University of Southern California

S&T Analysis and Management of Innovation Activity II (STAMINA II)

FY20-21 Annual Report

For Period September 24, 2020 to September 23, 2021

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The S&T Analysis and Management of Innovation Activity II (STAMINA II) project consisted of the tasks listed below and summarized in the ensuing sections.

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1. S&T R&D Customer Satisfaction Feedback (CSF) Methodology

The USC/CREATE STAMINA II team developed a working draft of a DHS Science and Technology Directorate (S&T) Research and Development (R&D) Customer Satisfaction Feedback (CSF) methodology responding to a recommendation from the United States Government Accountability Office (GAO). The draft recommended Strategic Multiattribute Rating Technique of Customer Satisfaction (SMART-CS) methodology features an academically rigorous multiattribute utility rating technique with a robust analytical basis and widespread use in numerous practical applications. The recommended process integration of the methodology with S&T's Business Process Flow (BPF) 2.0 and Program/Project Management (PM) templates was identified. The draft methodology incorporated input and comments from key Stakeholders in the process and was tested in a tabletop exercise (TTX) with the US Coast Guard (USCG). For demonstration purposes, the draft SMART-CS methodology was implemented in Qualtrics with an easy-to-use interface, as shown in Figure 1.

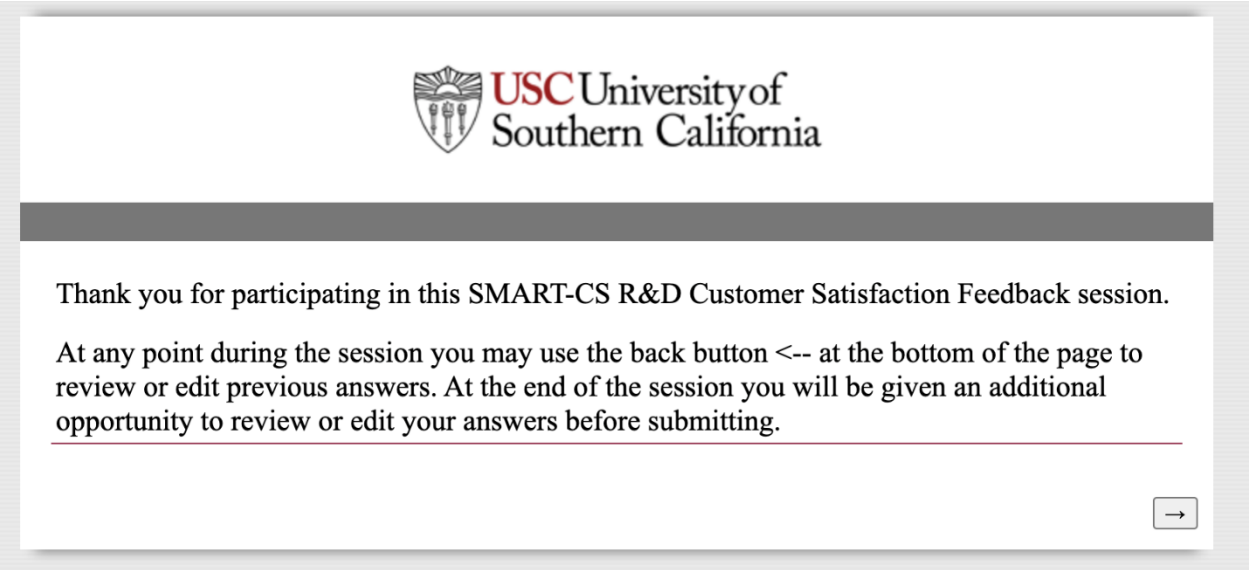

Figure 1. SMART-CS Implementation in Qualtrics, Screenshot of Introduction.

The draft recommended SMART-CS methodology is a combination of a scientifically grounded multi-attribute utility analysis and an adaptation of methodologies used by the US Coast Guard to evaluate R&D projects and to conduct a post-completing review. The multi-attribute utility part consists of customer ratings of R&D projects and products on several outcome criteria, which can be weighted and aggregated into an overall customer satisfaction outcome score. The criteria were adapted from input received from several operational components, especially drawing from the USCG Post Completion Review methodology, and includes criteria addressing cost savings, improved operational performance, and improved decision making. Also adapting a previous USCG R&D methodology for evaluation R&D projects in transition, the SMART-CS methodology distinguishes the likelihood of use from the potential impact (beneficial outcomes), once actually in use. A total outcome score is the product of the likelihood of eventual use (from 0-1) and the score assuming successful implementation and use. Research products are also scored on two process criteria, adequacy of funding and technical support, leading to a second overall score reflecting the satisfaction with the process of developing and implementing the R&D product. Different stakeholders can provide independent responses to the questions, leading to possibly different scores for comparison. For demonstration purposes, the draft SMART-CS methodology is implemented in Qualtrics with an easy-to-use interface.

The proposed integration of the draft SMART-CS with the S&T's BPF 2.0 was developed in close consultation with S&T's stakeholders, including the S&T Transition Measures Working Group and the DHS NDAA Transition Measures Working Group, S&T Portfolio Managers (PfMs), the Office of Science and Engineering (OSE)/Tech Centers, and the Office of Mission Capability Support (MCS) Program Managers (PMs). Criteria for quantifying R&D Customer Satisfaction were presented for comment to the operational components (CBP, CIS, CISA, FEMA, ICE, TSA, USCG and USSS). The TTX with USCG Stakeholders was conducted with personnel from its headquarters Research, Development, Testing and Evaluation (RDT&E) division and its Research and Development Center (RDC) in New London, CT. The TTX provided valuable and practical insights and comments on using the draft SMART-CS methodology.

The proposed draft SMART-CS methodology presented herein reflects the many rounds of feedback and refinement resulting from stakeholder input. Complete details of the effort are contained in the final report and presentation.[1]

2. Office of University Programs (OUP) Transition Process Integration

The USC/CREATE STAMINA II team assisted the S&T Office of Science and Engineering (OSE), Technology Scouting and Transition Division (TST) with coordination and integration of Office of University Programs (OUP) projects into the ServiceNow platform. OUP transition milestones for the current fiscal year were entered for tracking purposes. Previous year transition milestones were entered to help identify and highlight the issues associated with synchronizing the OUP time frame for collecting its data for current projects, initiating new projects, and reporting out on transition successes per NDAA) requirements. A screenshot of the ServiceNow portal showing the OUP entries is shown in Figure 2.

As part of this effort, USC/CREATE reviewed the list of milestones and transition milestones developed by OUP, and commented on which additional listed milestones could be considered transition milestones, and identified transition milestones which read more like non-transition milestones. The feedback was provided so as to develop a more rigorous, standardized and agreed upon nomenclature and process for classifying these in FY23 and moving forward. A representative screenshot with an example of each of these is shown in Figure 3, in which a red cell indicates a Milestone that could/should be a Transition Milestone, and purple designates a Transition Milestone that perhaps is not, based on the limited information provided in the

[1] Isaac Maya, Richard John, Katie Byrd and Detlof von Winterfeldt, "R&D Customer Satisfaction Feedback (CSF) Methodology", Final Report (Draft) and Summary Presentation, June 14, 2021, submitted to S&T Office of Science and Engineering (OSE), Technology Scouting and Transition Division (TST).

Milestone column as written. In many cases, it was probable that improved descriptions in that cell would lead to better Milestone vs Transition Milestone type identification and classification decisions.

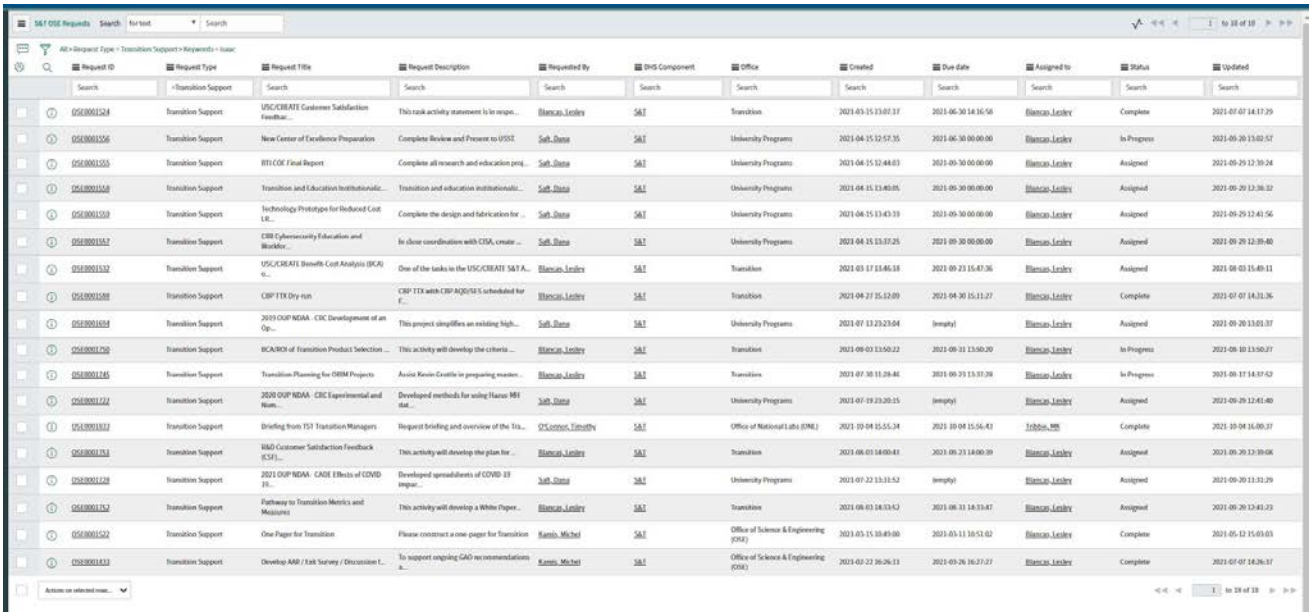

Figure 2. Office of University Programs (OUP) Transition Milestones ServiceNow Platform Entries.

	L	M	N	O	P	Q	R	S	T	U
1	Source	Transition Plan	Project Schedule	Milestone	TRL Level(s)	Reporting	Transition	Reporting FY	Planned Start	Planned Completion
766	FY23 OMBJ Transition Plans	X		•S&T program managers work with the CIRI to structure and position projects to align with customer needs from proof of concept through testing, and piloting in the field. Technology development activities sync with the scientific and program	2-7	External	X	FY 2022	FY 2022 Q1	FY 2022 Q4
767	FY23 OMBJ Transition Plans	X		•Program managers work with the Office of General Counsel, the General Counsel of the performing institution(s), and COE Technology Commercialization Offices to support legal, privacy, market, and technology transfer elements of each project. COEs	2-7	External	X	FY 2022	FY 2022 Q1	FY 2022 Q4
768	FY23 OMBJ Draft Project Schedule		X	Complete cyber vulnerability and gap assessment of current Public Safety Answering Point (PSAP) 911 architecture.	4	External	X?	FY 2021	FY 2021 Q1	FY 2021 Q2
769	FY23 OMBJ Draft Project Schedule		X	Develop, document, and publish proposed standards, procedures, and best practices to enhance the cybersecurity and resilience of next-generation mobile telecommunications networks (emphasis on 5G and emergency communications).	5	External		FY 2021	FY 2021 Q1	FY 2021 Q4
770	FY23 OMBJ Draft Project Schedule		X	In close coordination with CISA, create the business model and implementation plan to establish a national scale cybersecurity education and workforce development network of academic institutions (including HBCUs, MSIs and two-year programs).	5	External		FY 2021	FY 2021 Q1	FY 2021 Q4
771	FY23 OMBJ Draft Project Schedule		X	Enhance the assurance of resilient operational delivery of the 55 national critical functions by developing a cross-domain framework that industry and government can use to understand, implement, and maintain sound and standardized cyber risk	5	External	X	FY 2022	FY 2021 Q3	FY 2022 Q3
772	FY23 OMBJ Draft Project Schedule		X	Facilitate development of a robust, competitive market for NG911 systems and enhance the assurance of resilient operational delivery of NG911 services by developing and implementing a sustainable, national-scale testing framework and capability to	5	External		FY 2022	FY 2021 Q4	FY 2022 Q4

Figure 3. Office of University Programs (OUP) Milestone and Transition Milestone Designation Review and Feedback.

3. Knowledge Product (KP) Categorization and Impact Assessment

The USC/CREATE STAMINA II team helped TST developed a set of Knowledge Product (KP) classification types/categories to help in more refined tracking and impact assessment of these R&D products for the TST Knowledge product Transition Plan Template[2], as required by the National Defense Authorization Act (NDAA)[3]. The NDAA requires that DHS develop and track indicators of success to demonstrate the uptake of

[2] "Knowledge Product Transition Plan Template (Draft)," DHS S&T Directorate, Technology Scouting and Transition Division, July 25, 2021.
[3] National Defense Authorization Act (NDAA) for Fiscal Year 2017 (P.L. 114-328).

R&D by S&T's recipients (e.g., Component customers and end-users) for a three-year period. The draft KP types/categories are shown in Table 1, including examples of each and the KP transition value/impact assessment levels are shown in Table 2. A recurring theme is to avoid double reporting/counting of same R&D product/output, for example by inadvertently counting various modes of communication of the same output/product, or receipt of a given R&D output/product by multiple receiving organizations, so as to achieve accurate accounting of transitions.

Table 1. Knowledge Product (KP) Types/Categories

KP Type/Category	Common Examples of KP Transitions	Not Considered KP Transition
Domain-specific reports or publications on specific domain/topic	Final Report on telecom cybersecurity standards, procedures, best practices; Final Report on Northern Triangle migration flow and management policies; Refereed journal publications and presentations on specific topics	Fact Sheets and informal 1–2-page summaries; Documented SME input to an R&D project report provided elsewhere
Education and Training including Professional Workforce Development Degree Programs, Certificate Programs, Curriculum, Plans and Courses	Security Technology Transition MBA Curriculum; Training and Education Plans; Webinars and Presentations of best practices, Transition Field Experience/Best Practices Reports if based on original content not reported elsewhere	Holding a course multiple times. Repeat Webinars and Presentations of best practices
Operational analysis information needed/requested by Component	Input to an acquisition decision; Evaluation of alternatives; Operations Research analysis report of component process; Tech Scouting Reports; Reports that result from operational experiments; SAVER documentation;	Component generated program artifacts (e.g., CONOPS, MNS/ICD, AOA, and ORD/CDD)
Progress and Annual Reports summarizing findings of an R&D activity, project or program reported elsewhere	A report whose content has not been reported elsewhere, but was supported with R&D dollars as part of an R&D activity (e.g., annual reports, FFRDC organizational evaluations)	Progress-type monthly, quarterly, semi-annual or final reports; Summaries of deliverables and recommendations reported in detail elsewhere

Table 2. Knowledge Product (KP) Transition Value Proposition Assessment for NDAA Purposes

Level 1 – Transition Numbers: Ordinal Counts of Transitions meeting definition	Level 2 – Transition Outcomes: Counts of transitions with quantifiable consequential Transition Value	Level 3 – Transition Operational Impacts: Benefit-Cost Analysis (BCA) and/or Return on Investment (ROI) Assessment, for Each Benefit Category
1. Number of knowledge products generated 2. Number of Patents 3. Number of Licenses 4. Number of products increasing TRL from baseline to the R&D's intended objective 5. Number of KPs used in Congressional Testimony	1. Number of knowledge products used in decision-making (make-or-buy, analysis-of-alternatives, policy-making, etc.) 2. Number of KPs used by Operational Components to modify SOPs	1. Reduced operational costs 2. Improved operational effectiveness 3. Improved operational efficiency 4. Value of decision-making 5. Value of Congressional action resulting from KP-related testimony 6. Etc., by Benefit Category

4. Borders, Immigration and Maritime (BIM) Research and Development (R&D) Project Reconciliation

The USC/CREATE STAMINA II team assisted TST in developing a master list of Borders, Immigration and Maritime (BIM) R&D portfolio projects. The challenge in developing this master list was reconciliation of the various working documents in active use, each containing various versions of R&D project titles, descriptions, Program and Project Managers, etc., each of which had been developed for specific management process purposes. For example, according to the S&T Analytical Tracking System (STATS) data base, the definitive data repository used by S&T, the BIM portfolio consisted of 60 projects, each with a unique set of Program, Project and Activity Identifiers. Yet, project entries in TST's working files listed in Table 3 could be interpreted to contain entries for what appeared to be approximately 100 projects. The difference could be attributed to different listings for the same project, with slight variations of titles, changing personnel assignments, etc.

Table 3. List of BIM Portfolio Project Files Provided for Reconciliation Analysis
1. S&T Project Inventory List Cross-Walk.xlsx
2. Copy-im of MASTER Transition Efforts Active – BIM only 11.25.2020.xlsx
3. S&T Project List, AMO & USBP.xlsx
4. CBO TTP ST BIM Active Projects.docx
5. S&T Program Data Call – Transition to CBP (BIM) Compiled.xlsx
6. S&T Project List – AMO and CBP.xlsx
7. FY20 S&T Milestone Status Final.xlsx
8. FY20 S&T Milestones Transitions YE Status.pdf
9. STATS Program and Project Information Aid.xlsx
10. C1 Innovation Team Project Analysis.docx

To initiate the project list reconciliation analysis task, the USC/CREATE team was provided a copy set of the various documents describing the projects in the BIM portfolio, as shown in Table 3. The team then followed the process shown in Table 4 to match-up and reconcile the various column entries of the same project, as in the example shown in the table. This process was followed for the 95 projects listed across all the files in Table 3. The result was provided to TST as a new resolved Master spreadsheet, ***Copy-im4 of MASTER Transition Efforts Active – BIM only 11.25.2020.xlsx,*** with a single row entry for each unique, STAT-listed project, with data entries and notes/comments resolving any discrepancies across the spectrum of data files in Table 3.

Table 4. BIM R&R Project Portfolio Reconciliation Analysis Process
1. Select project on *S&T Project Inventory List Cross-Walk.xlsx*
a. E.g., Biometric Technology Refresh/Biometric Tech Rallies – Biometric Collection Technology Refresh
2. Look for project in *Copy-im of MASTER Transition Efforts Active – BIM only 11.25.2020.xlsx*
a. E.g., Search for "Biometric" … found one project in H47 and L47: PRG-829, PRJ-1472, PA-39 – Biometric Collection Technology Refresh
3. Look for project in *S&T Project List, AMO & USBP.xlsx*
a. E.g., Search for "Biometric" … project (term) not found
4. Look for project in *CBO TTP ST BIM Active Projects.docx*
a. E.g., Search for "Biometric" … found as CBP project list item 1, 3rd row, Biometric Collection Technology Refresh, PA-39,
b. Enter additional information in Copy-im of MASTER
i. E.g., CBP Project List Number, PA#, S&T PM, Customer, CBP PM, POP, Transition Timeline
5. Look for project in *S&T Program Data Call – Transition to CBP (BIM) Compiled.xlsx*
a. E.g., Search for "Biometric" … found 3 projects with term, matched to project in line 3
b. Enter additional information in Copy-im of MASTER
i. E.g., Description, Type of deliverable, S&T Project Source and POC, CBP office and POC, CBP Acq Program, S&T project start and end dates, TRL @ start and end
6. Look for project in *S&T Project List – AMO and CBP.xlsx*
a. E.g., Search for "Biometric" … term not found
7. Look for project in *FY20 S&T Milestone Status Final.xlsx*
a. E.g., Search for "Biometric" … found 24 cells with term, corresponding to …
i. OSE (Office)/TCD (Division)/R&D (CAS)/RD&I (PPA)/Innovative Research & Foundational Tools (Thrust)/Technology Center (Program)/Innovative Systems Technology Centers (Project)/Milestone (4)/Transition Milestone?/Reporting Yr/Planned Start &Completion/Actual Completion/POC/Q1-4 Workflow State, Status, Explanation, Verification and Validation/Complete?
ii. MCS/BIM/R&D/RD&I/POE Security & Trade/People Screening/Milestone (2)/etc.

iii. MCS/FRD/R&D/RD&I/Counter Terrorist (RD&I)/Identify Management/Non-Cooperative Biometrics/Milestone (2)/etc.
8. Look for project in *FY20 S&T Milestones Transitions YE Status.pdf*
a. E.g., search for "Biometric" … found Technology Centers (Program)/Innovative Systems Technology Centers (Project), 4 milestones BI-TC, completed
9. Look for Thrusts, Programs and Projects in *STATS Program and Project Information Aid.xlsx*
a. E.g., First, search for "Biometric" … found APEX Core (RD&I) (Thrust)/APEX Engines (Program)/Biometrics Technology Engine (BT-E) (Project)
b. E.g., Second, search for "Innovative Research & Foundational Tools" … term not found
c. E.g., Third, search for "Technology Center" … term not found
d. E.g., Fourth, search for "Innovative Systems Technology Centers" … term not found
e. E.g., Fifth, search for "POE Security" … found Border Security (RD&I)/Cargo and POE Security
i. 6 projects, one being People Screening, matching 7.a.ii
f. E.g., Sixth, search for "Counter Terrorist" … found Counter Terrorist (RD&I)/Identity Management
i. Project - Digital Forensics … match to Non-Cooperative Biometrics?
10. Look for project in *C1 Innovation Team Project Analysis.docx*
a. E.g., search for "Biometric" … term not found
11. Update project entry in new Master *Copy-imx of MASTER Transition Efforts Active – BIM only 11.25.2020.xlsx* with reconciled data cell entries in each Column for each project

5. Office of Biometric Identification Management (OBIM) Project Transition Planning

The USC/CREATE team and TST initiated engagement with Kevin Grottle, Program/Project Manager (PM) in the Mission Capabilities Support (MCS) Biometrics and Identity Management group, and the lead PM for the Office of Biometric Identification Management (OBIM) portfolio of R&D projects. Mr. Grottle has been very successful in transitioning products emerging from the OBIM portfolio of R&D projects to the relevant Component end-users, including both knowledge products and technology products. The engagement aimed to capture the transition process used by Mr. Grottle for these successes, and reconcile and align with TST's Technology Transition Planning (TTP) templates and the therein contained Technology Acceptance Agreement (TAA).

As part of the initial engagement, TST provided the relevant TST TTP templates and TAA to Mr. Grottle and his team for review and completion of draft versions of these documents for a single project which delivered two knowledge products (KPs). These draft TTP and TAA documents were provided to TST at the end of the fiscal year, and were being reviewed and discussed among the team members so as to develop a master template to guide the development of additional TTPs and TAAs for the rest of the projects in the OBIM portfolio.

Specifically, the review of the TTP/TAA was being conducted to,

- Assess its compliance with the S&T Understanding BPF Rev2.0 process

- Compare the current state of transition planning to the actions taken in the production of the two KPs delivered to OBIM
- Identification of Component-specific actions that were required during transition that should be captured in the template as a means of streamlining the delivery of all future knowledge products to that entity.

This was considered as a generalized approach - how to capture any Component specific transition actions as a means of streamlining the TTP/TAA development process. Multiple meetings and discussions were conducted with Mr. Grottle and his team to better understand this process, and work was initiated to create an example of a TTP Appendix-based approach to capturing these data.

6. White Paper on Metrics and Measures of Transition Performance

A White Paper on metrics and measures is being developed which is specific to the assessment of transition performance. The terms "metric" and "measure" are defined in the S&T Lexicon[4] as,

- Metric -- a parameter used for quantitative assessment, comparison; Extended Definition: may be used to track performance or production
- Measure – a value used in tandem with a metric; Extended Definition: may be associated with a target or expected performance standard

Though simply stated as such, these terms, in general, present difficulties in interpretation and application in specific domains. Figure 4 aims to provide a visualization of these terms to help clarify their use in a few domains.

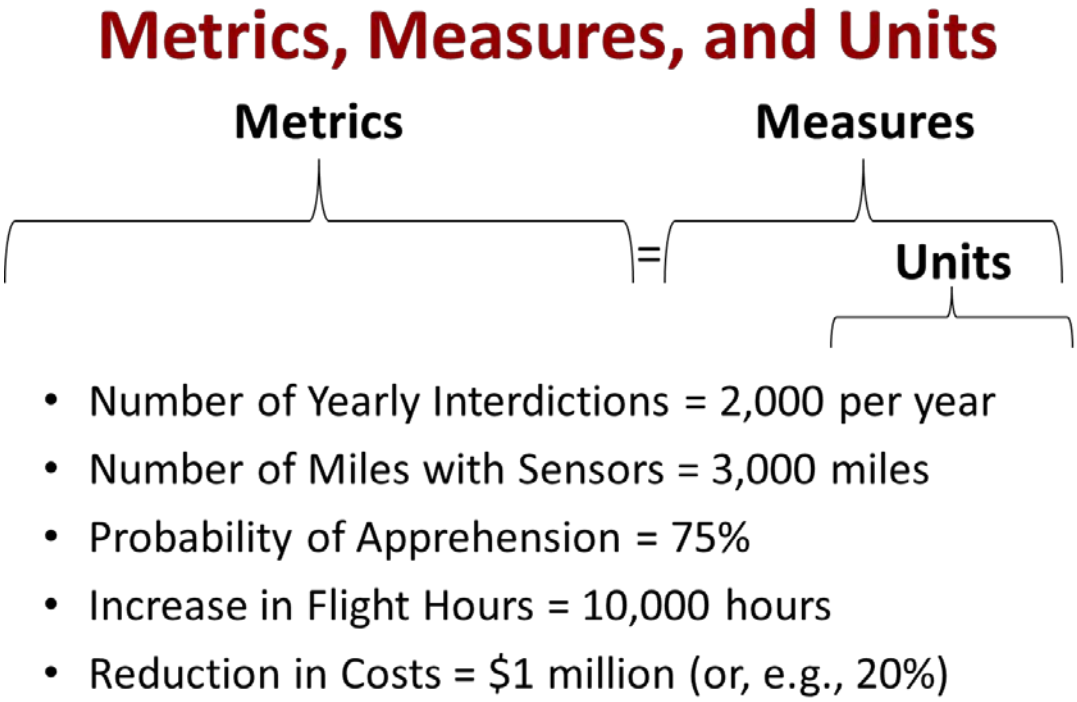

Figure 4. Visual Representation of Metrics, Measures and Units in a few Example Domains.

[4] Department of Homeland Security, Science & Technology Directorate, Lexicon v3.0, January 31, 2018: Accessed at https://collaborate.st.dhs.gov/orgs/OUS/COS/SPO/kpo/Shared%20Documents/SandT_Policies-and-Directives/DHS_SandT_Lexicon_v3-0.pdf.

Sets of metrics exist for many Homeland Security Enterprise (HSE) related domains, such as,

- Border Security Metrics
- Contract Performance Metrics
- Federal Information Security Modernization Act (FISMA) Performance Scorecard Reportable Metrics
- Program/Project Management Metrics
- Mission Capability Support (MCS) Performance Metrics

Examples of these metrics will be provided in the White Paper under development to demonstrate the breadth of application of these terms and their use in practice.

Further complicating the understanding of metrics and measures, is that there are also many other terms synonymous with these, often used interchangeably (and sometimes unintentionally inappropriately/poorly defined) used to quantify the quantity, quality and value of the results of R&D efforts, such as,

- Outcome, Output, Impact, Benefit, Performance, Success
- Benefit-Cost Analysis (BCA), Return on Investment (ROI), with their own range of Benefit Categories
- Product, Knowledge Product, Technology Product
- Transition, Transfer, Commercialization
- Requirements, Needs, Gaps, JRC/IPT, ORD, CONOPS
- Analysis of Alternatives (AoA)
- Indicators of Success, Vignettes, Anecdotes, similar "taken" phrases

Driving the need for a transition-specific set of well-defined, definitively quantified metrics and measures are the reporting requirements mandated by the NDAA, as well as the emerging needs to meet the Evidence Act[5]. Of the two, the former is perhaps better known at S&T for driving current R&D transition reporting and tracking requirements. It is likely the latter which will fulfill an agenda to have quality transition-related open data access for Program/Project/Activity management, statistical analysis purposes, and program evaluations. The transition-specific metrics and measures are still under development, and an example of the intent and direction are presented in Table 5.

Table 5. Examples of Adaptation of General Metrics to Transition-Specific Needs

Examples of **General Metrics**	S&T Transition-**Specific Interpretations**
• **Value**	• S&T's R&D portfolio provides greater value to meeting DHS/S&T-Component missions
o **Contributions to business objectives**	o S&T Business Objective 1 – TST enables R&D transitions to better respond to R&D needs - X1 -- Meet Component requirements, needs, gaps - Y1 - Z1 o S&T Business Objective 2 – - X2 - Y2
o **Reduction of risk**	o S&T Transition Risks

[5] Public Law No: 115-435 (01/14/2019); Office of Management and Budget (OMB) Memorandum for Heads of Executive Departments and Agencies, "Phase 1 Implementation of the Foundations for Evidence-Based Policymaking Act of 2018: Learning Agendas, Personnel, and Planning Guidance, M-19-23, July 10, 2019; Accessed at https://www.bing.com/search?q=evidence+act&cvid=971da7cf7169430a82e4776f7862188c&aqs=edge.0.0l7.2218j0j1&pglt=43&FORM=ANNAB1&PC=U531

	- X - Y
o **Improved efficiency in operations**	o S&T Transition Operational Processes - Time to issue contracts
• **Effectiveness**	• S&T's effectiveness in operationalizing R&D transitions
o **Achievement of goals and objectives**	o Goals & Objectives - Spend all funds - Respond to taskers
o **Extent stewards are using the relevant tools**	o Transition Steward Activities -
o **Effectiveness of communication**	o
o **Effectiveness of education/training**	o
o **Speed of change adoption**	o
• **Sustainability**	•
o **Performance of policies and processes (i.e., are they working appropriately?)**	o
o **Conformance to standards and procedures (i.e., are staff following the guidance and changing behavior as necessary?)**	o