University of Southern California

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

FY22 Annual Report

For Period September 24, 2021 to September 23, 2022

December 23, 2022

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S&T Analysis and Management of Innovation Activity III (STAMINA III)
FY22 Annual Report for Period September 24, 2021 to September 23, 2022

Executive Summary

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

ES1. S&T R&D Customer Satisfaction Feedback (CSF) Methodology, Pilot Results, and Tools/Templates

USC/CREATE conducted five full-scale pilots of the S&T R&D Customer Satisfaction Feedback (CSF) methodology, demonstrating its effectiveness in eliciting feedback on the results of R&D projects. The results are summarized in Table ES-1 below. The CSF methodology uses the Strategic Multi-Attribute Rating Technique of Customer Satisfaction (SMART-CS) to perform a rigorous analytical assessment of component satisfaction with R&D projects. The SMART-CS tool scores R&D projects on several criteria, enabling an increased understanding of customer satisfaction. Application of the CSF translates to improved reporting of the National Defense Authorization Act (NDAA) Transition Indicators of Success and informs S&T internal process improvements. The five pilots engaged a range of DHS stakeholders, including CBP's Office of Field Operations (OFO) in their assessment of the Common Viewer System (CVS), CBP's Border Patrol in their assessment of the Augmented Reality Sand Table (ARES) and Enhanced Dynamic Geo-Social Environment (EDGE), CISA's Resilient PNT Conformance Framework, and the USCG for the TITANIC, Space-based Iceberg Reconnaissance project, a part of their International Ice Patrol. The results and experience with the pilot phase will help determine how to expand collection of customer feedback using the S&T matrix structure and further streamlining the CSF process for effective implementation across the S&T R&D project portfolio.

Table ES-1. Summary of CSF Pilot R&D Project Ratings and NDAA Tracking Recommendations

CSF PILOT R&D PROJECT	R&D CSF Transition Benefit Rating	Likelihood of Transition	Risk-Adjusted Transition Uptake Benefit Rating	S&T R&D Process Rating	NDAA Future Year Tracking Recommendation
Augmented Reality Sand Table (ARES) for CBP/USBP	66	10%	8	81	No
Common Viewer System (CVS) for CBP/OFO	81	100%	81	85	Yes, Years 1-3
Enhanced Dynamic Geo-Social Environment (EDGE) Virtual Training for CBP/USBP	100	15%	15	100	No
Resilient Position Navigation and Timing (PNT) Conformance Framework for CISA	100	100%	100	100	Yes, Years 1-3
TITANIC for USCG	80	85%	67	84	Yes, Years 1-3

The definitions of the three R&D CSF ratings are,

- **R&D Transition Benefit CSF Rating** -- R&D customer satisfaction rating for the transition product being evaluated on a scale of 0 to 100. This rating reflects the positive impact on the customer if the product is successfully transitioned and implemented The rating is a weighted average of normalized scores for product-relevant benefit categories, including cost savings, reduction of

effort, improved performance, improved decision making, and improved staff performance. A score of 100 corresponds to the best score possible for similar R&D products in all benefit categories and a score of 0 indicates the lowest possible score on all relevant benefit categories.

- **Likelihood of a Successful Transition and Implementation for Eventual Use** – Scored on a scale of 0% to 100%, this is the probability that the R&D output will transition successfully to the Operational Unit, as estimated by the R&D customer. Zero percent means that the product will definitely not succeed in transition and implementation. 100% means that it will certainly succeed or is already successfully transitioned and implemented.
- **Risk-Adjusted Transition Uptake Benefit CSF Rating** -- Adjustment of the Transition Benefit CSF Rating accounts for the respondents' assessments of the likelihood that the transition would actually be implemented in the intended domain. It is the product of the R&D Transition Benefit CSF Rating and the Likelihood of Transition score.
- **S&T R&D Process CSF Rating Score** - R&D customer satisfaction rating for S&T's process for conducting the R&D project, accounting for the resources made available to the project and the expertise of the project team conducting the R&D (not the project management process). The process CSF Rating Score is an equally weighted average of resource and expertise scores ranging from 0 (not adequate) to 100 (completely adequate).

The rating results are very informative, demonstrating the valuable numerical and verbal feedback that can be obtained from the CSF methodology. Quantitatively, with only five samples, statistical analysis is not viable for the pilot projects. Still, as ratings are compiled in time, the results will permit interpretation of ratings on a familiar 0-100 scale. Qualitatively, the elicitation generated substantive comments for each project from vested stakeholders providing specific guidance both to the individual project and the S&T R&D process on where the S&T transition products and process are strong and where there are opportunities for improvement.

USC/CREATE also developed the tools and templates for efficiently and effectively conducting the CSF methodology at full-scale production scale for future deployment at S&T on its R&D portfolio. These tools and templates are further described below and are provided under separate cover.

ES2. Knowledge Product Transition Type Categorization, Definitions and Examples

USC/CREATE developed and recommended the use of four Knowledge Product (KP) types to facilitate their STATS data entry and their post-transition tracking and follow-up for NDAA purposes. The four types include,

1. **Operational analysis information** needed/requested by Component
2. **Domain-specific reports or publications** on specific domain/topic
3. **Education and Training,** including Professional Workforce Development Degree Programs, Certificate Programs, Curriculum, Plans, and Courses
4. **Progress and Annual Reports** summarizing findings of an R&D activity, project, or program not reported elsewhere

The guidance developed for adequately identifying and categorizing Knowledge Products included common examples of KP transitions, and examples of what is **not** considered a KP transition. USC/CREATE will continue to assess, refine, and further develop the KP categories as examples accumulate that indicate there should be a new category. Alternatively, a category may be eliminated/substituted/renamed.

ES3. Knowledge and Technology Product Transition Uptake Benefit Tracking and Assessment for NDAA Purposes

USC/CREATE developed a methodology and process for tracking and assessing transition product uptake benefits to meet the NDAA 3-year requirements. It consists of determining the Transition Outcomes, Operational Impacts, and Homeland security Enterprise (HSE) Value, according to,

- **Transition Outcome**: the direct result of an action attributed to the R&D output transition. These consist of counts of transitions with quantifiable consequential transition uptake benefit
- **Operational Impact**: effect/change of a Component's operational performance resulting from the transitioned project's outcome, according to a set of operational benefits, such as reduced operational costs, improved efficiency or effectiveness, reduced false alarm rate, increased signal detection, etc.
- **HSE Value**: importance or worth of the R&D uptake, e.g., number of lives saved, mission improvement, or monetary equivalent directly resulting from the impact of a transitioned project

Transition Product uptake and benefits are observed and measured over time. For example, a transitioned product's value can be projected but would not be immediately measurable or confirmed. Understanding the projected outcome, impact, and value of a proposed transitioned product as an HSE solution can inform the prioritization and section process for R&D investments.

ES4. R&D Logic Model for R&D Indicators of Success (IoS)

USC/CREATE is developing an R&D logic model for the relationship between R&D spending and R&D output Indicators of Success (IoS). To baseline the model, we first examine the correlation between federal R&D spending at universities and accepted metrics of university innovation. We are first developing a working dataset for input to the model, integrating a dataset from the National Science Foundation Higher Education Research and Development (HERD), which tracks R&D expenditures by year, institution and funding agency, with the Association of University Technology Managers (AUTM) Statistics Access for Technology Transfer Database (STATT) database, which tracks licenses, royalty income, invention disclosures and patents by institution. The novel integrated dataset will enable analysis of relationships between R&D investment and innovation metrics over time through multivariate statistical analysis. The model will then be used to examine IoS applicable to transition project output uptake benefits.

ES5. New Curriculum for Transition Coaching

USC/CREATE, through Virginia Tech's LAUNCH, Center for New Ventures, initiated the development of transition coaching and education material for use by S&T's transition matrix participants. This is the first transition-specific coaching effort of its kind for S&T. It emphasizes transition activities in accordance with the DHS strategic goals of Leadership, becoming the driving force of its Innovation and Partnership goals, and engaging in deliberate relationships for success. The coaching material follows the format of a general R&D project lifecycle, using S&T's instantiation, termed the Business Process Flow (BPF), to exemplify the coaching material specifically for S&T. The material will cover a range of transition-related topics, such as NDAA transition uptake benefits reporting and transition milestone data entry development, and is intended to introduce, reinforce, and build new skills and habits, as well as enhance transition acumen.

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- SMART-CS Excel Spreadsheet Calculational Tool
- SMART-CS Excel Spreadsheet for Elicitation Raw Data Download Template
- SMART-CS Excel CSF Pilot Summaries FY22
- Appendix C: Literature Review of R&D Indicators of Success (IoS) and Government Performance Reporting Measures Related to Transition
- Appendix D:
- Virginia Tech Annual Report for FY22

1. S&T R&D Customer Satisfaction Feedback (CSF) Methodology, Pilot Results, and Tools/Templates

USC/CREATE conducted five full-scale pilots of the S&T R&D Customer Satisfaction Feedback (CSF) methodology, demonstrating its effectiveness in eliciting feedback on the results of R&D projects. The results are summarized in Table ES-1 below. The CSF methodology uses the Strategic Multi-Attribute Rating Technique of Customer Satisfaction (SMART-CS) to perform a rigorous analytical assessment of component satisfaction with R&D projects. The SMART-CS tool scores R&D projects on several criteria, enabling an increased understanding of customer satisfaction. Application of the CSF translates to improved reporting of the National Defense Authorization Act (NDAA) Transition Indicators of Success and informs S&T internal process improvements. The five pilots engaged a range of DHS stakeholders, including CBP's Office of Field Operations (OFO) in their assessment of the Common Viewer System (CVS), CBP's Border Patrol in their assessment of the Augmented Reality Sand Table (ARES) and Enhanced Dynamic Geo-Social Environment (EDGE), CISA's Resilient PNT Conformance Framework, and the USCG for the TITANIC, Space-based Iceberg Reconnaissance project, a part of their International Ice Patrol. The results and experience with the pilot phase will help determine how to expand collection of customer feedback using the S&T matrix structure and further streamlining the CSF process for effective implementation across the S&T R&D project portfolio.

Table 1-1. Summary of CSF Pilot R&D Project Ratings and NDAA Tracking Recommendations

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The definitions of the three R&D CSF ratings are,

- **R&D Transition Benefit CSF Rating** -- R&D customer satisfaction rating for the transition product being evaluated on a scale of 0 to 100. This rating reflects the positive impact on the customer if the product is successfully transitioned and implemented The rating is a weighted average of normalized scores for product-relevant benefit categories, including cost savings, reduction of effort, improved performance, improved decision making, and improved staff performance. A score of 100 corresponds to the best score possible for similar R&D products in all benefit categories and a score of 0 indicates the lowest possible score on all relevant benefit categories.
- **Likelihood of a Successful Transition and Implementation for Eventual Use** – Scored on a scale of 0% to 100%, this is the probability that the R&D output will transition successfully to the Operational Unit, as estimated by the R&D customer. Zero percent means that the product will

definitely not succeed in transition and implementation. 100% means that it will certainly succeed or is already successfully transitioned and implemented.

- **Risk-Adjusted Transition Uptake Benefit CSF Rating** -- Adjustment of the Transition Benefit CSF Rating accounts for the respondents' assessments of the likelihood that the transition would actually be implemented in the intended domain. It is the product of the R&D Transition Benefit CSF Rating and the Likelihood of Transition score.
- **S&T R&D Process CSF Rating Score** - R&D customer satisfaction rating for S&T's process for conducting the R&D project, accounting for the resources made available to the project and the expertise of the project team conducting the R&D (not the project management process). The process CSF Rating Score is an equally weighted average of resource and expertise scores ranging from 0 (not adequate) to 100 (completely adequate).

Responses from the stakeholder respondents to the CSF elicitation are combined according to the SMART-CS methodology to derive the ratings. The rating results, provided in Appendix A of this document, are very informative, demonstrating the valuable numerical and verbal feedback that can be obtained from the CSF methodology. Quantitatively, with only five samples, statistical analysis is not viable for the pilot projects. Still, as ratings are compiled in time, the results will permit interpretation of ratings on a familiar 0-100 scale. Qualitatively, the elicitation generated substantive comments for each project from vested stakeholders providing specific guidance both to the individual project and the S&T R&D process on where the S&T transition products and process are strong and where there are opportunities for improvement.

The CSF Pilot R&D project selection and elicitation process is shown in Figure 1-1 and consists of the following steps,

1. Consult with the Transition Branch to select candidate R&D projects for obtaining CSF Ratings. Typical selection criteria used included,
    a. The R&D project will soon or has recently delivered a Transition Product
    b. The recipient Federal Stakeholders available for the CSF elicitation process
    c. The R&D project received high visibility by S&T or the Component
    d. Providing a variety of perspectives that will assist in improving the CSF process
2. Contact the S&T R&D Project Manager to identify Operational Component Stakeholders for participation in the elicitation session and provide the email template example in Appendix B for outreach to the identified Stakeholders.
3. Contact agreed-upon Stakeholders with background information on the CSF process using the R&D Customer Satisfaction Feedback (CSF) FAQ and Prep Sheet in Appendix B. Solicit time availability and schedule the participation of Stakeholders.
4. Conduct the CSF elicitation session with a 10- to 15-minute introduction, orientation and Q&A period, followed by each Stakeholder responding individually to their own Qualtrics survey.
5. Conduct an analysis of the provided feedback, following the steps described in Appendix B,
    a. Download raw data from Qualtrics to the SMART-CS Raw Data workbook, “Exported Data” spreadsheet.
    b. Copy data from the “Exported Data” spreadsheet to the SMART-CS Calculation Template workbook, “RAW Data Template” spreadsheet. Results will automatically populate the “Summary Sheet Template.”
    c. Convert the “Summary Sheet Template” spreadsheet to a Word document, and a) add the additional requested information in “Section II. R&D Project, Transition Product, and Recipient Component Information,” and b) develop NDAA Future Year Tracking Recommendation.
    d. Convert Word document to Adobe pdf for distribution.

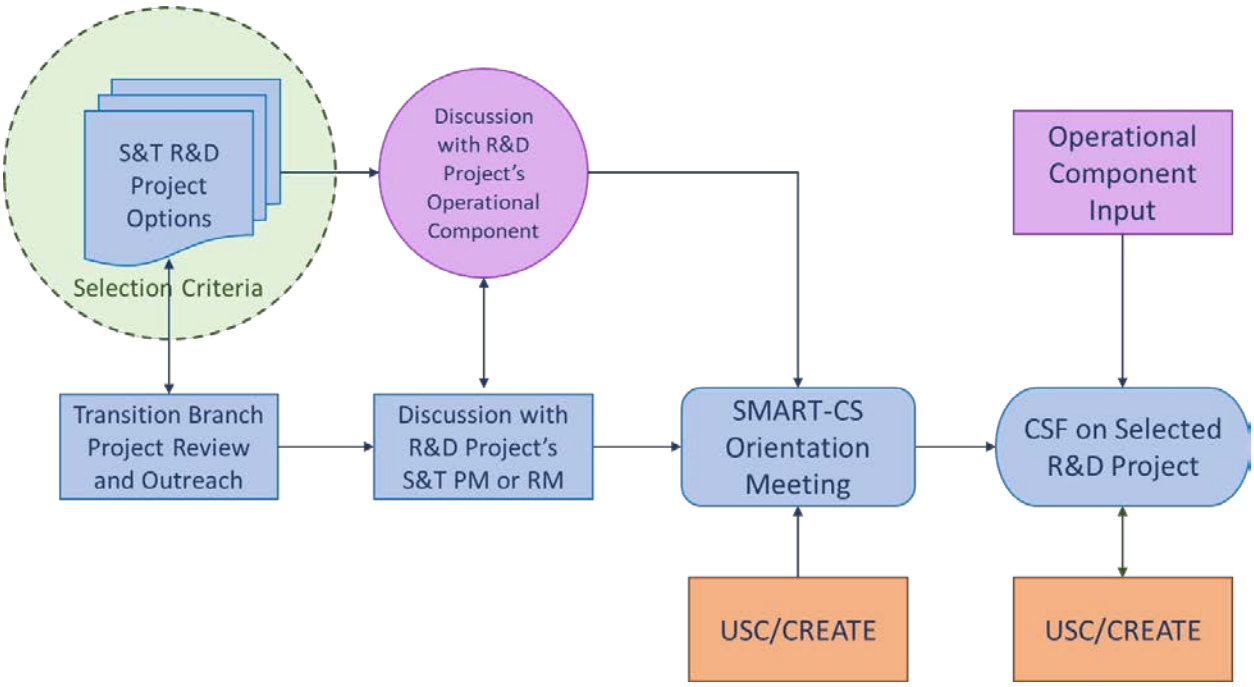

Figure 1-1. CSF Pilot R&D Project Selection and Elicitation Process.

USC/CREATE also developed the tools and templates for efficiently and effectively conducting the CSF methodology at full-scale production for future deployment at S&T on its R&D portfolio. These tools and templates are summarized below, are further described in Appendix B, and are provided under separate cover.

2. Knowledge Product Transition Type Categorization, Definitions and Examples

USC/CREATE developed and recommended using four Knowledge Product (KP) types to facilitate their STATS data entry, post-transition tracking, and follow-up for NDAA purposes. The four types include,

1. **Operational analysis information** needed/requested by Component
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3. **Education and Training** including Professional Workforce Development Degree Programs, Certificate Programs, Curriculum, Plans and Courses
4. **Progress and Annual Reports** summarizing findings of an R&D activity, project or program not reported elsewhere

The guidance developed for properly identifying and categorizing Knowledge Products included common examples of KP transitions, and examples of what is **not** considered a KP transition, as shown in Table 2-1. USC/CREATE will continue to assess, refine, and further develop the KP categories as examples accumulate that indicate there should be a new category, or alternatively a category may be eliminated/substituted/renamed. The goal is to get full credit for KP transition outputs, without double counting. A recurring theme is to avoid double reporting/counting of the same R&D product/output, so as to achieve accurate accounting of transitions' value for NDAA purposes.

USC/CREATE participated in numerous KP milestone reviews to demonstrate the applicability of these definitions and the overall approach in practice. These reviews included the review of S&T transition milestones for the 2021 NDAA report.

Table 2-1. Knowledge Product (KP) Types/Categories, with Examples

KP Type/Category	Common Examples of KP Transitions	Not considered KP Transitions
Operational analysis information needed/requested by Component	Input to an acquisition decision; Evaluation of alternatives; Operations Research analysis report of component processes; Tech Scouting Reports; Reports that result from operational experiments; SAVER documentation	Component-generated, supporting program artifacts (e.g., CONOPS, MNS/ICD, AOA, and ORD/CDD)
Domain-specific reports or publications on specific domain/topic	Final Report on telecom cybersecurity standards, procedures, and 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
Progress and Annual Reports summarizing findings of an R&D activity, project, or program not reported elsewhere	A report whose content has not been reported elsewhere but was supported with RD&I 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

3. Knowledge and Technology Product Transition Uptake Benefit Tracking and Assessment for NDAA Purposes

USC/CREATE developed a methodology and process for tracking and assessment of transition product uptake benefits to meet the NDAA 3-year requirements. As shown in Figure 3-1, it consists of determining the Transition Outcomes, Operational Impacts, and Homeland security Enterprise (HSE) Value, according to,

- **Outcome**: the direct result of an action attributed to the R&D output transition. These consist of counts of transitions with quantifiable consequential transition uptake benefit
- **Operational Impact**: effect/change of a Component's operational performance resulting from the transitioned project's outcome, according to a set of operational benefits, such as reduced

operational costs, improved efficiency or effectiveness, reduced false alarm rate, increased signal detection, etc.

- **HSE Value**: importance or worth of the R&D uptake, e.g., number of lives saved, mission improvement or monetary equivalent directly resulting from the impact of a transitioned project

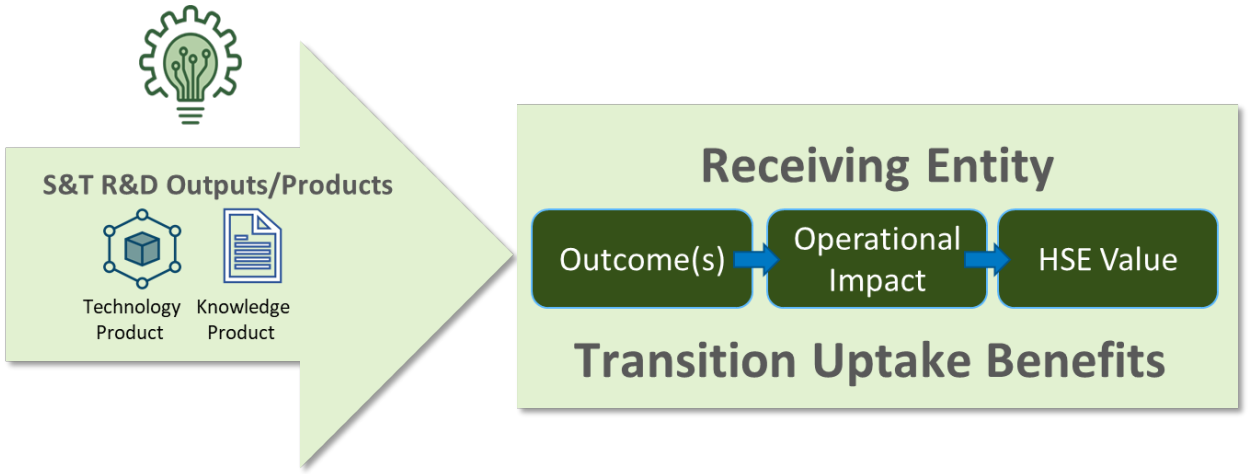

Figure 3-1. S&T R&D Transition: Tracking Indicators of Success

Transition Product uptake and benefits are observed and measured over time. For example, a transitioned product's value can be projected but would not be immediately measurable or confirmed. Understanding the projected outcome, impact, and value of a proposed transitioned product as an HSE solution can inform the prioritization and section process for R&D investments. Knowledge and Technology Product transition uptake benefit tracking and assessment for NDAA purposes would then follow the pathway outlined in Table 3-1.

Table 3-1. Transition Project Output Uptake Progression and Tracking to Meet NDAA Requirements

R&D Close-out Year	Years 1-3, Transition Uptake	Years 1-3, Transition Product Uptake Impact & Value:
Transition Outputs: Ordinal counts of transitions meeting the definition	**Outcomes:** Counts of transitions with quantifiable consequential transition uptake benefit	**Benefit-Cost Analysis (BCA) of transition uptake:** 1) Operational Impact, and 2) Homeland Security Enterprise (HSE) Value
1. Number of Knowledge Products (KPs) generated 2. Number of Technology Products (TPs) 3. Number of Patents, Trademarks, Licenses, Agreements, and similar IP-related metrics* *Reported separately by T2C/OGC	1. Number of KPs and TPs used in decision-making (entered acquisition process, informed make-or-buy, analysis-of-alternatives, policy-making, etc.) 2. Number of KPs and TPs used by Operational Components, and SOPs modified 3. Number of KPs used in Congressional Testimony 4. IP-related Products & Royalties*	1. Reduced operational costs 2. Improved operational effectiveness 3. Improved operational efficiency 4. Value of decision-making 5. Improved personnel performance from training 6. Value of Congressional action resulting from KP-related testimony 7. IP-related Products & Royalties*

It is essential to quantify the Component's operational baseline, i.e., how is this being done today (before the R&D transition uptake), what are the metrics and measures of performance of the current

method of operations, what is the requisite/supporting data, prior to implementing the R&D result/product, to enable an accurate BCA methodology assessment. Baselining is best done when the Component or Customer has identified the gap or need. However, baselining can occur during the R&D lifecycle or any period before the introduction of the transitioned product into operations. This can be coordinated with the customer to ensure baselining is done before introduction and uptake/use. The responsible party for collecting baseline information is the Component. The Component should provide this information during the gap decomposition phase.

Additional information on R&D Output, Transition Outcome, and Impact metrics, and the development and use of R&D IoS are provided in Appendix C: Literature Review of R&D Indicators of Success (IoS) Related to Transition, and Appendix D: Literature Review of Government Performance Reporting Measures Related to Transition, both provided under separate cover.

4. R&D Logic Model for R&D Indicators of Success (IoS)

USC/CREATE is developing an R&D logic model for the relationship between R&D spending and R&D output Indicators of Success (IoS). To baseline the model, we first examine the correlation between federal R&D spending at universities and accepted metrics of university innovation. We are first developing a working dataset for input to the model, integrating a dataset from the National Science Foundation Higher Education Research and Development (HERD), which tracks R&D expenditures by year, institution and funding agency, with the Association of University Technology Managers (AUTM) Statistics Access for Technology Transfer Database (STATT) database, which tracks licenses, royalty income, invention disclosures and patents by institution. The novel integrated dataset will enable analysis of relationships between R&D investment and innovation metrics over time through multivariate statistical analysis. The model will then be used to examine IoS applicable to transition project output uptake benefits.

One of the major issues in combining the datasets is how each database records the name of the university (i.e., U. of Southern California vs University of SC). To combat these issues, we have developed a cleaning process using open source tools, including,

- FuzzyWuzzy Data Matching Algorithm
- Regex
- Pandas

FuzzyWuzzy is an AI that can help identify rough matches of two columns within both databases. We also have implemented Regex, a natural language processing platform that makes correcting syntax differences between the two databases easier. Finally, we implemented Pandas, which allows us to shape and reshape data frames based on the two databases. Furthermore, human interpretation between the two databases is necessary to supplement the identification process. Example changes made to enable combining of the databases include,

- NSF Database
  - Combing all the Texas schools to make a University of Texas System
  - Combining all the California schools to make the University of California System
  - Corrected U. to University in the names of universities using natural language processing
  - Corrected C. to College in the names of colleges using natural language processing
- STATT Database
  - Remove of entities that aren't in the NSF database
  - Correction of university names to match the NSF database

We next aim to combine multiple years of data for a multi-dimensional linear regression analysis. We will repeat the data cleaning pipeline we created and continue to modify the pipeline for past years,

given the syntax changes. We can then provide a Benefit-Cost Analysis of the output of the universities and provide what variables typically constitute the "Inputs," "Parameters," and "Outputs" to IoS for those universities.

An example of the analysis that will be enabled is provided in Figure 4-1. The first six rows represent the STATT database and the next 13 are from the NSF database. After generating multiple years of data, we can create these heat matrices for each year to identify which factors are most important. Then, we can fine tune our analysis based on these heat matrices for better results.

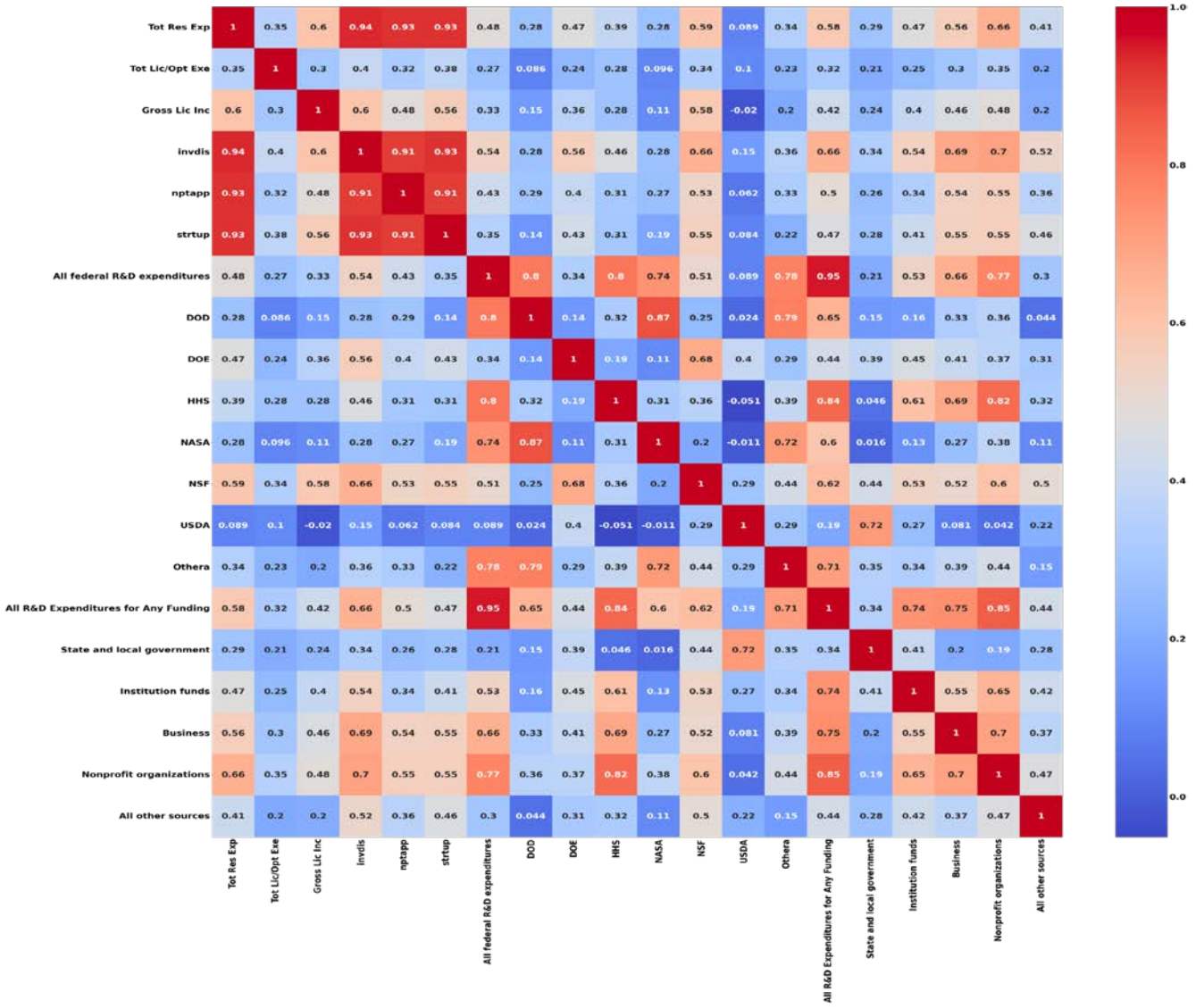

Figure 4-1: A heat correlation matrix based on the results of the two databases for 2020

Preliminary results for 2020 data show that businesses and nonprofits have the highest correlations with the IoS. This result could be due to business funding being directly toward IoS such as patent applications. Furthermore, business and nonprofits would have similar types of funding. From the federal level, the NSF has the highest correlation with the IoS, which could be due to the NSF funding many smaller projects than other departments leading to more technology transfers. Other departments like HHS, have larger departments than HHS, but fewer projects and technology transfers.

5. New Curriculum for Transition Coaching

USC/CREATE, through Virginia Tech's LAUNCH, Center for New Ventures, initiated the development of transition coaching and education material for use by S&T's transition matrix participants. This is the first transition-specific coaching effort of its kind for S&T. It emphasizes transition activities in accordance with the DHS strategic goals of Leadership, becoming the driving force of its Innovation and Partnership goals, and engaging in deliberate relationships for success. The coaching material follows the format of a general R&D project lifecycle, using S&T's instantiation, termed the Business Process Flow (BPF), to exemplify the coaching material specifically for S&T. The material will cover a range of transition-related topics, such as NDAA transition uptake benefits reporting and transition milestone data entry development, and is intended to introduce, reinforce, and build new skills and habits, as well as enhance transition acumen.

This effort was designed to provide transition best practices coaching to DHS S&T in the form of short and extended in-person education sessions. These sessions were initially conceptualized to capture best practices in customer interaction as an integral part of transition planning, execution, and reporting from Gap Analysis to Transition Tracking and Reporting. The Virginia Tech team has worked with the DHS team to provide support, guidance, and directional contributions in response to the evolving training needs of DHS S&T. Of particular importance is the move from scheduled in-person sessions to an asynchronous remote-based approach, through which DHS S&T can reach a larger number of personnel. Further, the effort has focused on developing coaching assets that align with the larger objective of complying with the 2017 NDAA requirements for transition reporting for all projects in which R&D is reduced to practice.

To date, progress on this task has included,

- PROGRAM TEAM MEETINGS – ALIGNMENT OF DIRECTION – The Virginia Tech team has met weekly with the DHS team to ensure proper alignment between coaching needs and the work being performed to produce evergreen education assets. These team meetings have been an integral part of capturing, analyzing, and focusing on changes, requests, and directional evolutions by the S&T team and their leadership as the understanding of needs has matured.
- CONTENT MANAGEMENT – To maintain currency of information and approach, the Virginia Tech team developed a tracking wiki page in the MS Teams environment that serves as a master outline of training module needs. The wiki, provided in Appendix A of the standalone VT Annual Report, includes module titles and anticipated module types. Types include presentation, document, and video assets. The allocation of types of content was achieved through an iterative assessment process between Virginia Tech and DHS S&T.
- CONTENT CREATION – The content being created has been differentiated by media type: presentation, document, or video. The effort and time required to create any singular content type will vary, with video production representing the highest level of effort. It is also noted that though resource intensive, video vignettes represent the most effective education media type available. As such, considerable effort has been expended in understanding the most effective direction to take the instruction video content.

The program has successfully navigated the initial uncertainty of the transition process coaching, and the combined understanding of needs and representative successful outcomes is stable. The team has made positive advances that will enable and ensure a successful project conclusion over the remaining work. Several Appendices are provided in the VT standalone Annual Report to demonstrate and present the scope and state of the work completed to date. Note that this documentation is a snapshot in time. All

output presented herein has undergone many iterations, modifications, additions, and deletions. Some of this ongoing copy edit and strategic edit is evident in the work submitted in the Annual Report.

Appendix A: SMART-CS R&D Project Customer Satisfaction Feedback (CSF) Ratings for Five Pilot S&T R&D Projects

A.1. Augmented Reality Sand Table (ARES) for CBP/USBP

Contents

***All responses & comments in this document are anonymized & randomized with no correlation to Responder number.**

Section I. SMART-CS CSF Ratings Summary	
1. Name of R&D Project	ARES
2. R&D Transition Benefit CSF Rating (Implementation Risk-Adjusted CSF Rating)	66 (8)
3. S&T R&D Process CSF Rating Score	81
4. NDAA Future Year Tracking Recommendation	No

Section II. R&D Project, Transition Product, and Recipient Component Information	
1. Name of R&D Project	Augmented Reality Sand Table (ARES)
2. Project Manager and Supervisor	To be added from STATS data in
3. R&D Performers	To be added from STATS data in
4. Total Funding, and by Fiscal Year	To be added from STATS data in
5. Operational Component & End-User	To be added from STATS data in
6. Other Operational Stakeholders	To be added from STATS data in
7. Intended End-Users	To be added from STATS data in
8. SMART-CS Responders' Roles*	Group Supervisors
9. R&D Project Purpose	To be added from STATS data in
10. R&D Transition Product Description	To be added from STATS data in
11. Expected Benefits	Improved performance of operations (e.g., improved interdictions); Improved decision making (e.g., the value of information); Improved staff performance from education and training
12. TRL: @Start, @End; Time Frame	

***All responses & comments in this document are anonymized & randomized with no correlation to Responder number.**

Section III. Recipient Component Feedback on Likelihood and Timeframe of Use*	
Is R&D Product Currently in Use?	No, a prototype was provided to the intended end-user during the year for trial testing, and to provide feedback to the R&D team on functionality, issues, customizations, etc., but the prototype did not yet

	undergo formal Verification and Validation (V&V) acceptance testing for it to be used in actual operations.
Yes, in Use, Comments	
a. If Yes, Go to Section IV below; If No, Why Not?: R&D-Related Reasons	R&D product's performance did not meet the original expectations, or is no longer aligned to the Component's operation; Software update/upgrade costs needed for training environment too high
If No, Why Not?: Non-R&D-Related Reasons	R&D product is no longer of interest or aligned to the Component
b. Likelihood of Eventual Use	10%
c. Time Frame for Eventual Use	

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Section IV. SMART-CS CSF Ratings on Expected Benefits of R&D Project Transition*	
Component's Expected Benefits of R&D Project Transition	**Responder Ratings**
• **Cost savings**	
• **Reduction of effort**	
• **Improved performance of operations**	44%
• **Improved decision-making**	100%
• **Improved staff performance from education and training**	100%

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Section V. Expected Benefits of R&D Project Transition, Responder Feedback Comments*	
Expected Benefits of R&D Project	**Responder Feedback Comments**
• **Cost savings**	
• **Reduction of effort**	
• **Improved performance of operations**	
• **Improved decision-making**	
• **Improved staff performance from education and training**	
• **Additional Information**	This product is useful for field operational application. Versus academy training.

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A.2. Common Viewer System (CVS) for CBP/OFO

Contents

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Section I. SMART-CS CSF Ratings Summary	
1. Name of R&D Project	CVS
2. R&D Transition Benefit CSF Rating (Implementation Risk-Adjusted CSF Rating)	81 (81)
3. S&T R&D Process CSF Rating Score	85
4. NDAA Future Year Tracking Recommendation	Yes, Years 1-3

Section II. R&D Project, Transition Product, and Recipient Component Information	
1. Name of R&D Project	Common Viewer System (CVS)
2. Project Manager and Supervisor	CBP Portfolio Manager, David Taylor Project Manager, Brenda Long
3. R&D Performers	Leidos
4. Total Funding, and by Fiscal Year	To be added from STATS data in
5. Operational Component & End-User	CBP OFO NII Division/Christopher Sullivan (Director) CBP OFO NII Division/Eric Demarest (Branch Chief) CBP OFO NII Division/Christopher Sunseri (Program Manager)
6. Other Operational Stakeholders	
7. Intended End-Users	CBP Integrated Logistics Division (ILD) MAXIMO system
8. SMART-CS Responders' Roles*	Project Lead for CBP, Subject Matter Expert
9. R&D Project Purpose	To be added from STATS data in
10. R&D Transition Product Description	To be added from STATS data in
11. Expected Benefits	Cost savings, Reduction of effort (e.g., less staff-hours for same security performance), Improved performance of operations (e.g., improved interdictions), Improved decision making (e.g., the value of information), Improved staff performance from education and training, Improved performance of operations (e.g., improved interdictions)
12. TRL: @Start, @End; Time Frame	

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Section III. Recipient Component Feedback on Likelihood and Timeframe of Use*	
Is R&D Product Currently in Use?	Yes, a completed prototype was delivered to the intended end-user, the prototype passed V&V acceptance testing, and was acquired and implemented as part of a standard operating procedure (SOP). It is now being used routinely in the field.

Yes, in Use, Comments	
d. If Yes, Go to Section IV below; If No, Why Not?: R&D-Related Reasons	
If No, Why Not?: Non-R&D-Related Reasons	
e. Likelihood of Eventual Use	
f. Time Frame for Eventual Use	

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Section IV. SMART-CS CSF Ratings on Expected Benefits of R&D Project Transition*	
Component's Expected Benefits of R&D Project Transition	**Responder Ratings**
• **Cost savings**	81%
• **Reduction of effort**	77%
• **Improved performance of operations**	69%
• **Improved decision-making**	100%
• **Improved staff performance from education and training**	100%

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Section V. Expected Benefits of R&D Project Transition, Responder Feedback Comments*	
Expected Benefits of R&D Project	**Responder Feedback Comments**
a. Cost savings	The current savings in Savannah is under review. We believe that the reduction of man hours and training will be significant.
b. Reduction of effort	
c. Improved performance of operations	Improvement of operations has been reported as significant, especially adding the command center concept into the CVS mix; More benefits could have been realized, but this system causes the port to utilize an extra CBP Officer to run the system in the CONOP, not less, which is one of the goals of a common viewer system that CBP wants to achieve.
d. Improved decision-making	The CVS is used to review all x-ray images from inbound containers that have been deemed a risk for contraband or agricultural issues.
e. Improved staff performance from education and training	A key objective for CVS is streamlining training. For example, instead of training on multiple vendors' software platforms, we would now only train on one software platform. Thus, allowing CBP to purchase x-ray scanners from different vendors while utilizing only one software platform to review images.
f. Additional Comments	More benefits could have been realized if: 1. The rest of the mesh radio network/repeaters could have been completed in the port, giving full coverage for either mobile NII system to do inspections

	dockside or any other location within the port. 2. A wireless E-Stop was created for the ground guide outside the mobile NII system in stationary mode to eliminate the body inside the mobile system dedicated to that purpose. You would still have the minimum 2 bodies for the system in stationary mode (ground guide and image analyst), not the 3 that you are forced to use in the current CONOPS, but the image analyst would be inside the command center on the CVS system and could not only analyze images from one mobile system but both mobile systems if the other mobile system were able to connect from other port locations through the fully realized mesh radio network system. The two mobile systems could be run simultaneously from anywhere in the port with a minimum 2 bodies per system in mobile mode and 1 body per system in stationary mode, plus the image analyst in the command center.

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A.3. Enhanced Dynamic Geo-Social Environment (EDGE) Virtual Training for CBP/USBP

Contents

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Section I. SMART-CS CSF Ratings Summary	
1. Name of R&D Project	EDGE
2. R&D Transition Benefit CSF Rating (Implementation Risk-Adjusted CSF Rating)	100 (15)
3. S&T R&D Process CSF Rating Score	100
4. NDAA Future Year Tracking Recommendation	No

Section II. R&D Project, Transition Product, and Recipient Component Information	
1. Name of R&D Project	USBP Enhanced Dynamic Geo-Social Environment (EDGE) Virtual Training: Serious Game Exercise Tool for Border Patrol
2. Project Manager and Supervisor	To be added from STATS data in
3. R&D Performers	To be added from STATS data in
4. Total Funding, and by Fiscal Year	To be added from STATS data in
5. Operational Component & End-User	To be added from STATS data in
6. Other Operational Stakeholders	To be added from STATS data in
7. Intended End-Users	To be added from STATS data in
8. SMART-CS Responders' Roles*	Group Supervisors
9. R&D Project Purpose	To be added from STATS data in
10. R&D Transition Product Description	To be added from STATS data in
11. Expected Benefits	Improved performance of operations (e.g., improved interdictions); Improved staff performance from education and training; Other: It is not "weather permitting" - product can be utilized in any type of conditions
12. TRL: @Start, @End; Time Frame	

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Section III. Recipient Component Feedback on Likelihood and Timeframe of Use*	
Is R&D Product Currently in Use?	No, the R&D project just ended last FY, and there has not yet been an opportunity to use it.
Yes, in Use, Comments	
g. If Yes, Go to Section IV below; If No, Why Not?: R&D-Related Reasons	R&D product's performance did not meet the original expectations, or is no longer aligned to the Component's operation; R&D implementation, capital acquisition, or maintenance costs would be too high
If No, Why Not?: Non-R&D-Related Reasons	R&D product is no longer of interest or aligned to the Component
h. Likelihood of Eventual Use	10%
i. Time Frame for Eventual Use	NA

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Section IV. SMART-CS CSF Ratings on Expected Benefits of R&D Project Transition*	
Component's Expected Benefits of R&D Project Transition	**Responder Ratings**
• **Cost savings**	
• **Reduction of effort**	
• **Improved performance of operations**	100%
• **Improved decision-making**	
• **Improved staff performance from education and training**	100%
• **Other (added by Responder): Not "weather permitting"**	

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Section V. Expected Benefits of R&D Project Transition, Responder Feedback Comments*	
Expected Benefits of R&D Project	**Responder Feedback Comments**
• **Cost savings**	
• **Reduction of effort**	
• **Improved performance of operations**	
• **Improved decision-making**	
• **Improved staff performance from education and training**	
• **Other (added by Responders)**	

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A.4. Resilient Position Navigation and Timing (PNT) Conformance Framework for CISA

Contents

***All responses & comments in this document are anonymized & randomized with no correlation to Responder number.**

Section I. SMART-CS CSF Ratings Summary	
1. Name of R&D Project	PNT
2. R&D Transition Benefit CSF Rating (Implementation Risk-Adjusted CSF Rating)	100 (100)
3. S&T R&D Process CSF Rating Score	100
4. NDAA Future Year Tracking Recommendation	Yes, Years 1-3

Section II. R&D Project, Transition Product, and Recipient Component Information	
1. Name of R&D Project	Develop the Resilient PNT Conformance Framework
2. Project Manager and Supervisor	Ernest Wong, Technical Manager; Brannan Villee, Program Manager; Chase Garwood, Portfolio Manager
3. R&D Performers	Who carried out this work?
4. Total Funding, and by Fiscal Year	Total through FY22 $26.4M?; amounts by prior FYxx's $xxM's?
5. Operational Component & End-User	PNT Program Office, Strategic Defense Initiatives Branch, National Risk Management Center, CISA
6. Other Operational Stakeholders	Specific/Example operational users of the PNT framework?
7. Intended End-Users	Commercial and government entities that use PNT data
8. SMART-CS Responders' Roles*	Two Respondents: Requirements developer/System engineer for systems that use Position Navigation and Timing Data provided by GPS; Program Management and industry and critical infrastructure collaborator/coordinator for critical infrastructure sharing security and resilient information, in the Program Management Office for the PNT Initiative, the Secretariat for DHS PNT Executive Steering Committee, whose members include all components and offices that have responsibility in their use of PNT services.
9. R&D Project Purpose	The R&D effort was designed to create a framework by which companies could judge the expected performance of GPS receivers. Before the PNT Conformance Framework there was no common lexicon for describing performance attributes.
10. R&D Transition Product Description	A framework on the design of PNT User Equipment to help industry and federal entities understand and know what is needed to build resilience for PNT solutions.
11. Expected Benefits	Improved performance of operations, Improved decision making (e.g., the value of information), Other: (please specify)
12. TRL: @Start, @End; Time Frame	?: ?; ?

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Section III. Recipient Component Feedback on Likelihood and Timeframe of Use*	
Is R&D Product Currently in Use?	Yes, an advanced prototype was delivered to the intended end-user, and it went so well that the latest prototype is on extended used. It is expected to undergo further V&V acceptance testing before the end-user decides if it will enter the acquisition and implementation processes.
	Yes, a completed prototype was delivered to the intended end-user, the prototype passed V&V acceptance testing, and was acquired and implemented as part of a standard operating procedure (SOP). It is now being used routinely in the field.
Yes, in Use, Comments	The program was meant to lay the ground work for follow on work. The project focused on technical guidance for building more secure electronics. We have seen instances where the private sector is advertising that their products are now fully compliant with the DHS conformance frame work. The framework is also the foundation for a standard being developed by IEEE. The framework met its intended objectives.
	The Resilient PNT Conformance Framework has been published and has been accepted as a Framework to be considered for a transition to an accepted industry standard led by the Institute of Electrical and Electronics Engineers (IEEE). Our focus and desire is that the information in the Conformance Framework becomes an accepted industry standard, by which PNT receivers will be designed at the 4 levels specified in the Conformance Framework.
j. If Yes, Go to Section IV below; If No, Why Not?: R&D-Related Reasons	
If No, Why Not?: Non-R&D-Related Reasons	
k. Likelihood of Eventual Use	
l. Time Frame for Eventual Use	

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Section IV. SMART-CS CSF Ratings on Expected Benefits of R&D Project Transition*	
Component's Expected Benefits of R&D Project Transition	**Responder Ratings**
• **Cost savings**	**NA**
• **Reduction of effort**	**NA**
• **Improved performance of operations**	**Total: 100** Respondent 1: 100 Respondent 2: 100
• **Improved decision-making**	**Total: 100** Respondent 1: 100 Respondent 2: 100
• **Other (added by Responder):**	**Total: Not Scored**
• **Confidence in Expected Benefits Estimates**	Moderate confidence (+/- 10%)

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Section V. Expected Benefits of R&D Project Transition, Responder Feedback Comments*	
Expected Benefits of R&D Project	**Responder Feedback Comments**
g. Cost savings	NA
h. Reduction of effort	NA
i. Improved performance of operations	• The conformance framework compliments security efforts underway in the private sector. This framework will help provide justification for the purchase of more secure and resilient GPS end user equipment for critical applications. It could help reduce cost by enabling end users to adopt less expensive receivers for non-critical functions while not significantly increasing risk. • It is tough to determine a performance improvement against a baseline. Most critical infrastructure users of PNT have antiquated equipment so I have gauged improvement to be at least a 50% uptick.
j. Improved decision-making	• With smarter PNT receivers that can detect and respond automatically to an anomaly is the focus the Conformance Framework to a Standards Development Organization, such as IEEE, if that happens. • This was difficult to distinguish between the two questions. Tens of thousands of commercial GPS receivers are purchased every year. If adopted by industry, this will inform the decision maker on what type of equipment to by based on the criticality of their system/operations. • Useful for multiple high-stakes decisions
k. Other (added by Responders)	• When adopted by industry the Conformance Framework will provide better, more resilient GPS receivers, and will provide a common lexicon by which to compare performance parameters of different GPS receivers • There are several areas that can be benefited if these receivers become a standard of development. Overall secure and resilient use of the PNT Signal. Although changing out receivers the overall cost would be less operational shutdown or disruption • Security and Resilience is improved
Funding Comment	• S&T R&D has a great set of technical folks and the use of the Federally Funded R&D Centers!

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A.5. TITANIC for USCG

Contents

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Section I. SMART-CS CSF Ratings Summary	
1. Name of R&D Project	TITANIC
2. R&D Transition Benefit CSF Rating (Implementation Risk-Adjusted CSF Rating)	80 (67)
3. S&T R&D Process CSF Rating Score	84
4. NDAA Future Year Tracking Recommendation	Yes, Years 1-3

Section II. R&D Project, Transition Product, and Recipient Component Information	
1. Name of R&D Project	TITANIC
2. Project Manager and Supervisor	John Thayer; James Viar
3. R&D Performers	Aerospace Corporation SMEs
4. Total Funding, and by Fiscal Year	Total $5.3M; FY19 $1.9M; FY20 $1.2M; FY21 $2.2M
5. Operational Component & End-User	USCG, International Iceberg Patrol (IIP)
6. Other Operational Stakeholders	USCG COMDT CG WWM, CG 26, Naval Research Laboratory (NRL) (SeaLab)
7. Intended End-Users	IIP satellite image analyst, Operational Watch
8. SMART-CS Responders' Roles*	Two Respondents: IIP Chief Scientist and End User/Technical
9. R&D Project Purpose	Develop a capability to reliably detect and identify icebergs with satellite imagery in the transatlantic shipping lanes
10. R&D Transition Product Description	An algorithm to correlate satellite-derived iceberg targets and AIS ship targets with existing iceberg database targets. Tool is designed to accelerate workflow in satellite image analysis.
11. Expected Benefits	Current method for iceberg detection using aerial ice reconnaissance costs the USCG more than $10 million annually, and is easily hampered by bad weather and low visibility conditions; Airborne missions utilize the C-130J aircraft, which is a low density / high demand asset. Iceberg reconnaissance patrols utilizing this asset prevent its use for other high priority Homeland Security missions such as counterdrug operations; TITANIC solution is a non-materiel solution utilizing existing space assets to perform its mission. The space solution is more economical and less susceptible to environmental issues than the aircraft implementation.
12. TRL: @Start, @End; Time Frame	TRL @Start: 3; TRL @End: 6; 3 years

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Section III. Recipient Component Feedback on Likelihood and Timeframe of Use*	
Is R&D Product Currently in Use?	No
m. If Yes, Go to Section IV below; If No, Why Not?: **R&D-Related Reasons**	• A prototype was provided to the intended end-user during the year for trial testing, and to provide feedback to the R&D team on functionality, issues, customizations, etc., but prototype did not yet undergo formal Verification and Validation (V&V) acceptance testing • The unclassified prototype was provided and tested with excellent results. The classified version is still under development. • Iceberg detection algorithm in use may benefit from additional iceberg validation data for machine learning solution. • The original R&D effort was to produce a Machine-Learning algorithm for target classification based on ground-truthed iceberg observations. The methods employed ended up to not be as successful as required and the project pivoted away from a target classifier to a target correlator for the classified environment. Implementation in classified infrastructure has imposed delays to original timeline.
If No, Why Not?: **Non-R&D-Related Reasons**	• Use of R&D product awaiting component-level change/approval (e.g., integration into an approved operational procedure) • Product is intended to be used in the classified environment. Migrating to this environment and establishing on USCG "cloud" and flow of necessary data between UNCLAS and CLAS systems still needs to be resolved internally • The product is ready to be developed in the classified environment, but requires USCG-level infrastructure changes to be brought online.
n. Likelihood of Eventual Use	**Total: 85%** Responder 1: 100% with Moderate Confidence Responder 2: 70% with High Confidence
o. Time Frame for Eventual Use	**Total: 6 months** Responder 1: 6 months with Moderate Confidence Responder 2: 6 months with Low Confidence

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Section IV. SMART-CS CSF Ratings on Expected Benefits of R&D Project Transition*	
Component's Expected Benefits of R&D Project Transition	**Responder Ratings**
• **Cost savings**	**Total: 60** Respondent 1: Not Rated Respondent 2: 60
• **Reduction of effort**	**Total: 71** Respondent 1: 75 Respondent 2: 67
• **Improved performance of operations**	**Total: 80** Respondent 1: 60 Respondent 2: 100
• **Improved decision-making**	**Total: 100** Respondent 1: 100 Respondent 2: 100
• **Other (added by Responder): Improved access to classified data**	**Total: Not Scored**

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Section V. Expected Benefits of R&D Project Transition, Responder Feedback Comments*	
Expected Benefits of R&D Project	**Responder Feedback Comments**
l. Cost savings	I based this on the potential cost savings for routinely incorporating classified imagery through these R&D efforts. With limited use of the system in an operational setting, this is very difficult to estimate (low confidence in this response).
m. Reduction of effort	In my opinion, it is not appropriate to make this estimate presently as this R&D effort will open new doors in terms of access to imagery. Thus it could introduce an increase in effort, at least initially, but should ultimately result in a more accurate, useful product for maritime safety.
n. Improved performance of operations	Ability to transition from using aerial reconnaissance that is extremely weather-limited and risky to satellite reconnaissance. Very difficult to quantify the degree of improvement. It is expected that the R&D effort will result in a more confident overall identification of iceberg targets.
o. Improved decision-making	This project will help make the highest-stakes decisions on a daily basis for the International Ice Patrol by increasing analyst confidence in target detections and classifications. The level of confidence anticipated is currently reserved only for costly, risky aerial missions.
p. Other (added by Responder)	Improved access to classified data sources

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Appendix B: SMART-CS R&D Project Customer Satisfaction Feedback (CSF) Ratings Stakeholder Outreach and Data Processing

B.1. Email Requesting Participation in R&D Customer Satisfaction Feedback (CSF) Session

Hello [names of Operational Component/Transition Product Recipients],

My name is [name of Transition Branch TM], and I am a Transition Manager within the DHS S&T Directorate. I am a colleague of [name of S&T PM/RM/PfM], a [PM/RM/PfM] of S&T's [name of S&T group conducting the R&D project group. [S&T PM/RM/PfM] has provided your contact information in an effort to further discuss the [name of R&D project] sponsored by S&T and recently transitioned to [receiving entity/Operational Component].

DHS S&T developed a Customer Satisfaction Feedback (CSF) process in response to a Government Accountability Office (GAO) recommendation to collect and analyze feedback on R&D outcomes being conducted on behalf of the Components. The process is called SMART-CS, the Strategic Multi-Attribute Rating Technique for Customer Satisfaction. My Branch is conducting a Pilot of the CSF process for DHS S&T and request your assistance.

Your project feedback on the [name of R&D project] will be one of the first S&T projects to go through this recently approved CSF process. We would very much appreciate your review and candid feedback as we pilot the methodology, as it will be repeated for all S&T R&D projects moving forward.

The CSF Prep Sheet for stakeholders who will be participating in the SMART-CS elicitation session is attached. The desired actions needed are to please advise of your availability for a scheduled prep session followed by the online survey. The total time will not exceed 1 hour. During the prep session we will provide additional guidance and answer any questions and then you will be asked to proceed with the online survey. The preference is to hold one session with all of you together, but we can also break it up into two if schedules do not permit a single session.

Available times that our research team led by Dr. Isaac Maya can meet are:

[list available times/dates]

If these dates do not work, please advise of alternate dates/times convenient to you.

We look forward to working with you to make this CSF methodology a success for all of us. And thank you in advance for your assistance. Please do not hesitate to reach out if you have any questions in advance.

Best Regards,

[name of Transition Branch TM]

Transition Manager

Technology Scouting & Transition Division
Office of Science and Engineering
Science and Technology Directorate
U.S. Department of Homeland Security

B.2. R&D Customer Satisfaction Feedback (CSF) FAQ and Prep Sheet

1. What is the SMART-CS Customer Satisfaction Feedback (CSF) Survey?

The SMART-CS (**S**trategic **M**ultiattribute **R**ating **T**echnique of **C**ustomer **S**atisfaction) is a survey tool for collecting Component feedback on customer satisfaction with the outputs of S&T R&D projects. The SMART-CS methodology was developed specifically for S&T by the Center for Risk and Economic Analysis of Threats and Emergencies (CREATE), a DHS Center of Excellence (COE) at the University of Southern California (USC).

2. Why is This Necessary?

The collection of S&T R&D customer satisfaction feedback is a result of a Government Accountability Office (GAO) recommendation to "*develop standard processes and procedures for collecting and analyzing customer feedback, applicable to components conducting R&D, for improving the usefulness of existing customer feedback mechanisms to assess R&D efforts and for implementing such mechanisms where absent.*" Assessing and quantifying customer satisfaction feedback on R&D products is fundamentally different than obtaining feedback on consumer products, necessitating development of a CSF methodology specific to R&D.

3. How Does the SMART-CS Methodology Work?

SMART-CS combines a scientifically based multi-attribute evaluation methodology for evaluating R&D projects with an adaptation of the methodology used by the US Coast Guard to evaluate their R&D projects and conduct post-completing reviews. The multi-attribute feature consists of a Component's ratings of an R&D project and its products on several potential outcome criteria (attributes), which are weighted and aggregated into an overall CSF score of the R&D outcomes. The criteria are based on well-defined measures of an R&D project's potential benefits, such as reduced cost, improved performance, etc. The SMART-CS calculates a satisfaction score assuming successful (eventual) implementation and use. R&D projects are also scored on S&T's process criteria, such as 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.

4. How Does This Line-Up with the S&T Business Process Flow (BPF)?

SMART-CS was developed to seamlessly integrate with S&T's BPF 2.0. It 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).

5. If This is So Integrated with the BPF, Why is This the First I Hear of It?

FY22 is the first year of implementation, starting with five pilot surveys of FY21 projects.

6. What is Expected of Me?

Candid answers regarding your satisfaction with the R&D results provided by S&T. We value your input.

7. OK, How Do I Prep for This?

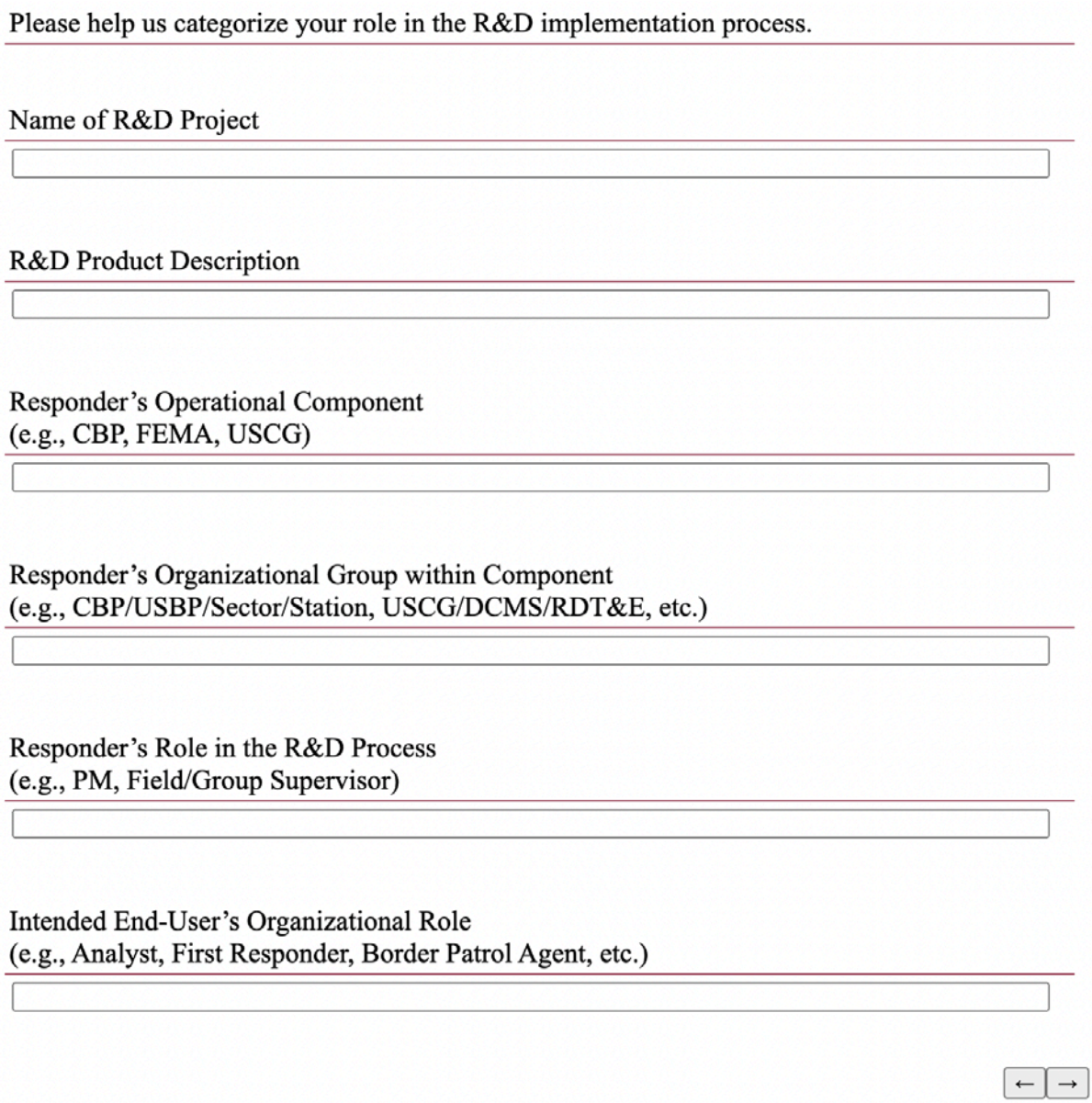
Stakeholder participants should have a working knowledge of the project domain and expected application of the project results in their organizations, including,

- Familiarity with the R&D project, the expectations on the output product, and the R&D results
- Familiarity with plans to use the R&D results, and a potential implementation plan

- Familiarity with the baseline process the R&D project was addressing, and identify the projected benefit/impact of the R&D project (e.g., cost savings, increased efficiencies, improved performance, etc.)
- Identify the baseline performance, i.e., the performance on cost and effectiveness criteria prior to implementing and using the results of the R&D project
- Determine, to the extent possible, the improvement in performance with the use of the R&D project (in percent values)

8. Screenshots of Survey Questions

The survey begins with a few basic information questions about the project and the stakeholder respondent to provide context. The actual survey questions are then provided in the following pages.



Question 1: This is the first question following the basic information questions. Throughout the survey, there are comment boxes for input not covered by the specific question. This input is welcome..

Is the R&D product currently in use?

- ○ No, the R&D project just ended last FY, and there has not yet been an opportunity to use it.
- ○ No, a prototype was provided to the intended end-user during the year for trial testing, and to provide feedback to the R&D team on functionality, issues, customizations, etc., but the prototype did not yet undergo formal Verification and Validation (V&V) acceptance testing.
- ○ Yes, an advanced prototype was delivered to the intended end-user, and it went so well that the latest prototype is on extended used. It is expected to undergo further V&V acceptance testing before the end-user decides if it will enter the acquisition and implementation processes.
- ○ Yes, a completed prototype was delivered to the intended end-user, the prototype passed V&V acceptance testing, and was acquired and implemented as part of a standard operating procedure (SOP). It is now being used routinely in the field.

Comments:

Question 2a: This is the next set of questions if the R&D output product is not in use, the more likely response for a recently completed R&D project. If the R&D output product is in use, the survey skips to Question 2b.

Why is the R&D product currently not in use? (R&D related reasons)

- ☐ R&D product's performance is not as applicable to the component as originally expected
- ☐ R&D is not making technical progress as originally expected
- ☐ R&D schedule delays have made product fall behind alternatives
- ☐ R&D product has too many current competitors already in the market
- ☐ R&D implementation or capital acquisition costs would be too high
- ☐ Other R&D-related reason

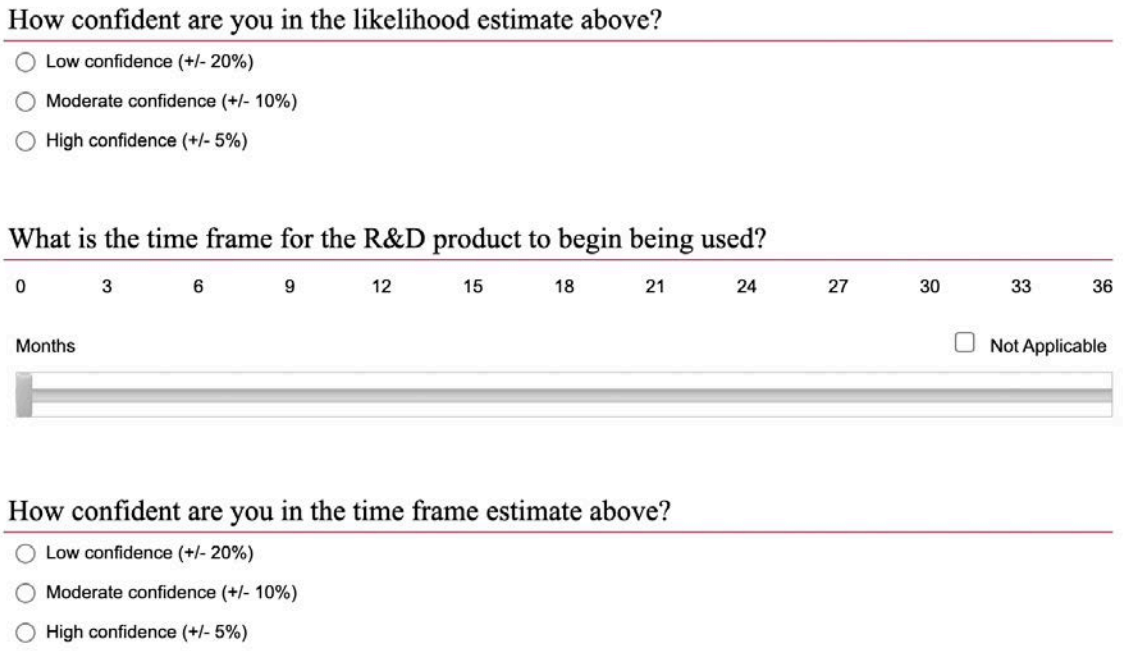
Why is the R&D product currently not in use? (Non-R&D related/Administrative reasons)

- ☐ Use of R&D product awaiting on S&T-level compliance, strategy or policy change/approval
- ☐ Use of R&D product awaiting component-level change/approval (e.g., integration into an approved operational procedure)
- ☐ R&D product requires component-level acquisition-related approvals or processes (e.g., product is in the acquisition pipeline)
- ☐ R&D product is no longer of interest to the component
- ☐ Other non-R&D related reason

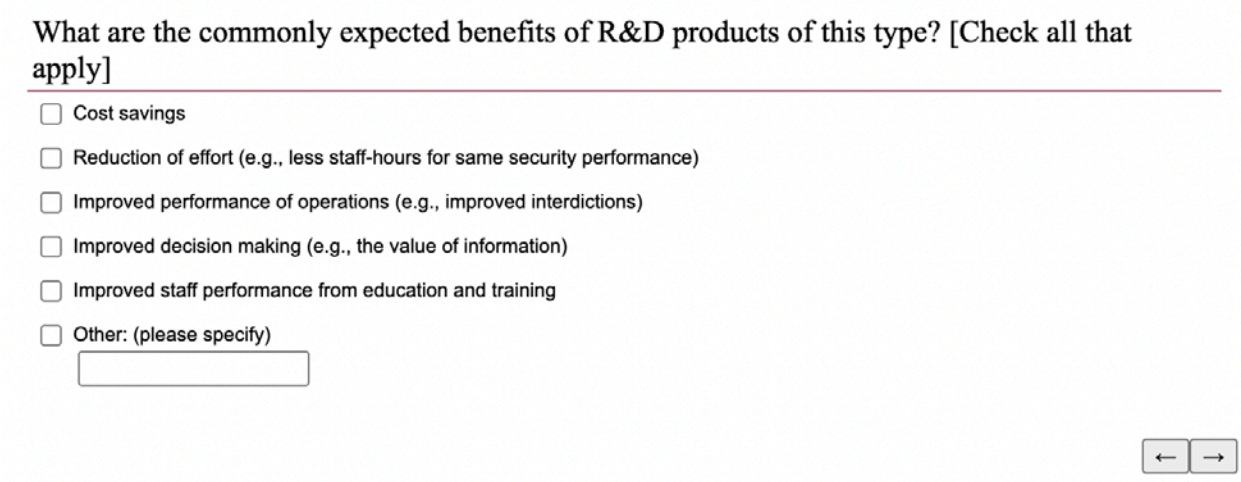
Likelihood of eventual use of the R&D product?

0 10 20 30 40 50 60 70 80 90 100

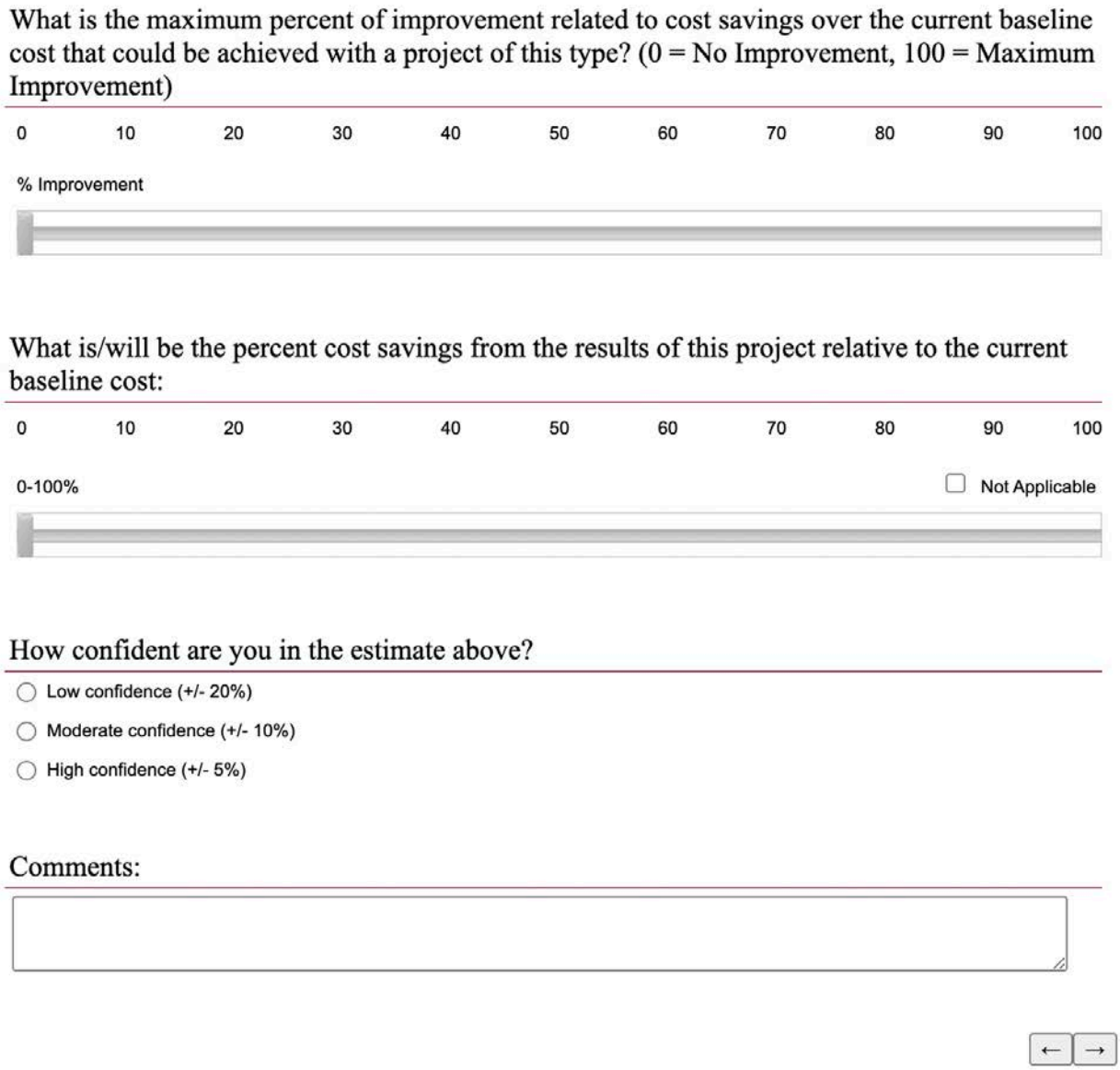
0-100% ☐ Not Applicable



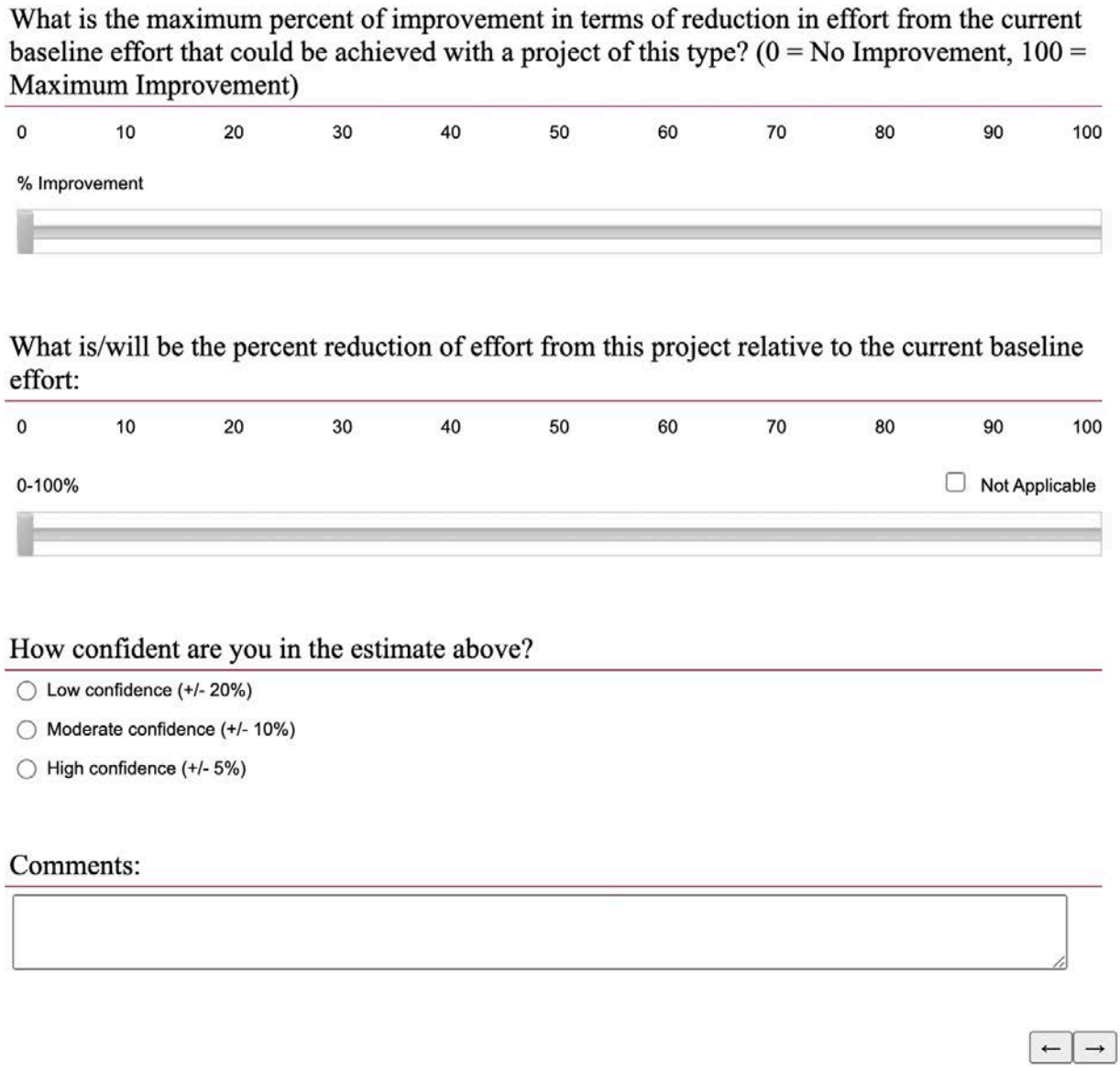
Question 2b: If the R&D output product is in use, the survey skips Question 2a, and goes right to this screen. The answer to this question is critical, as it selects the path for the next set of questions, whether the R&D output product is in use or not.



Question 3a: The next set of question relates to each option selected in the previous question, with that screen having offered the possibility of selecting up to 5 benefits relative to the current operational baseline. This is the screenshot for the Cost Savings benefit.



Question 3b: This is the question for the Reduction of Effort benefit.



Question 3c: This is the question for the Improved Performance of Operations.

What is the maximum percent of improvement relative to the current baseline performance of operations that could be achieved with a project of this type? (0=No Improvement, 100= Maximum Improvement)

0 10 20 30 40 50 60 70 80 90 100

% Improvement

What is/will be the percent improvement in the performance of operations from the results of this project relative to the current baseline performance:

0 10 20 30 40 50 60 70 80 90 100

0-100% ☐ Not Applicable

How confident are you in the estimate above?

- ○ Low confidence (+/- 20%)
- ○ Moderate confidence (+/- 10%)
- ○ High confidence (+/- 5%)

Comments:

← →

Question 3d: This is the question for the Improved Decision-Making/Value of Information benefit.

What is the greatest improvement in terms of decision making (value of information) that could be achieved with a project of this type?

- ◯ Useful for one-time, low-stakes decisions
- ◯ Useful for multiple low-stakes decisions
- ◯ Useful for one-time, high-stakes decisions
- ◯ Useful for multiple high-stakes decisions

What is/will be the degree of improvement of decision making (value of information) from the results of this project?

- ◯ Useful for one-time, low-stakes decisions
- ◯ Useful for multiple low-stakes decisions
- ◯ Useful for one-time, high-stakes decisions
- ◯ Useful for multiple high-stakes decisions

Comments:

Question 3e: This is the question for Improved Staff Performance from Education and Training.

What is the greatest improvement in terms of staff performance from education and training that could be achieved with a project of this type?

- ◯ Useful for a few staff members in moderately important areas
- ◯ Useful for many staff members in moderately important areas
- ◯ Useful for a few staff members in high important areas
- ◯ Useful for many staff members in high important areas

What is/will be the improvement of staff performance from education and training from the results of this project?

- ◯ Useful for a few staff members in moderately important areas
- ◯ Useful for many staff members in moderately important areas
- ◯ Useful for a few staff members in high important areas
- ◯ Useful for many staff members in high important areas

Comments:

Question 4: Please rank order the benefits of the R&D product in terms of their importance to your organization by moving the benefits around to match your estimated order of importance.

Please provide a rank ordering of the components below in terms of their relative importance for evaluating the TTKP project. Consider the feasible range designated previously for each component. For each component, the feasible range is defined as the difference between no improvement vs. the maximum improvement that could be achieved with a project of this type.

- Cost savings
- Reduction of effort (e.g., less staff-hours for same security performance)
- Improved performance of operations (e.g., improved interdictions)
- Improved decision making (e.g., the value of information)
- Improved staff performance from education and training
- Other: (please specify)

Comments:

Question 5: This is the final set of questions, and they relate to the R&D process, specifically, the funding level of the project, and the technical skills of the R&D performers. After this question, respondents are given the option to review their responses and make changes. Once they are satisfied with their responses they can submit.

How much do you agree with the following statements?

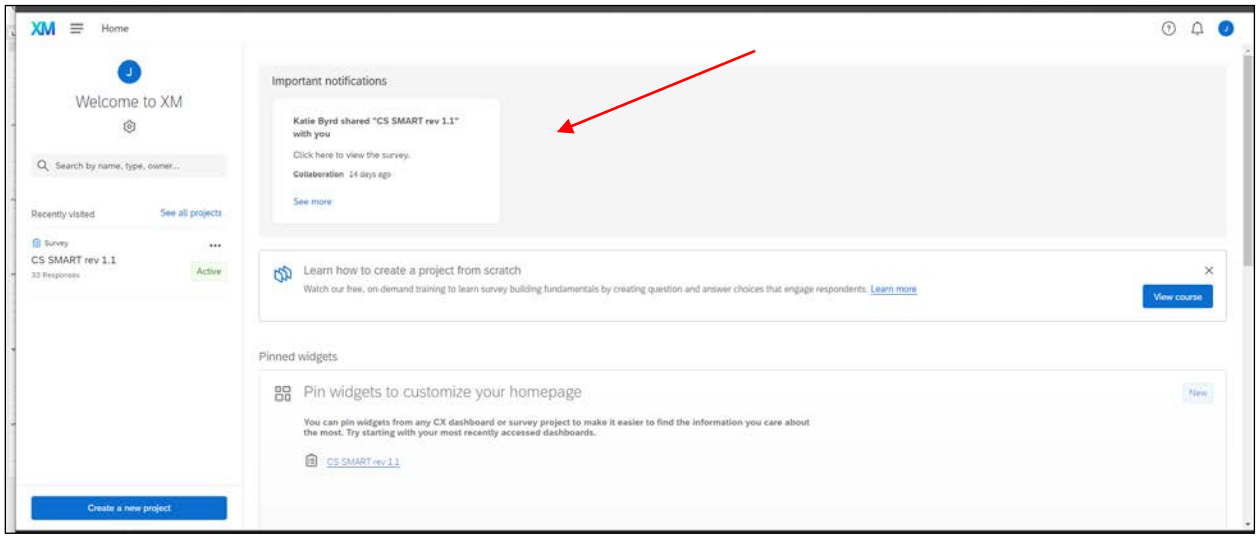
	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
The funding for this project is/was appropriate	○	○	○	○	○
The technical skills of the team developing the R&D product for this project are/were appropriate	○	○	○	○	○

B.3. Qualtrics Data Processing

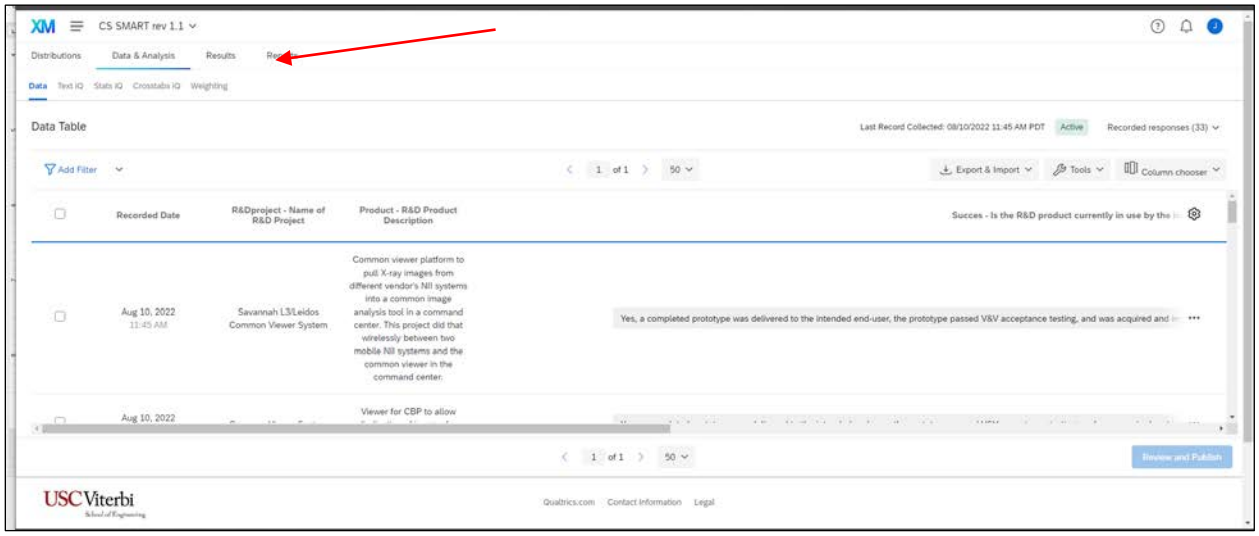
The Excel template provided under separate cover is used to download and paste the responses from Qualtrics, and process the data to the CSF rating information in report form. You will need to run a report for each separate project. So, for example, you have downloaded all responses and notice that there are 5 additional entries since the last report, but 3 of them are for Project A and 2 of them are for Project B. You will need to run responses through the template for Project A first and create a saved report, then start again with the responses for Project B. The template can accommodate up to three responses per project.

A. Downloading the Data from Qualtrics into CS-SMART Spreadsheet

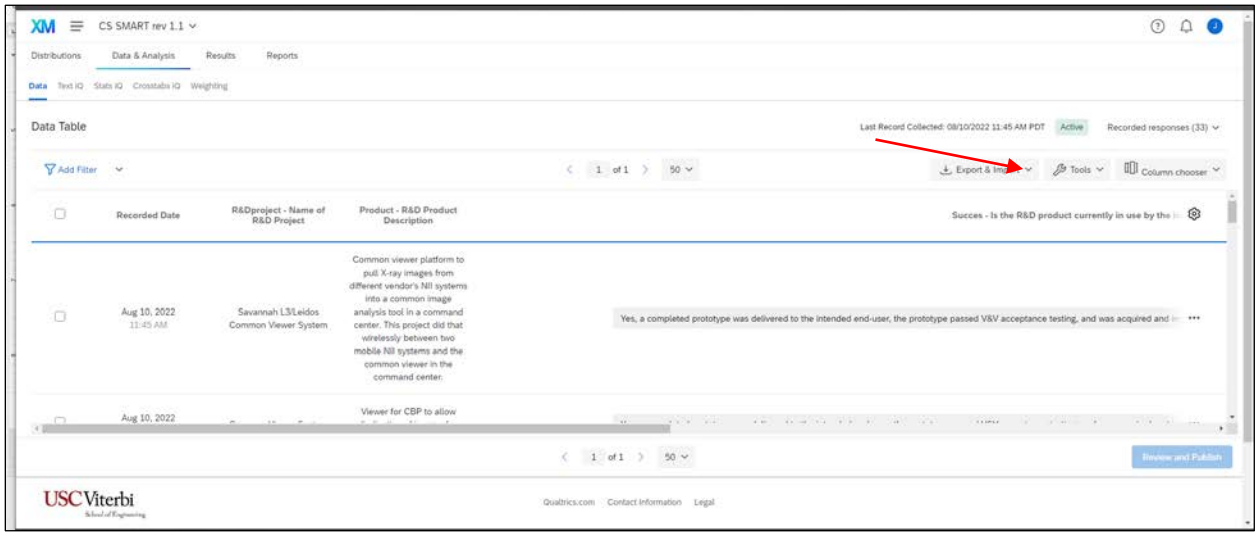
1. Open Qualtrics https://www.qualtrics.com/
2. In the center, select the data set "CS SMART rev 1.1"



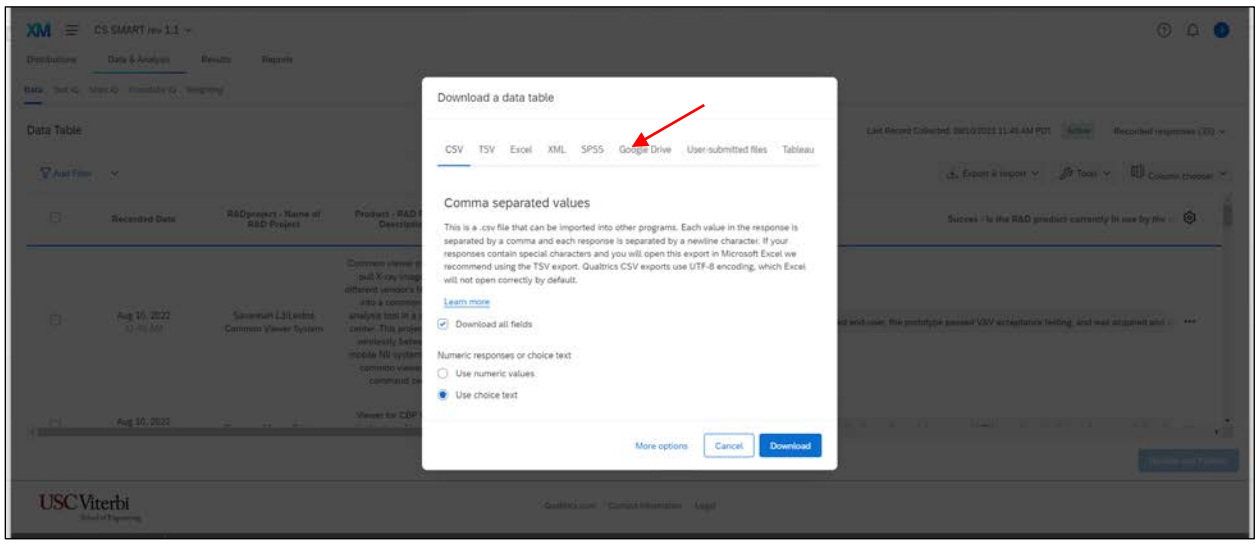
3. Go to the tabs at top and make sure you are looking at the "Data & Analysis" tab.



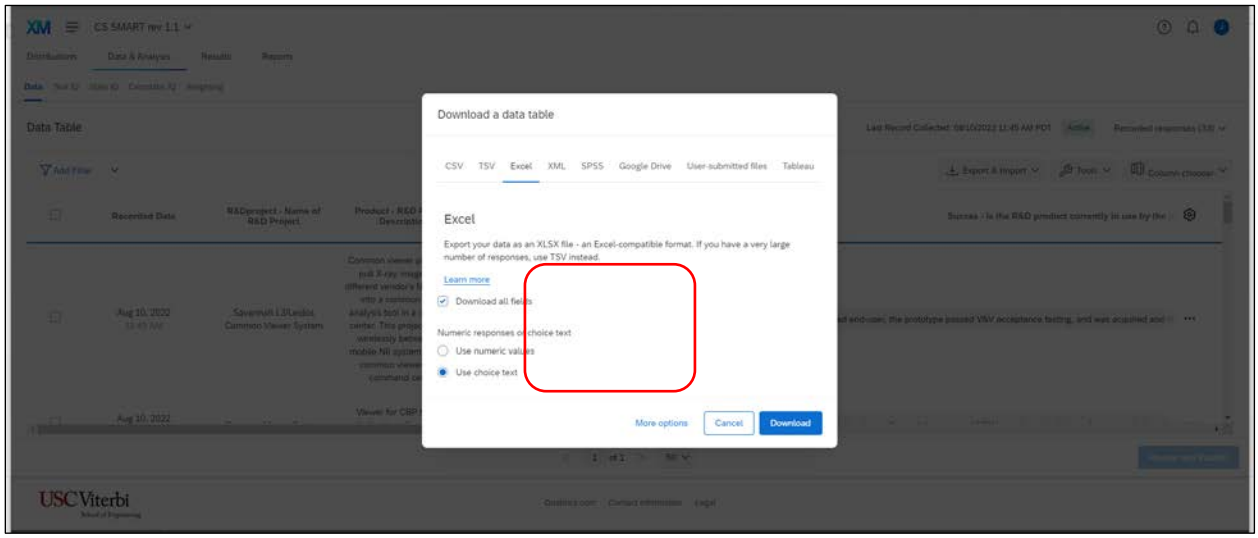
4. Above the table headers, you will see “Export & Import”. Click on that and select “Export Data”



5. In the pop-up window, you will see the default “CSV” option. Select the Excel option.



6. The Excel tab should look like this.



*Keep all defaults selected and click on "Download". Save a copy of this worksheet to your desktop.

B. Copy/Pasting Data into CSF Summaries Template

1. With the template provided, open both the CSF Summaries template and the downloaded worksheet from Qualtrics.
2. Go to the downloaded date file and find the responses related to the project being evaluated. These will be at the bottom of the sheet. Please note that the template only accommodates three rows of responses per project.
3. Select the rows related to the project (up to 3 rows) from the Qualtrics file then copy and paste them into the first tab of the template labeled "Raw Data Template" beginning in Row 3 and moving downward (Rows 1 and 2 are used as headers).
4. To ensure the correct rows were copied click on the tab "Clean Data Template" (tab 2) in the worksheet and check that C2:E2 correspond to the project. As noted above, you will have to run a separate report for each project. You can review additional information in this tab if you would like, but you should not need to touch anything.
5. Go to the "Calculations" (tab 3). As with tab 2, you can review, but you should not need to edit anything.
6. Go to the "Summary Sheet Template" (tab 4). All of the cleaned up data should show up there.
7. Save a copy of this tab as a separate file and review for any cases of "NA". Any "NA" response below row 23 should be removed. Check that only the values are copied over into the new tab and not linked to the original document. This will ensure that the formulas in the original tab from the template remain intact. Note: Make sure that just the values are copied and that the values are not still linked to the previous template because if they are still linked to the template there may be a problem if the template has been used again, or if someone trying to view the summary doesn't have the template.
8. This new worksheet should be saved. The data in the Excel spreadsheet eventually winds up in the Word template which is then converted to a pdf for distribution.