intended to represent a scientific sample. All interviews were confidential, and no attribution to any specific individual, institution, or agency is provided or implied.

During these interviews, MITRE asked stakeholders to identify elements of risk (key actions, drivers, and causal relationships), to identify perceived best practices, and to highlight observed barriers that contribute to ongoing challenges.

Figures 1 through 3, on the following pages, provide details on the characteristics of university interview participants.

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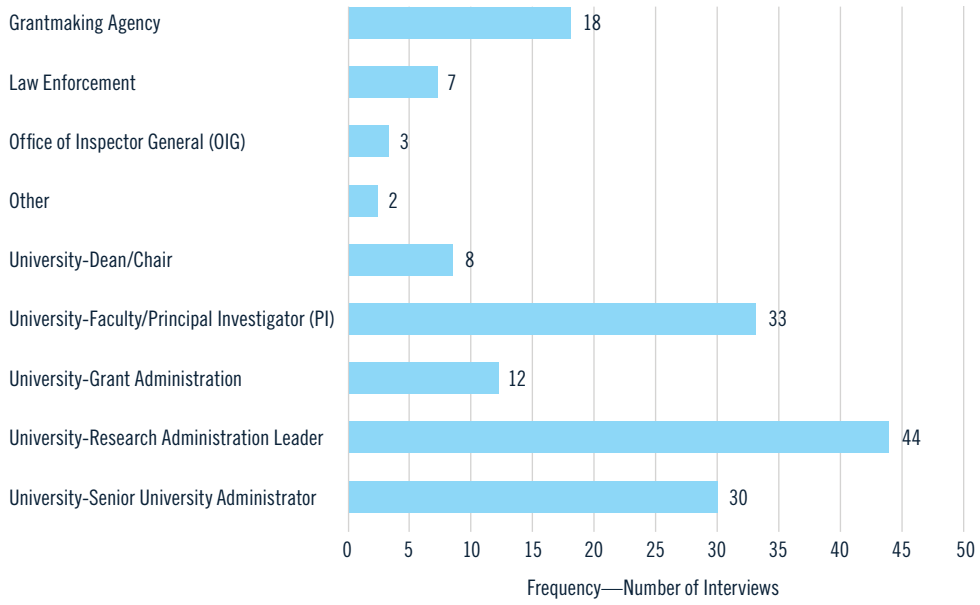

FIGURE 1: STAKEHOLDERS WHO PARTICIPATED IN INTERVIEWS

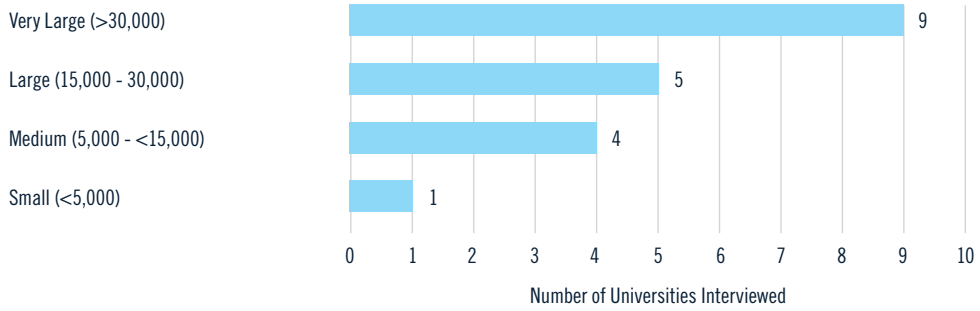

FIGURE 2: SIZE OF UNIVERSITIES THAT PARTICIPATED IN STAKEHOLDER INTERVIEWS

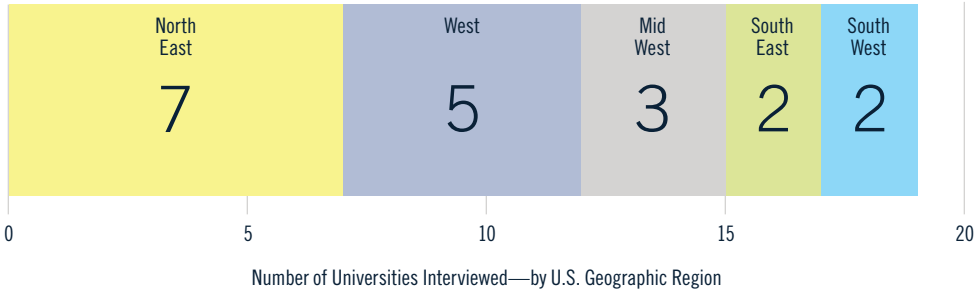

FIGURE 3: GEOGRAPHIC LOCATION OF UNIVERSITY STAKEHOLDERS THAT PARTICIPATED IN INTERVIEWS

In addition to stakeholder interviews, MITRE:

- Conducted a **literature review** to understand the problem, obstacles, stakeholder environment, and current efforts to address the problem.
- Analyzed **stakeholder interview data** using qualitative methods to identify elements of risk (key actions, drivers, and causal relationships), red flags, roles, responsibilities, and to identify best practices and barriers that contribute to ongoing challenges.
- Developed an expanded **model of F3RE stakeholders** and their relationships based on stakeholder interview data.
- Facilitated a table-top exercise with MITRE internal subject matter experts to **explore possible COAs** based on data.
- Developed a **Body of Knowledge document** that provides an overview of the problem space and stakeholder perspectives, informed by the MITRE literature review and interview findings.
- Produced this **research report** to communicate MITRE's findings and recommendations back to the F3RE stakeholder community.

ASSUMPTIONS

Assumption 1: Federal agencies have the ability to restrict access to research they fund through classification, as per NSDD 189.

Assumption 2: For the purposes of this study, federally funded fundamental research does not include classified research or research conducted at agency-owned and-operated facilities (intramural research) that may be funded by federal grants.

Assumption 3: U.S. government classified, intramural, and U.S. private industry proprietary research may also be subject to improper foreign government influence, but these domains are out of scope for this study.

Assumption 4: The number and characteristics of stakeholders engaged for this study are representative of the stakeholders in the problem space, even though they do not constitute a statistical sample.

CONSTRAINTS

Constraint 1: All stakeholder interviews were conducted remotely due to COVID-19 pandemic restrictions.

Constraint 2: Planning for the fall 2020 academic session due to the COVID-19 pandemic limited the availability of university stakeholders.

Constraint 3: The timeline for this project limited the window for conducting interviews; not all relevant stakeholder types could be interviewed within the time frame.

STUDY FINDINGS

How Stakeholders Define Improper Foreign Government Influence

Many stakeholders expressed difficulty in defining improper foreign government influence on research integrity. However, there was some agreement about the activities and behaviors that characterize improper foreign government influence on federally funded fundamental research. These activities and behaviors are shown in Figure 4, below.

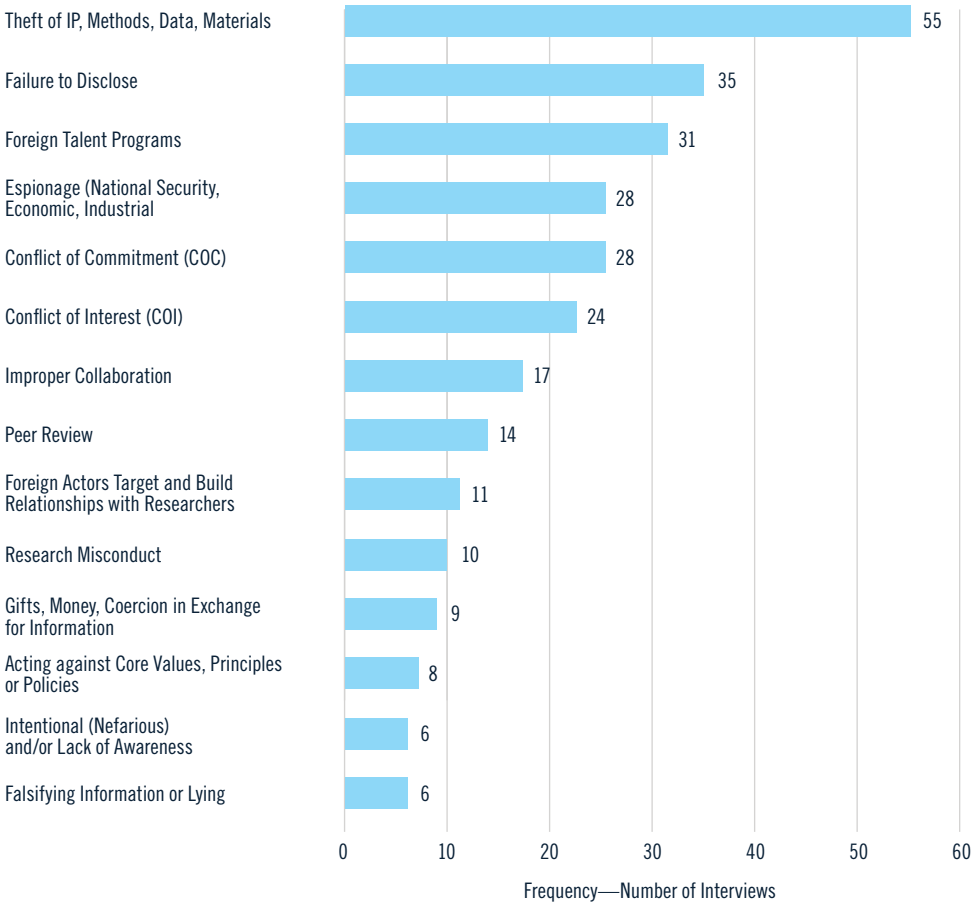

FIGURE 4:
HOW STAKEHOLDERS CHARACTERIZE IMPROPER FOREIGN GOVERNMENT INFLUENCE

The six most frequently identified activities and behavior that stakeholders associated with improper foreign government influence were:

1. **Theft of Intellectual Property (IP), Methods, Data, and Materials**

   Bad actors exploit the openness of the U.S. research enterprise by stealing research ideas, IP, methods, and data, and foreign governments use the research for their own purposes without paying for it.

2. **Failure to Disclose**

   Researchers do not disclose to grantmaking agencies and universities contractual or employment agreements, financials sources, other collaborations with foreign entities, or gifts received from foreign entities.

3. **Improper Foreign Talent Programs**

   Foreign state-sponsored actors actively engage U.S. researchers in formal and informal programs that offer benefits to the researcher in exchange for transfer of research data or methods in advance of publication. U.S. researchers who work in STEM fields on large U.S. grants are particular targets. Benefits may include significant pay and bonuses, careers prospects, or access to state-of-the art labs, materials and resources. U.S. researchers may be required to sign contracts to participate in the program and are discouraged from disclosing the agreement.

4. **Espionage**

   Bad actors carry out surreptitious surveillance for theft of valuable information. Foreign governments gain pre-publication access to research and data that could harm our economic and/or national security.

5. **Conflict of Commitment (COC)**

   Researchers whose time is fully funded by their university and federal research grant funds also have a significant obligation of their time to a foreign entity that is not disclosed.

6. **Conflict of Interest (COI)**

   Researchers receive federal grant funds for a research effort and also receive financial benefits for that same research effort from a foreign government.

"I think of intentional targeted acts, could be a range of different things, the goal of which is to access our research information, especially pre-publication information, through ways that aren't in the spirit of collaboration in the way we were used to before now."

– SENIOR UNIVERSITY ADMINISTRATOR

Methods of Improper Foreign Government Influence

The primary methods through which most stakeholders perceived foreign governments have been able to improperly influence federally funded fundamental research were associated with formal or informal collaborations between federal grant recipients PIs and foreign students or researchers. These collaborations have been considered standard practice within the F3RE and a prized characteristic of its open nature and core values[6], but are now being exploited by foreign governments seeking advantage over the U.S. F3RE and U.S. national security.

Common collaborations identified by stakeholders that have presented an opportunity for improper foreign government influence included:

- **Single event, informal collaborations**, such as a PI engaging in conversation with a foreign national at an international conference or meeting with a visiting foreign national on the university campus.
- Informal collaborations, such as a PI agreeing to host a **foreign postdoctoral researcher or visiting faculty** in his/her laboratory.
  - This visitor is not enrolled in or employed by the university, but does possess a valid visa provided by the U.S. Department of State.
  - The visitor is given access to the laboratory space where the PI conducts federally funded research and may, or may not, participate in the conduct of the funded research.
  - The university may not know who or how many such visitors a PI has invited onto its campus.
- Collaborations formalized through **written or verbal agreements** between a PI and a foreign entity, such as foreign talent program agreements, especially when those formal agreements are not disclosed to or reviewed by the university or grantmaking agency.
- **Other formal collaborations**, such as participation of foreign nationals on grantmaking agency peer review panels.

> "Think of it this way—you would never work for Pepsi and work for Coke at night, that would clearly be wrong. But at times foreign states can contrive this sort of situation."
>
> – UNIVERSITY RESEARCH ADMINISTRATION LEADER

> "There are a variety of other visitors who come for weeks or months on their own visas, who are given access to buildings on campus without officially receiving access through a standard process. If you ask me on a given day who we have on campus of what category, I can't tell you. The risk is a foreign agent, sitting in a lab, masquerading as a researcher, taking photos."
>
> – SENIOR UNIVERSITY ADMINISTRATOR

Red Flags

Stakeholders identified several red flags that may signal an improper foreign government influence risk associated with a potential collaboration which would require a higher level of scrutiny.

- Exchange of **money** during the collaboration.
- Lack of **reciprocity**.
- **Goal** of the collaboration is something other than to publish the research.
- **Multi-year** collaborations.
- Frequent overseas **travel**.
- Association with a foreign **talent program**.
- Publishing with a foreign collaborator who is not listed on any **disclosure** forms.
- Foreign collaborators who don't have the required **background or expertise** to support the research topic.
- **Time commitment** for the collaboration exceeds the time available after properly executing university responsibilities (e.g., working more than a certain number of days a year on an outside activity).
- Several foreign post-docs or visiting professors in the lab and/or **high turnover** of those individuals.
- Individuals who reach out to the university to help with research, are unknown to the university, and are willing to **work for free**.

"Red flag is a lack of reciprocity—information flows only one way to foreign entity, not science, not secure."

– LAW ENFORCEMENT AGENCY

"The goal in collaborations is to publish … If they were not interested in publishing, I would be more reluctant."

– PRINCIPAL INVESTIGATOR

Motivators for Pursuing Foreign Collaboration

Stakeholders indicated that the following factors may motivate PIs and other researchers to pursue foreign collaborations, even if they are risky.

- **Money** (direct payments, bonuses, honoraria)
- Access to state-of-the-art **labs and equipment**
- **Career** advancement opportunities/tenure
- Ability to obtain funding for their research (strong **competition** for limited U.S. grant funds)
- **Opportunity** to work on research of interest (foreign government may fund research that does not receive as much funding in the U.S.)
- Professional **reputation**
- Access to additional **resources** for research (e.g., research team, materials)

"International collaborations that result in joint papers are big feathers in the cap for researchers. It's how professors are promoted; how federal scientists are rewarded. They get accolades for publications, international collaborations, international publications, proving not disproving. We don't provide incentives to keep things balanced."

– GRANTMAKING AGENCY

"Funding has gotten harder to get in the U.S. and it became easier to get from foreign sources in some cases. So what's driving this is the challenges in the U.S. research environment."

– PRINCIPAL INVESTIGATOR

Risks of Improper Foreign Government Influence

Stakeholders indicated that improper foreign government influence on federally funded research could have a number of negative consequences for grantmaking agencies, universities, individual faculty/PIs, the F3RE, and U.S. national security. The most frequently mentioned negative consequences are identified in Figure 5.

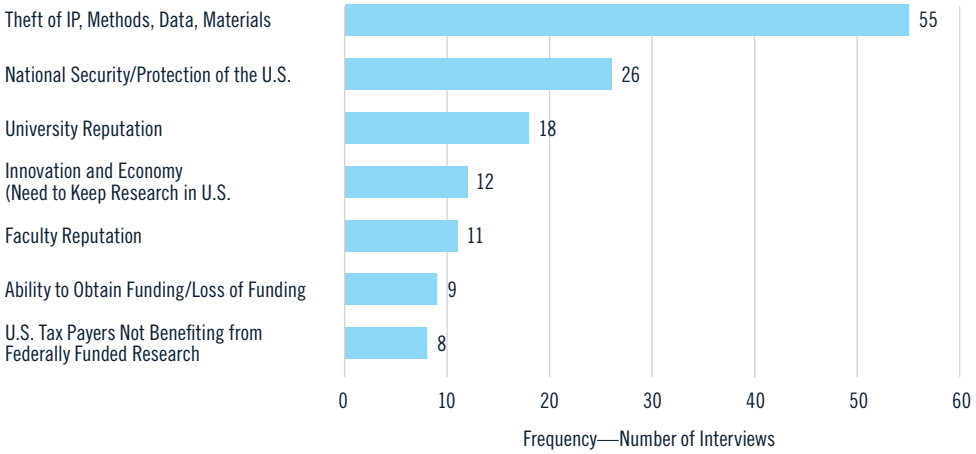

FIGURE 5:
RISKS TO STAKEHOLDERS OF IMPROPER FOREIGN GOVERNMENT INFLUENCE

These specific consequences translate into the following stakeholder-specific risks:

- **Risk to faculty reputation and professional advancement**
  - Theft of IP, research methods, data, and materials can result in a foreign researcher publishing first (scooping). U.S. researchers may miss publication and patent opportunities and can lose years of research when their research data are released earlier than intended.
  - Undisclosed COI and COC violate federal grant agreements and many university policies. They may impact a researcher's ability to design, perform, or report on his/her research and are viewed as a misuse of federal, state, and university resources to benefit an entity that is not funding the research. Researchers may be subject to administrative or legal discipline and may come to be viewed as bad stewards of taxpayer money.
  - Researchers found to have been involved in foreign government influence activities could lose their credibility and reputation, as well as their ability to receive future grant funds, which can hamper career advancement.

- **Risk to university and its reputation**
  - University research leaders are responsible for signing the PI COI form that accompanies a grant application on behalf of the university. When PIs fail to disclose COC and COI, universities do not have a sense of what their researchers are doing that could put them at legal risk.
  - IP that resides in the university could be credited to other foreign institutions or researchers.
  - Incidents of improper foreign government influence within the university could lead to bad press that harms the university's reputation and ability to attract donations and funding. The university may be viewed as a bad steward of taxpayer and donor funds.
  - Damage to a university's reputation can impact its ability to attract the best and brightest students and faculty, its national and worldwide rankings, and how it is viewed by federal grantmakers.

- **Risk to grantmaking agencies, their reputation, funding, and mission**
  - When PIs fail to disclose COC and COI, grantmaking agencies do not have a sense of what their researchers are doing that could negatively impact the integrity of their research mission outcomes. Investigation of potential COC and COI consumes agency financial and personnel resources that could otherwise be used to support the research mission.
  - The fruits of federal grant funding may be diverted to advance R&D efforts in foreign countries at the expense of the U.S. F3RE, agency mission, and/or U.S. national security.
  - Incidents of improper foreign government influence on agency peer review processes can harm the reputation of the agency and its research program.
  - Damage to an agency's reputation can impact the amount of funding it receives for its research mission from Congress.

- **Risk to U.S. National Security**
  - Foreign governments gain early access to unclassified research data/methods that, in combination with other information, could have military implications.
  - Foreign governments gain access to classified research being conducted in the same facility as unclassified research.
  - Foreign governments with access to pre-publication research data/methods use the information to advance lines of inquiry the U.S. would not support, such as the development of chemical or biological weapons.
  - Foreign governments have more available funds to advance its military because it is using research that has been paid for by the U.S. taxpayers.

"I don't want to be on the front page of the paper with my best researcher being dragged off in handcuffs. It doesn't look good for our university."

– SENIOR UNIVERSITY ADMINISTRATOR

"We should not be naïve about what China does with our research. They use it to better their military and they don't hide it. Why do we make it easy for them?"

– GRANTMAKING AGENCY

- **Risk to U.S. Innovation and Economy**
  - U.S. economy is not the first to benefit from the products and innovations derived from federally funded fundamental research.
  - U.S. researchers could be improperly diverted away from lines of inquiry where a foreign government seeks to lead.
  - Foreign governments with improper, early access to pre-publication research data/methods can develop the research for economic and commercial application earlier than the U.S.
  - If the U.S. is perceived as unable to secure IP the F3RE may become a less desirable research environment for researchers.

"There are benefits of having research grown at a U.S. institution, within the U.S. system —to the U.S. economy, to generate ideas for companies and the workforce. All are significant benefits that come out of the research, but that is different when someone has a contractual obligation with another entity."

– SENIOR UNIVERSITY ADMINISTRATOR

Stakeholder Identified COAs

Stakeholders were asked to independently identify concrete actions that could be taken to identify, counter, and deter improper foreign government influence risks to the integrity of federally funded fundamental research. The COAs identified in Figure 6 represent common, unsolicited suggestions and include needed activities that stakeholders believe will make the U.S. research enterprise more resilient to improper foreign government influence.

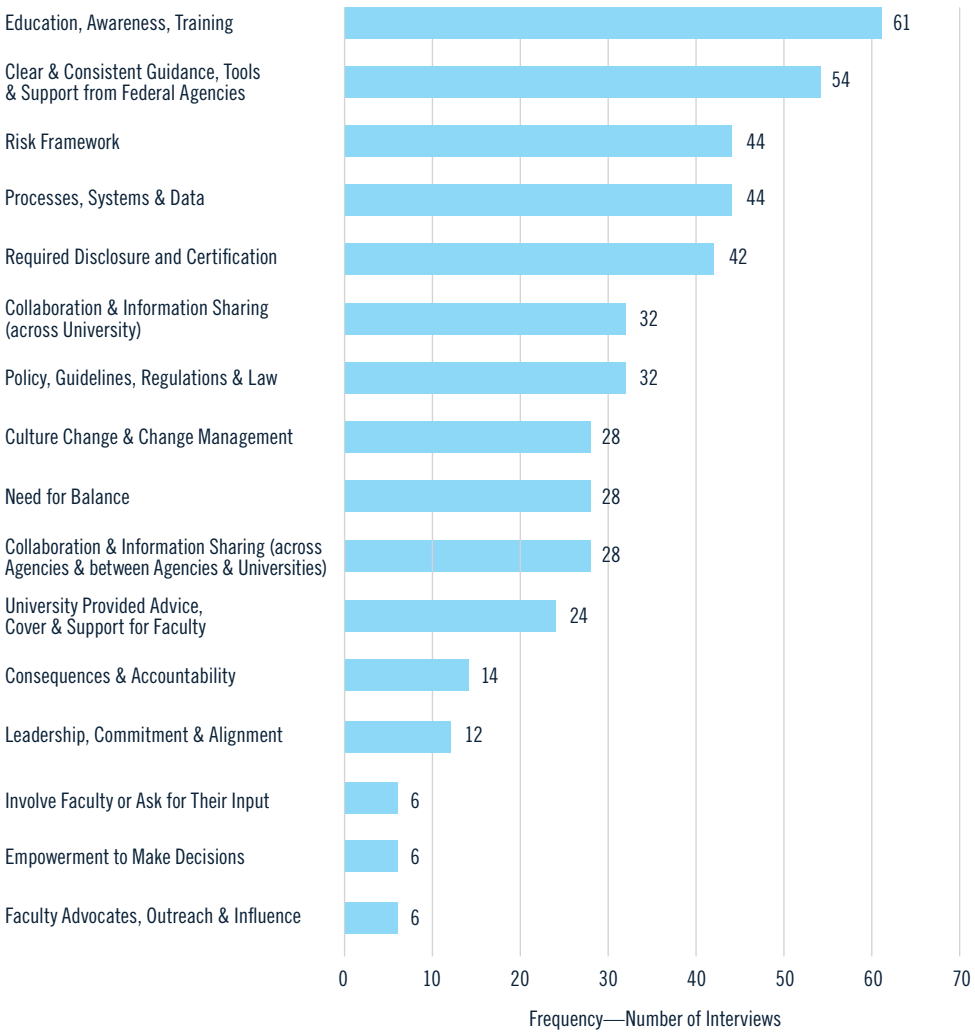

FIGURE 6:
CURRENT OR FUTURE COURSES OF ACTION IDENTIFIED BY STAKEHOLDERS

"We have a culture here—we and others in leadership have had a hand in developing it. It is a culture of administrators, faculty and deans working together… Our advice to other universities is to get these groups together to work on their common goals."

– SENIOR UNIVERSITY ADMINISTRATOR

Table 1 depicts the consensus across stakeholder groups on the identified COAs. The greatest consensus among stakeholders was found for COAs associated with:

- Education, awareness, training
- Clear & consistent guidance, tools & support from federal agencies
- Risk framework
- Processes, systems & data (including information sharing)
- Required disclosures & certifications

Course of Action (COA)	Grantmaking Agency	Other	Law Enforcement	OIG	University Dean	University Grant Administration	University Principal Investigator	University Research Administrator Leader	University Senior University Administrator
Education, Awareness, Training	X	X	X	X	X	X	X	X	X
Clear & Consistent Guidance, Tools, and Support from Federal Agencies	X		X	X	X	X	X	X	X
Risk Framework	X		X	X	X	X	X	X	X
Processes, Systems & Data	X			X	X		X	X	X
Required Disclosure and Certification	X				X	X	X	X	X
Collaboration & Information Sharing (across University)	X	X	X			X	X	X	X
Policy, Guidelines, Regulations & Law	X	X		X		X	X	X	X
Culture Change & Change Management	X		X		X		X	X	X
Need for Balance	X		X		X	X	X	X	X
Collaboration & Information Sharing (across Agencies, between Agencies & Universities)	X		X	X		X	X	X	X
University Provided Advice, Cover & Support for Faculty	X				X	X	X	X	X
Consequences & Accountability	X		X	X		X	X	X	X
Leadership Commitment and Alignment							X	X	X
Involve Faculty or Ask for Their Input							X		X
Empowerment to Make Decisions	X				X			X	X
Faculty Advocates, Outreach & Influence								X	X

TABLE 1:
STAKEHOLDER CONSENSUS ON CURRENT AND POTENTIAL COURSES OF ACTION

Some stakeholders have already begun to take action on these COAs, especially the top three: Education, Awareness, and Training; Clear and Consistent Guidance, Tools, and Support from Federal Agencies; and Risk Framework. MITRE's analysis of interviews identified some specific themes raised by stakeholders about gaps and opportunities of current efforts:

- Some grantmaking agencies have released revised websites with updated frequently asked questions and guidance for completing grant applications and disclosures. However, **guidance still varies across agencies, even when application and disclosure forms are similar**.
- Existing grant recipient training efforts on this topic are being held as stand-alone events. There may be an opportunity to provide the training more efficiently by **incorporating this material into existing required training** on laboratory safety, training on ethical treatment of human and animal subjects, etc.
- Most universities operate open campuses with free public access to many facilities. Campus visitors, regardless of length of stay or purpose of visit, are generally **not vetted or tracked**.

"We are getting multiple guidance from multiple sources. Clear and concise guidance with one voice would help in export controls and fundamental research security to protect them from foreign influence. We need clear guidance from government and partners."

– UNIVERSITY RESEARCH ADMINISTRATION LEADER

Comparison of Stakeholder Identified COAs with Recommendations in Prior Studies and Reports

MITRE compared the stakeholder-identified COAs with COAs identified in prior published studies and reports analyzed in the literature review. Five of the top six stakeholder-identified COAs were discussed in over 50% of the prior studies and reports. This correlation signals consensus among an expanded set of stakeholders about proposed recommendations to address research integrity and preserve and protect the research enterprise. However, the fact that these COAs continue to be identified by stakeholders as needed, implies a gap in their implementation and effectiveness (problem still persists and solutions not working).

MITRE looked more closely at the COAs identified in prior reports and those currently being implemented and found that they lack key components that may be limiting effectiveness:

- They do not recommend a **coordinated approach** for implementation of activities across stakeholders.
- They do not consider the **potential negative consequences** of potential COAs.
- They do not consider **barriers to successful implementation** and how to overcome them.

"What I want to know is who is getting the grant, where they are from, what are their allegiances, are they a member of a foreign talent program—not just from China but anywhere. Are they getting funding from any other source, whether from their local grocery store or from another government? In order to be good stewards of taxpayer dollars, the government needs to know what is going on."

– GRANTMAKING AGENCY

Stakeholder Concerns About Potential Negative Consequences of COAs

During the interviews, many stakeholders expressed concerns about the potential negative impact of actions that might be taken to identify, counter, and deter improper foreign government influence on research integrity. Many of these concerns have surfaced as grantmaking agencies, law enforcement, and universities begin to execute COAs and may be barriers to effective implementation. These concerns are provided in Figure 7 and described more fully, below.

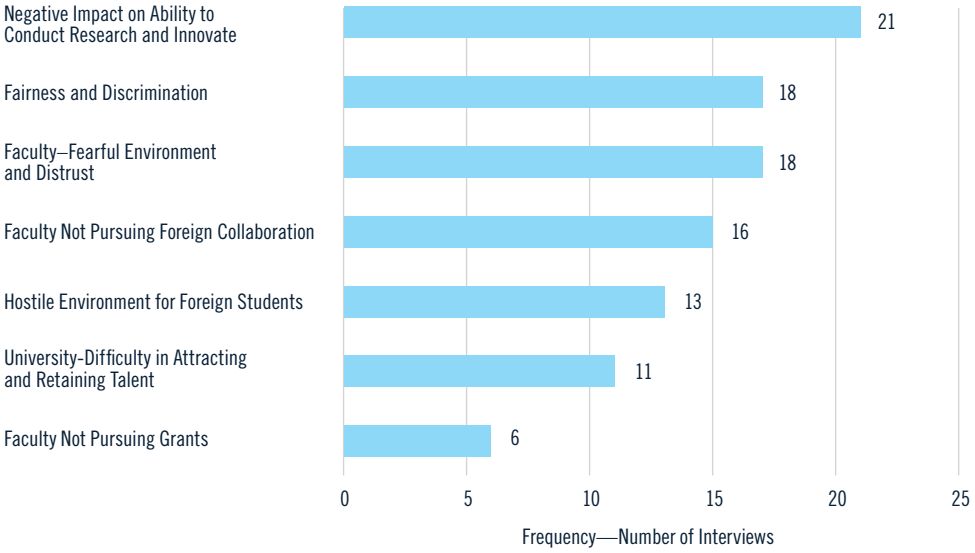

FIGURE 7:
CONCERNS EXPRESSED ABOUT POSSIBLE COURSES OF ACTION TO SOLVE IMPROPER FOREIGN INFLUENCE PROBLEMS

- **Negative impact on the U.S. ability to collaborate internationally and conduct effective research**: Not maintaining free and open collaborations with foreign researchers could impede and jeopardize the research conducted at universities, and the U.S. may fall behind in research and innovation. For example, faculty may not get access to valuable data for their research or benefit from the expertise of foreign researchers. Roughly one-half of the interviews (32 out of 65 interviews), including both university and federal agency stakeholders, reinforced the need to maintain the collaborative U.S. research environment, including collaborations with foreign researchers.
- **Fairness and discrimination**: There is a need to protect individual liberties and treat all employees fairly when taking actions to identify, counter, and deter improper foreign government influence in the university setting. Stakeholders cautioned against singling out or targeting individuals from certain countries or national origins while executing COAs, which could lead to discrimination.

"When the JASON report came out, faculty said, 'I can't do anything—I give up!' It comes out as if you look sideways you get into trouble. That is the message that researchers are hearing."

– SENIOR UNIVERSITY ADMINISTRATOR

- **Fearful university research environment and distrust of faculty**: Some faculty feel they are under increased scrutiny, distrusted, viewed as a suspect or criminal, will get into trouble when engaging in foreign collaborations, and will be assumed "guilty by association" if they disclose an international collaboration with someone later discovered to be engaging in improper foreign government influence.
  - This fearful environment is already discouraging some faculty from engaging in foreign collaborations or pursuing federal grants ("the juice is not worth the squeeze").
  - Some stakeholders observed a level of distrust between PIs and university administrators. Some university administrators felt that if they start to be viewed as investigators, it will be harder to build trust with faculty and get them to disclose foreign collaborations.
- **Hostile environment for foreign students at U.S. universities**: There is concern at some universities that the environment for foreign students will be perceived as hostile. Foreign students are viewed as a critical part of the university's student body that has contributed to breakthrough research.

"Our faculty born in China and Asian faculty feel they have a target on their back. Our most frequent correspondence is with Asian faculty who are saying, "this is what I want to do," and they are concerned that they are targeted… I had someone in tears that they felt so targeted. It is important to make sure that people are not feeling targeted."

– UNIVERSITY RESEARCH ADMINISTRATION LEADER

Barriers to Effective COA Implementation

In addition to the above, stakeholders identified an additional set of barriers they believe will inhibit the ability to identify, counter and deter improper foreign government influence. These barriers are depicted in Figure 8 and described below.

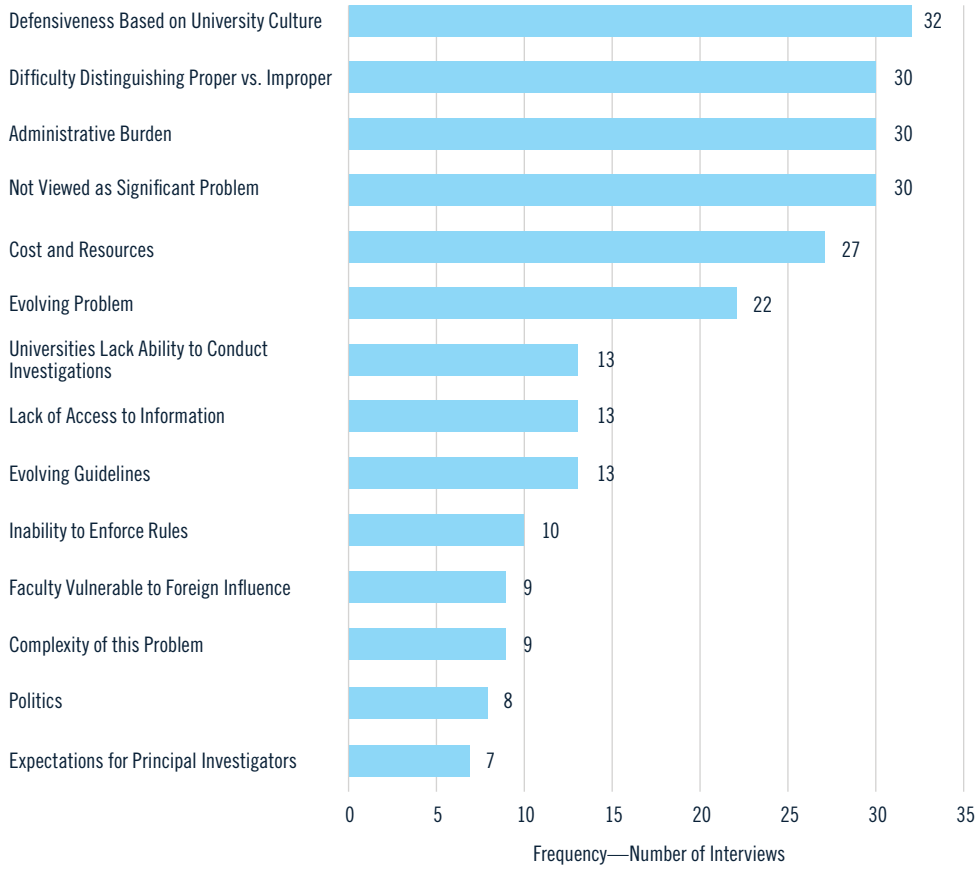

FIGURE 8: STAKEHOLDER-IDENTIFIED BARRIERS TO COA IMPLEMENTATION

- **Defensiveness based on university culture**: Research at universities is governed by the idea of academic freedom and international collaborations are critical for the success of universities and faculty. There is resistance to the idea that faculty collaborations and behaviors will be scrutinized more than they already are.
- **Difficulty distinguishing proper vs. improper collaborations**: Some faculty are unable to make informed decisions on whether to enter into an international collaboration because they perceive the line delineating proper and improper collaboration is unclear and changing (gray area).

- Collaborations often begin informally and stakeholders indicated it can be difficult to identify intent, as it is perception driven. Often it is difficult for a PI to recognize when aspects of the collaboration have changed or crossed the line, especially if the collaboration evolves and matures over a significant period of time.
- PIs generally collaborate with individuals and are unaware of whether that constitutes or when that might become collaboration with a foreign government.
- Some PIs reported being encouraged by grantmakers or universities to collaborate with entities and individuals that are later found to be engaged in improper foreign government influence activities. Grantmaking agencies and universities have also been hesitant to ban participation in foreign talent programs. PIs felt both of these add to the confusion about how to tell if a collaboration is proper or improper.
- Some collaborations that are deemed acceptable can still bear one or more of the red flags for improper collaboration.
- Some stakeholders commented about the general naivete of some researchers, who are primarily focused on their research, eager to engage with anyone who is interested in it, and lack skills to evaluate collaborations.
- Some PIs questioned how to identify improper foreign government influence when collaborating with foreign research institutes and universities in countries where those entities generally receive significant government financial support.
- Stakeholders also described an inability to distinguish between improper collaboration and improper influence. Some stakeholders questioned the criteria being used to determine whether an aspect of collaboration constitutes an opportunity for influence. For example, if a PI receives a $200 honorarium from a foreign entity, is that a large enough amount to require disclosure and raise a red flag for either improper collaboration or improper influence?
- Stakeholders observed that countries involved in improper foreign government influence on the F3RE in recent years have begun to change the methods they use to influence federally funded research. Because stakeholders rely on information about red flags generated from past confirmed cases there is concern that they cannot identify new methods and red flags.
- PIs with nine-month faculty positions may be unsure to what extent their summer activities should be disclosed or scrutinized if they are not working on federally funded research during that time.

"The model of required training in responsible conduct of research seems to be very applicable. It should be feasible to have a level of mandatory training."

– GRANTMAKING AGENCY

"When universities accept students that will go into the laboratory for research, they should have training and sign some kind of paperwork. A CDA [confidential disclosure agreement] should be basic and require disclosure of conflict of interest and whether they are in a relationship with a lab in China or India."

– PRINCIPAL INVESTIGATOR

- **Cost, Resource, and Administrative Burden**: There are concerns among several stakeholders that increasing the scope of existing processes and requirements for grantmakers and grant recipients could cause undue cost, resources, and administrative burden and will face resistance to adoption.
  - Some universities believe they lack sufficient resources (staff, time, money, information sources) to protect from foreign government influence. Universities heavily rely on their faculty to meet their obligations to disclose pertinent information and do not have investigatory units to validate disclosures or vet collaboration partners.
  - Some universities reported having recently hired additional administrative staff or external contractors to meet the demands of increased scrutiny on faculty activities. They noted that the costs are not offset by existing grants administration funds.
  - Researchers generally want to spend their time conducting research and consider existing disclosure requirements, curriculum vitae (CV) updates, and completing annual trainings to be a significant burden.
- **Not Viewed as a Significant Problem**: Some university stakeholders were not overly concerned about improper foreign government influence and don't feel that fundamental research is at risk. For these stakeholders:
  - Improper foreign government influence is viewed as a problem only for classified research and some disciplines with obvious connection to national security (e.g., nuclear or fusion research).
  - Fundamental research is, by its nature, intended to be shared broadly for the benefit of humanity and scientific progress and this outcome outweighs the possible negative impact of improper foreign government influence.
  - Some PIs or university research facilities are in such high demand or conducting such important work that they believe grantmakers should accept their judgment about what is proper or improper foreign government influence.

"42% of faculty members' time on their grant now is spent on administration. We are on track to increase that. This is a big problem."

– SENIOR UNIVERSITY ADMINISTRATOR

FINDINGS AND OBSERVATIONS

General Findings and Observations

Based on analysis of the data collected from stakeholder interviews and literature review, MITRE developed the following summary findings about the problem space:

- Competing interests and the lack of a common understanding of the significance of the problem have produced **tension among stakeholders** in the U.S. F3RE that inform individual stakeholder behavior.
- Some universities may not believe that foreign government influence on research integrity is a **significant problem**.
- There is a **perceived disconnect** between grantmaking agencies and grant recipients over the prioritization of international collaboration.
- **Individual PIs** may create opportunities that deviate greatly from those expected by their university and introduce risks.
- Balancing **varied motivations and incentives** to universities and their associated personnel/researchers is key to establishing a suitable risk environment.
- Some stakeholders view improper foreign government influence as a **compliance and rules-based** issue as opposed to focusing on proactively identifying and mitigating improper foreign government influence risks.
- Many universities are unable to make **informed decisions** on whether or not to enter into an international collaboration.
- The line delineating proper and improper collaboration is **unclear and changing**.

Many universities are unable to make informed decisions on whether or not to enter into an international collaboration.

Findings on Environmental Barriers

MITRE also found the following, additional environmental barriers to achieving resilience to improper foreign government influence on federally funded fundamental research:

- A foundational **grants risk management framework** that includes the risk of improper foreign government influence is lacking.
- Focused evaluation of risk is broadly flagged and **based on specific countries** rather than based on behavior.
- Current understanding of risk is overly reliant on **retrospective** evaluation of realized threats, rather than anticipatory of future approaches or targets.
- **Coordination and consistency** among federal agencies to identify risk and set expectations of grant awardees is lacking.
- There is no **clear definition** of proper foreign collaborations.
- High-profile and highly publicized cases of prosecution are increasing the perception among the academic and scientific research community of the United States as an environment **hostile toward foreign students and foreign talent**.

Findings on Relationships and Influence

Based on analysis of interview data, MITRE expanded upon prior understanding of F3RE stakeholders, their objectives, priorities, actions, and relationships, and developed a revised model of the problem space. This expanded model considers 21 stakeholders, divided into three groups who, through their actions and interactions, have the ability to take action that can influence the outcome and impact of potential COAs:

- **Core stakeholders**: direct participants in the grantmaking process and/or in the conduct of federally funded fundamental research.
- **Secondary stakeholders**: provide governance and oversight of federally funded fundamental grantmaking and research conduct and also supply key resources required for research execution.
- **Systemic stakeholders**: stakeholders who are more remotely connected to grantmaking and research execution, but who may also have a role in monitoring and influencing the F3RE. These federal and non-federal stakeholders may influence the F3RE or other stakeholders through economic, political, or social means and may include other parties with significant interest in the health and strength of the F3RE. They may also indirectly benefit from the products of the F3RE.

MITRE examined the objectives, priorities, actions, and relationships among 21 stakeholders that have the ability to influence the outcome and impact of potential COAs.

Table 2 lists the stakeholders whose actions and interactions are included in the MITRE model.

TABLE 2:
STAKEHOLDERS IN THE MITRE MODEL OF THE F3RE

Category	Stakeholder
Core	Grantmaking Agencies
	Internal Research Team Member (Grad. Students, Post-Docs, etc.)
	Principal Investigator (Faculty)
Secondary	Agency Offices of Inspector General (OIGs)
	U.S. Congress
	U.S. or Foreign Collaboration Partner
	University Deans / Department Chairs
	University Grant Administrator
	University Senior Leadership
	University Research Administration Leader
Systemic	Academic / Scientific Publishers
	Department of Commerce
	Department of Education
	Executive Office of the President (e.g., OSTP, OMB)
	Federal Law Enforcement / Intelligence Community
	Federal Multi-Agency Scientific Commissions, Committees
	Foreign / International Scientific NGOs, Associations
	Foreign Governments
	U.S. Academic NGOs, Associations (e.g., COGR, FDP, AAU)
	U.S. Department of State
	U.S. Scientific NGOs, Associations (e.g., NAS, AAAS, CIS)

By expanding the model of the F3RE system to include additional stakeholders, MITRE was able to identify data sources and modes of influence that have not previously been considered when developing COAs. MITRE used this model to develop a set of MITRE-recommended foundational COAs which can assist existing actions to be more effective.

RECOMMENDATIONS

MITRE concurs with those past studies and reports that have proposed a risk-based approach to mitigating the threat of improper foreign government influence in federally funded fundamental research. However in order to be effective, this approach must focus on identifying new and emerging risks and must be coordinated and implemented consistently, across the full state of stakeholders in the F3RE.

To build a capacity for resilience the F3RE should adopt a standardized approach to assessing improper foreign government influence risks based on timely access to data that is shared across government and academia and avoid the appearance of focusing on threats from a single country or of a single method of influence. To accomplish this goal, MITRE recommends:

- **Four new, foundational COAs** to establish a framework for collaboration and information exchange sufficient for all stakeholders to implement a risk-based approach to identify, counter, and mitigate improper foreign government influence threats
- **19 Activities** suggested by stakeholder interview data that may increase the success of seven stakeholder-identified COAs
- Implementation of a set of nine recommended **metrics and indicators** to measure the resiliency of the U.S. F3RE to improper foreign government influence and track the impact of potential COAs on the health and strength of the F3RE

MITRE concurs with those past studies and reports that have proposed a risk-based approach to mitigating the threat of improper foreign government influence in federally funded fundamental research.

MITRE-Recommended Foundational COAs

MITRE recommends the following four foundational COAs to balance incentives, address foreign talent attraction, and ensure resilience of the F3RE. MITRE believes that implementation of these foundational COAs can overcome identified barriers and increase the success of existing and future actions to secure the U.S. F3RE from improper foreign government influence.

- **MITRE Foundational COA 1**: Extend the existing federal grants risk management framework to account for managing improper foreign government influence threats throughout the grants life cycle. Leverage appropriate public and private data sources and tools that can contribute to the development of the framework and support implementation.
- **MITRE Foundational COA 2**: Implement a risk-based approach to assessing foreign collaborations and their potential impact on national security. Support implementation of this approach by:
  - Enabling and executing an education campaign on the scope of modern national security, which includes commonly-recognized physical and cyber security interests, in addition to political, food, economic, and health security.
  - Enabling and executing an education campaign on the difference between traditional understanding of threats to research security and integrity and threats from a foreign government actor. Communicate how threats from improper foreign government influence manifest differently than traditional threats to research integrity and security.
  - Tailoring and applying the grants risk management framework across all F3RE stakeholders and align application of risk frameworks between stakeholders to provide coordinated approach.
- **MITRE Foundational COA 3**: Increase the ability of F3RE stakeholders to share information by operationalizing an information sharing and analysis center (ISAC) model. Look to the existing Research Education Network ISAC (REN-ISAC) for prospective elements and functions that could be applicable to strengthen the resilience of the F3RE.
- **MITRE Foundational COA 4**: Explore opportunities to identify areas of fundamental research as emerging and high risk and integrate into the risk framework.

These MITRE COAs are foundational because the success of each of the COAs identified by stakeholders (see Table 1) is dependent on or can be enhanced by at least one of the four MITRE foundational COAs. The alignment between stakeholder-identified COAs and MITRE COAs is shown in Table 3, on the following page.

"If there was a consistent online reporting system that covered all of federal government that was shared, that would be a huge step forward. Then it would not be the university having to interpret information… and save so much work for everyone. It would eliminate any chaos."

– SENIOR UNIVERSITY ADMINISTRATOR

"We need to know if someone already has funding and that's not easy to do. We try working with other agencies, we are all a part of one government, but our databases are all separate."

– GRANTMAKING AGENCY

TABLE 3:
ALIGNMENT OF STAKEHOLDER-IDENTIFIED COAS WITH MITRE FOUNDATIONAL COAS

Stakeholder-Identified COA	High Level COA Description	Dependency on/ Alignment with MITRE-Proposed Foundational COAs			
		M-1	M-2	M-3	M-4
Education, Awareness & Training	Universities should provide comprehensive education on improper foreign government influence risk. Faculty are most important to educate but also need to engage deans, university administrators and graduate students. Materials should be standardized and developed by a Federal entity.		X		
Clear & Consistent Guidance, Tools & Support from Federal Agencies	Federal agencies need to provide clear and consistent guidelines as a baseline with as little variation for agency mission-specific needs as possible.		X		X
Processes, Systems & Data	Need for tools and technology as well as more data to identify and evaluate risk.	X	X	X	X
Required Disclosure & Certification	PIs must disclose all current and pending support as well as additional data to allow agencies to evaluate risk; foreign/ visiting faculty and researchers should have mandatory disclosures as well. Consider integrating research integrity training into required laboratory / research certifications.	X		X	
Policy, Guidelines, Regulations & Law	Need for formal policy directives re: talent programs and formal codes of conduct.	X			X
Collaboration & Information Sharing (Across/Among Agencies & with Universities)	Need a whole-of-government approach with information sharing and strong partnership between government and universities.		X	X	X
Risk Framework	Need a uniform risk framework and tools, such as a matrix; data-based; vet foreign visitors/visiting faculty; develop a formal process.		X		X
Need for Balance	Need to balance the need for reducing risk with maintaining an open, collaborative research environment and attracting top talent.		X		X
Consequences & Accountability	Clear consequences and accountability should be established based on roles and responsibilities.	X			
Collaboration & Information Sharing (Across University)	Integrate risk management across siloed organizations within the University; develop a new culture.			X	
Culture Change & Change Management	Establish a culture that promotes a balance between collaboration and resiliency to risk; shift from rules-based to risk-based approach.				X
University Provided Advice, Cover & Support for Faculty	If researchers provide all disclosures promptly and accurately, to the best of their knowledge, the university should support them if a new risk situation arises.	X	X		
Leadership Commitment & Alignment	University and agency leadership need to be committed to countering this threat and aligned with the goals and objectives of other stakeholders.	X			
Involve Faculty or Ask for Their Input	Involve faculty or ask for their input in designing the risk evaluation process and tools.	X		X	X
Empowerment to Make Decisions	Empower individual stakeholders to make decisions based on an personal assessment of risk.	X		X	X
Faculty Advocates, Outreach & Influence	University faculty have influence on peers and students; leverage faculty to advocate for practices that reduce risk of improper foreign government influence.				X

Key Considerations for Stakeholder-Identified COAs

MITRE makes the following recommendations for several stakeholder-identified COAs that may increase their potential to successfully identify, counter, and deter improper foreign government influence on the F3RE. These recommendations are based on interview data describing stakeholder current or planned leading practices.

- **Policy, Guidelines, Regulation, and Law**
  - Universities and federal agencies should seek to align policies and procedures about annual PI disclosures of outside activities, financial interests, and participation in talent recruitment programs ore closely.
  - Universities should provide formal codes of conduct and rules for researchers in university labs, including rules for invited/visiting post-doc and faculty access to university facilities, research methods, and data. These codes and rules should apply regardless of national origin of the visiting researcher.

"Confidentiality, what are your rights and not your rights in the laboratory, do not share data without written permission of your supervisor… these are what you would think are the rules we all abide by without saying them, but we have entered an era where this should probably be more formal."

– PRINCIPAL INVESTIGATOR

- **Processes, Systems and Data**
  - Universities should consider implementing information technology systems that centralize information required for submitting grant applications. These systems have the potential to streamline grant disclosure and application processes and facilitate evaluation of improper foreign government influence risk.
  - An integrated data source with centralized access could be implemented across government and universities to increase information sharing, produce more robust disclosures, and reduce the administrative burden required to evaluate risk. Information could include PI biographies (CV, bio-sketch), publications and co-authors, current and potential collaborators, institutional affiliations.
  - Online federal grant applications and forms should be standardized to the greatest extent possible.

"We are in the process of building a new system that will encompass state requirements and what we think is required by federal funding agencies. That will allow for those prospective disclosures required by the state to populate the disclosures required by the grants' SOP so that people do not have to enter that information multiple times."

– SENIOR UNIVERSITY ADMINISTRATOR

- **Education, Awareness and Training**
  - The most effective universities are using multiple education and communication methods, have an integrated training approach across university departments and offices, and focus on educating diverse stakeholders.
    - Improper foreign government risk topics are covered at new faculty orientation and onboarding as well as town hall meetings and regular department meetings.
    - Case studies, short videos, and briefings from law enforcement are included.
  - Although research faculty are the most important group to educate about improper foreign government influence, other university stakeholders should also be educated (e.g., department heads and chairs, senior university administrators, graduate students).
  - The following topic areas should be included in training and education about improper foreign government influence:
    - Importance of sharing research openly effectively and safely
    - Distinguishing proper from improper collaborations (what is and is not acceptable)
    - Rules of engagement and importance of disclosing all foreign collaborations
    - Examples of both egregious and more subtle improper foreign government influence activities
    - Roles/responsibilities for protecting against improper foreign government influence risk
    - Federal agencies and university stakeholders should jointly develop training materials

"Need to educate on how to do science safely and securely—goes back to the biological weapons convention. There are case studies where we could discuss exploitation of science, and not just technical acumen."

– LAW ENFORCEMENT

"It would be useful for the work of JCORE to provide guidance to us as to where you cross the line for improper foreign engagement and also improper engagement in universities period. For example, accepting funding from an entity which we later discover was behaving unethically."

– SENIOR UNIVERSITY ADMINISTRATOR

- **Clear and Consistent Guidance, Tools, and Support from Federal Agencies**
  - Federal grantmaking agencies should provide more frequent, clear, and consistent guidelines to universities regarding improper foreign government influence. Consistency and clarity on the following topics would not only help universities adhere to grantmaking agency requirements but also be proactive in identifying and countering improper foreign government influence:
    - Definitions of improper foreign government influence, COC, and COI.
    - Improper foreign government influence threats.
    - Acceptable and unacceptable collaborations and activities (e.g., list of entities with which faculty should not engage).
    - Expectations from grantmaking agencies and role of universities in protecting against improper foreign government influence.
    - Types of disclosures required during the grants process (reporting requirements).
    - Specific programs that incentivize improper activities, how they work, and how people apply for them (e.g., talent recruitment programs).
  - A one-size-fits-all approach may be difficult for federal grantmaking agencies based on their specific mission needs, but to the maximum extent possible, grant applications, required disclosures, and associated grants management processes should be consistent across agencies.

"One concern is the possibility that, in an effort to standardize across government, we lose some of the things in the existing policies and procedures to prosecute these things.... If there are changes made where people are not required to certify, that would inhibit our ability to fight fraud."

– OFFICES OF INSPECTOR GENERAL

"We carry out our missions in very different ways. Trying to have a single, uniform grant application may be loved by universities but it would tie our hands with respect to our mission needs."

– GRANTMAKING AGENCY

- **Risk Framework**
  - Universities and other F3RE stakeholders should develop a risk matrix that can be used to assess risk levels, identify collaborations and activities that are of most concern, and identify when further review or escalation is needed. The risk matrix should be regularly updated based on new/emerging improper foreign government influence risks. Potential risk factors for consideration in a risk matrix to evaluate a collaboration include:
    - Is it a multi-year (long) contract?
    - Does the total funding exceed a certain amount?
    - Is the PI engaging with a high-risk country (e.g., China, Russia)?
    - Is the collaborator included on a list of concern (e.g., Huawei)?
    - Is it a high priority area of research/technology (e.g., quantum, biotech, artificial intelligence)?
    - Will there be a restriction on sharing the output of the research (publication)?
    - Will access to data be granted to collaborators?
    - Will resources be sufficient to fully meet the grant obligation?
    - Does the research follow human and animal subject protection standards?
  - All post-docs and graduate students who are conducting research on federal grants and visiting faculty/researchers working in labs where federally funded research is conducted should be effectively vetted as part of the evaluation of risk. Many universities have access to data sources used in their export control offices that may be helpful for that purpose.
  - Universities should form task forces or working groups with faculty representation to identify gaps and solutions for making their university more resilient to improper foreign government influence.
  - University administrators and others who work closely with faculty should build relationships and work closely with faculty to create a comfortable environment for faculty to discuss potential collaborations and disclose outside activities.

"We have a group that also does internal audits. We went through a risk assessment process with a committee that had the president on it. It is updated quarterly. We try to establish parameters for the speed of something to happen, the impact of something happening, the likelihood of something happening. It includes reputation, financial, and hundreds of other risks and is detailed and comprehensive."

– SENIOR UNIVERSITY ADMINISTRATOR

- **Required Disclosure and Certification**
  - The time between grant application submission and award can be significant. During that time PIs could apply for other funding or join new foreign collaborations. Grantmaking agencies may want to consider expanding required disclosures beyond the grant application/proposal stage of the grant lifecycle. Suggestions for additional PI disclosures include:
    - Prior to award of the grant.
    - Annually (during annual reporting).
    - Within 30 days after PIs have new financial interests or collaborations.
  - Grantmaking agencies may want to request PIs to provide additional information during disclosures, such as whether:
    - Has ever been identified as a denied person.
    - Has used another name.
    - Has received funding or been employed by a denied entity.
    - Has received funding from or been a member of a foreign talent program.
  - Universities should have formal policies that require all faculty to complete an annual disclosure of their outside activities and financial interests, and to update their disclosures when they have new collaborations.
    - Disclosing all information up front should become part of the culture, so the university and PI can work through collaboration decisions together.
    - Universities may want to consider requiring mandatory disclosures for graduate students, postdocs, and visiting faculty/researchers who work in labs that conduct to-be-published research in order to protect the integrity of the research.

"Faculty become more attractive once they have [grant] funding. If the only time they get certified is when the application is submitted, then we may miss people who are recruited after the fact."

– OFFICES OF INSPECTOR GENERAL

"One gap is the issue of visiting individuals and scholars. We had gotten clarification from the government that we should have been vetting these people all along. That is not something that we had been doing…"

– SENIOR UNIVERSITY ADMINISTRATOR

- **Collaboration and Information Sharing Across a University**
  - Universities should seek to eliminate silos and increase communication and coordination among offices and stakeholders, especially the Office of Research, Office of General Council, Export Control, and Sponsored Programs.
    - PIs may report information to different people and offices in the university, and it is difficult for universities to consolidate information needed to identify improper foreign government influence risks and how to address them.
    - Multiple points of contact at universities make it challenging for law enforcement and federal grantmaking agencies to work with universities on the improper foreign government challenge.

"Academia is complicated, which is a challenge for law enforcement. There are silos and compartments within universities. The counter terrorism division works with local police, cyber works through the CIO, but there is overlap when it comes to foreign influence… with the silos it's tough to get to the right spot."

– LAW ENFORCEMENT

Potential Metrics and Indicators

Stakeholders currently do not have any standard metrics or indicators to measure the resiliency of the U.S. F3RE to improper foreign government influence or to track the impact of potential COAs on the health and strength of the F3RE. Based on research and stakeholder interviews, MITRE used a systematic approach to develop a set of recommended metrics and indicators to monitor the performance of a set of defined research integrity factors. The approach, described in Figure 9, provides a way to understand the maturity of a stakeholder's research integrity policy program and introduces a methodology to measure an organization's resilience across the F3RE. MITRE recommends a implementation of a standardized process for tracking and reporting data sources to inform these measures that can be adopted by any of the various components and stakeholders in the F3RE.

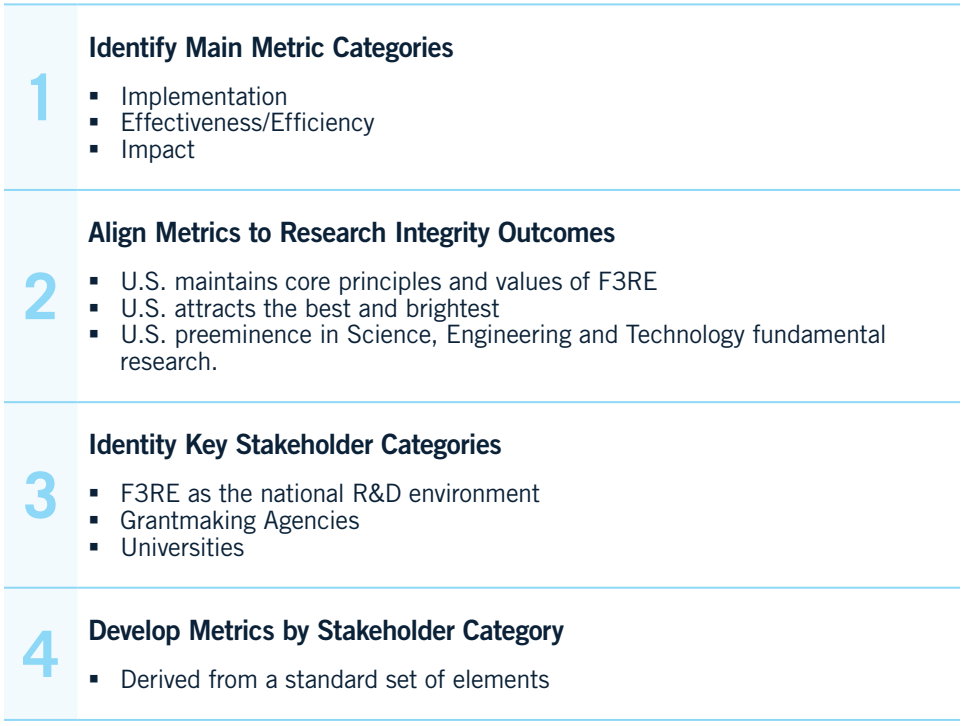

FIGURE 9:
STEPS IN THE APPROACH USED TO DEVELOP METRICS

MITRE's proposed collection of metrics can provide insight into organizational maturity and alignment with F3RE core principles and values, while maintaining awareness of the U.S. leading position and attractiveness to prominent foreign talent in the fields of science, engineering, and technology. Accordingly, each metric is aligned with one or more of the following desired target outcomes:

- The U.S. F3RE is **resilient** to improper foreign government influence.
- The U.S. maintains **core principles and values** of F3RE.
- The U.S. **attracts the best and brightest** scientific talent.
- The U.S. **maintains preeminence** in science, engineering, and technology fundamental research.

The following metrics are proposed to measure the achievement of the aforementioned target outcomes:

1. Awareness and training
2. Institutional alignment
3. Disclosure rate
4. Case resolution rate
5. R&D budget
6. World university rankings
7. R&D publications
8. R&D patents
9. Attractiveness rate

Each metric would be composed of 10 recommended elements: metric type, outcome alignment, description, reasoning (why the metric is important), formula for calculation, target for the metric, reporting frequency, responsible party (who needs it and who should track it to maintain historical data), data source (data provider), and recommended reporting format.

A sample description for one of the proposed metrics is provided in Table 4, on the following page.

Metrics can provide insight into organizational maturity and alignment with F3RE core principles and values, while maintaining awareness of the U.S. leading position and attractiveness to prominent foreign talent.

Metric Name	Awareness and Training
Measure Type	Implementation
Outcome(s)	U.S. maintains core principle and values of F3RE
Description	Percentage of researchers across the entire F3RE that received Research Integrity training
Reasoning	Annual research integrity training is critical for ensuring researcher awareness of ever-evolving policies, procedures, and threats. This will be an aggregate number supported by data reported by various F3RE entities.
Formula	(Number of researchers that have completed training within a year/total number of researchers) *100
Target	100%
Frequency	Annually
Responsible Party	JCORE
Data Source	F3RE (rolled up/aggregated from entities)
Reporting Format	Line chart for trend analysis (YoY) or bar chart for one year only
Notes	N/A

TABLE 4:
SAMPLE METRIC:
AWARENESS AND TRAINING

These metrics and indicators can be captured for different levels of the F3RE, such as the national level, individual grantmaking agency level, and university level. They could be rolled-up/aggregated, but each stakeholder within these levels would track the metrics individually, as they provide a clear picture where each entity stands.

CONCLUSION

The methods that foreign governments use to improperly influence federally funded fundamental research have continued to change as they are discovered. For example, stakeholders described that improper Chinese talent recruitment programs are no longer documenting contracts in writing or publicizing program participants. Without timely access to information about the evolving threats and the sources of those threats, the ability of U.S. F3RE stakeholders to identify, counter and deter improper foreign government influence risk is compromised.

MITRE concurs with past studies that have proposed a risk-based approach to mitigating this threat. However in order to be effective, this approach must focus on identifying new and emerging risk and must be coordinated and implemented consistently, across the full community of stakeholders in the F3RE. To build a capacity for resilience the F3RE should adopt a standardized approach to assessing improper foreign government influence risk based on timely access to data that is shared across government and academia and resist focusing on threats from a single country or of a single type of action.

Without timely access to information about the evolving threats and the sources of those threats, the ability of U.S. F3RE stakeholders to identify, counter and deter improper foreign government influence risk is compromised.

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End Notes

1. In this study, fundamental research is defined as research conducted with the intention of publishing the results, excluding research that qualifies for national security classification, that is conducted within Government owned or operated facilities, or that aims to produce proprietary information.
2. GPC arises when powerful nation states pursue their objectives in ways which threaten the national interests of other such nation states. Today's great powers make use of numerous instruments of policy in their interactions and find themselves simultaneously cooperating on some issues, competing to shape the global system, and in direct conflict over particular issues.
3. National Security Decision Directive 189 (NSDD 189): National Policy on the Transfer of Scientific, Technical and Engineering Information (Sept. 21, 1985). Full text available at: https://fas.org/irp/offdocs/nsdd/nsdd-189.htm. Original text at: https://catalog.archives.gov/id/6879779
4. The term "foreign entities" in the context of this paper includes foreign graduate students, post-doctoral researchers, university faculty, institutions, and organizations.
5. The Federal Demonstration Partnership is a cooperative initiative among 10 federal agencies and 217 institutional recipients of federal funds…convened by the Government-University-Industry Research Roundtable of the National Academies. Its purpose is to reduce the administrative burdens associated with research grants and contracts. http://thefdp.org/default/
6. https://www.whitehouse.gov/wp-content/uploads/2017/12/Enhancing-the-Security-and-Integrity-of-Americas-Research-Enterprise-June-2020.pdf
7. https://www.nsf.gov/statistics/2019/nsf19321/overview.htm#fn1

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