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Committee on Science, Space, and Technology
Subcommittees on Research and Technology and Oversight
Technology Needed to Secure America's Border

Written Testimony

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Good morning Chairman Bucshon, Chairman Broun, Ranking Member Lipinski, Ranking Member Maffei, and distinguished members of the Committee. I thank you for this opportunity to testify today regarding the *Technology Needed to Secure America's Borders*.

The successful use of technology to secure our borders depends on the ability of staff within Customs and Border Protection and Immigration and Customs Enforcement to employ the technology in a meaningful way that allows them to more effectively or efficiently engage the public they serve. Our social and behavioral research on private and public sector technology development demonstrates the critical importance of engaging the customer early and often in the research and development (R&D) cycle. Successful engagement facilitates the transition from R&D to application or consumption. Failure to engage the customer can result in orphaned technologies that are fully functional but are never fully exploited. Valuable and relevant technologies more often than not fail to leave the lab or fail to realize their full potential because they are not properly tailored to the needs of the customers.

Background

I have been working closely with the Department of Homeland Security Science and Technology Directorate (DHS S&T) on a series of needs assessments, requirement analyses, and program and technology evaluations for the past 6 years in my role as Director of the Institute for Homeland Security Solutions (IHSS). IHSS is a consortium that includes Duke University, University of North Carolina, and the nonprofit RTI International. Our work with DHS S&T is part of a larger effort to apply the theories and methods developed in the social and behavioral sciences to examine the effectiveness of programs and new technologies for advancing the specific missions of government agencies. Our work includes qualitative and quantitative assessments of programs and technologies and draws on the evaluation techniques used at RTI and other research organizations to assess programs throughout the federal government.

In addition to my work with DHS, I have also taught social science research methods to graduate students in the United States and Ireland. I have also worked closely with several private sector technology development and assessment programs. In these roles, I have come to appreciate the

value that strong social science research methods can add to technology development in the private, academic, and public sectors. Specifically, these methods allow us to better understand the needs of the customers who will use the technology in their jobs and daily lives. This understanding can accelerate the technology transition process and bring more effective and efficient technical solutions to meet our nation's border security needs.

Role of Social Science in Security Programs and Technologies

Social science methods have been used extensively to support private and public sector technology development. The social and behavioral sciences are designed to study the interactions of individuals and groups in a variety of settings and generally include the fields of economics, sociology, psychology, political science, communications, anthropology, criminology, and related disciplines. The standard methods used in modern social science include a suite of quantitative and qualitative data collection and analysis techniques that are designed to assess explanations of the social world with data that measure human behavior. These techniques are often used to assess the current state of group knowledge, attitudes, and beliefs; change in group composition and behavior over time; and the impact of social change on current group dynamics. These same methods and techniques are particularly valuable for assessing the effectiveness of governmental policies because they allow us to measure change in the condition of groups and individuals resulting from social interventions such as new programs and technologies.

Our application of the social science method has been to examine the impact of programs or technologies on the community of practice and the community of benefit. The community of practice includes all of the people who will use the technology in support of their role in achieving the agency mission. For example, in our work with the Transportation Security Administration (TSA) we examined the use of x-ray technologies with Transportation Security Officers, trainers, managers, and key decision makers. The community of benefit includes all of the members of the general public who are exposed to policy or technology in its application for the agency mission. In the TSA example, the community of benefit includes any member of the public who travels through TSA-managed airports. Both communities must be examined to fully understand the presence and nature of the need for the technology, the impact of the technology on the agency mission, and possible barriers to a successful transition of the technology or program to operational use.

IHSS has been conducting a series of program and technology evaluations for DHS S&T since 2008. Some examples of these evaluations are the following:

- **Rapid DNA Testing.** A DHS S&T-funded project to evaluate the integration of low-cost, rapid DNA screening technology into the programmatic activities of United States Citizenship and Immigration Services (USCIS) criminal checks and kinship verifications. Our research includes an assessment of the ability of USCIS workers to

- engage the technology in their work processes and an assessment of the acceptability of the technology to applicants in refugee camps.
- **Technology Acceptance Evaluation.** A DHS S&T-funded project to examine the *nontechnical* barriers to successful transition of new technologies from the laboratory to the operational setting in the DHS components. This project assesses the potential barriers related to privacy, policy, organizational structures and practices, staff perceptions and capabilities, and public perceptions. By working with teams of private sector technology developers, government R&D program managers, and the general public, we will produce a set of best practices to guide the transition of new technologies into the DHS operational environment.
 - **TSA Personnel Evaluation.** This DHS S&T project enhances the TSA Office of Security Operations' existing Officer Performance Studies project by expanding the evaluation of search capabilities for TSA. This will be done by developing new visual search techniques to assist with the review of x-ray images combined with an assessment of the working conditions, job requirements, training process, and performance measures of TSA workers. This study uses research methods from cognitive psychology to measure the visual searching processes employed by TSA workers to develop new training methods and technologies.
 - **Unmanned Aircraft Systems (UAS) and the Human Element.** An internally funded project to assess the nontechnical factors that will contribute to the safe and successful transition of UAS into the routine aspects of our economic and social lives. This project examines the UAS technology transition into the communities of practice and benefit using public opinion data, assessments by law enforcement officers, and a comparative analysis to other technologies.

Current Coordination Between DHS Technology Development and Communities of Practice and Benefit

Overall, DHS does not draw extensively on the social and behavioral sciences to assess the impact of its programs and technologies on the agency missions and the populations served. In some cases, such as those listed above and the work carried out by some of the DHS Centers of Excellence and by other contractors, DHS has embraced social research to advance its understanding of critical security issues, its workforce needs, and the populations served. However, the number of DHS staff assigned and the frequency of the application of the standard social and behavioral evaluation model for DHS-funded programs and technologies is very limited and lags behind the more robust and prevalent evaluation procedures employed by other Departments in the federal government. This is in part a result of the pressure immediately following the establishment of the Department to develop quick solutions to keep our nation secure across a very large mission space. However, now that DHS is well into its second decade, the establishment of standard impact evaluation requirements for new technologies and programs on the human aspects of the agency should be possible and expected. DHS should establish a

social and behavioral sciences unit within S&T and task it with coordinating evaluations of the impact of new technologies and programs throughout the components on its specific mission, its workers, and the populations it serves. Such a unit would result in more timely, effective, and efficient technology transfer that promotes a secure homeland.

Furthermore, a dedicated social and behavioral sciences unit within DHS headquarters would promote the coordination between the technology development at S&T and the transition and implementation in the operational components through a standardized evaluation design. Such a design would engage the community of practice in the operational components and the community of benefit at all stages of the technology evaluation, starting with the early needs assessment through workforce and public reactions to the technology and intended uses prior to transition, to the assessment of the effectiveness and acceptability of technology for meeting mission requirements and satisfying public standards of acceptability after implementation. The stages of a good social and behavioral evaluation model should include at least the following:

- an assessment of the operational need in the community of practice that will benefit from the new technology;
- an assessment of the ability of the community of practice to employ the technology, including the identification of gaps in staffing and training that must be addressed before the technology can be transitioned to practice;
- an evaluation of perceived risks, threats, or biases associated with the technology by the community of benefit; and
- an assessment of the technology on the operational mission of the components following the transition and over time.

Key Findings From Our Research

As indicated above, the IHSS team has conducted a series of DHS S&T–sponsored technology and program evaluations using methods from the social and behavioral sciences. Some of the key findings of these studies include the following:

1. Strong and potentially beneficial technologies can be derailed by nontechnical problems stemming from a failure to understand the needs and abilities of the community of practice and the willingness of the community of benefit to accept the technology in their daily lives.
2. The social and behavioral evaluation model is rarely applied to new technologies, and when applied it is used in a limited and nonstandard manner, which reduces its value and prevents comparability of its value to other transitioned technologies.
3. Private sector R&D programs encourage frequent and early engagement of communities of practice and benefit in the design, planning, and implementation of new technologies. Similar procedures will increase the relevance, value, and efficiency of DHS S&T technology development.

4. Complex technologies can develop at a slower rate than operational realities of the components, often resulting in a technology that is less desired and useful than when the original technology transfer agreement was developed between DHS S&T and the operational components.
5. Management priorities and funding levels can shift and change during the R&D cycle, leaving potentially beneficial solutions without sufficient budget or organizational support to implement.
6. Public perceptions of technology can be more complex and dynamic than may be expected by technology developers. As a result, technologies that the public may consider relatively benign and nonthreatening may produce an unexpected backlash when introduced to the community of benefit. In addition, the tolerance of new technologies and the perceived impact on privacy and safety can change over time and significantly affect the ability to use new technologies in an operational context.
7. The assessment of operational requirements, workforce capabilities, and public perceptions can support both the technology development and the communication plan between DHS S&T and the operational components.
8. The DHS S&T technology transfer process is inconsistently applied across programs, rarely draws in all members of the community of practice, and rarely addresses the public perception issues in the community of benefit. This could be resolved through better coordination of the evaluation plan in DHS S&T.
9. Careful assessments of the technical needs and operational abilities of the user communities, and thorough assessment of the effectiveness of new technologies to support agency missions, are both expensive and time consuming. These time and cost requirements can be reduced through standardization and better coordination of the evaluation process.

Conclusions

Successful technology transition requires attention and accommodation of both nontechnical and technical issues. The nontechnical issues can be addressed by applying evaluation techniques from the social and behavioral sciences to assess the needs, abilities, and perceptions of the community of practice in the DHS workforces and the community of benefit in the general public. The application of these techniques is most effective if engaged early in the design phases of technology development and used through development and transition to track the changing mission needs, workforce, and public perceptions. Finally, this same model can be used to assess the effectiveness of DHS programs and technologies by measuring change over time and the impact on the mission requirements.

Joe Eyerma Biography

Dr. Joe Eyerma is the Co-Director of the Institute for Homeland Security Solutions, a senior research methodologist, and the Director of RTI International's Center for Security Safety and Defense. Dr. Eyerma has more than 17 years of professional experience statistically modeling social behavior and managing data collection and analysis projects. His substantive interest is in the formal and statistical modeling of decision processes related to political behavior, terrorism, and radicalization. His recent methodological work has focused on the relationship between the data collection process and error in population estimates on a variety of bioterrorism, public health, and surveillance studies. Dr. Eyerma has conducted methodological studies to investigate ways to improve data quality and studies of survey nonresponse. He is an experienced project manager, survey methodologist, and data analyst. His training is in political science and social science research methods, and he teaches social research and program evaluation methods in the United States and Ireland. He has worked on several private and public sector technology development programs to assess the human aspects of technology development and acceptance. He has worked closely with the Department of Homeland Security for the past 6 years on a wide range of social and behavioral science studies, including evaluation of new technologies and programs, privacy assessments, and public perception panels.