BTI Institute

Borders • Trade • Immigration

A Department of Homeland Security Center of Excellence

Program Year 5 Annual Report

Approved 2 December 2020

The Borders, Trade, and Immigration Institute

A Department of Homeland Security Center of Excellence
Led by the University of Houston

Thank You

This product, along with everything we do, is dedicated to the men and women of the United States Department of Homeland Security. We thank them for their tireless efforts to secure our Nation and safeguard our economic prosperity by facilitating lawful travel and trade.

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On the Cover: (clockwise from top left) o Tony Ambler, Ph.D., Director of BTI and Dean of the College of Technology University of Houston conducts an interview with a correspondent from KXAN Austin in reference to port security on 7 November 2019.
o Brian Harrell, Assistant Director for Infrastructure Security at the Cybersecurity and Infrastructure Security Agency, provides the opening keynote during the Port of the Future Conference at the University of Houston on 11 March 2020.
o Richard Willson, Ph.D., Research Committee member, oversees the kickoff meeting for the Department of Homeland Security Minority Serving Institution Summer Research Team on Zoom on 20 May 2020.
o The Director of Field Operations Houston visited the University of Houston Technology Bridge on 20 February 2020 to see a live demonstration of the "Exploring Homeland Security Applications for Unmanned Autonomous Systems" project.

Borders, Trade, and Immigration (BTI) Institute

A Department of Homeland Security Center of Excellence
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Program Year 5 Annual Report
01 July 2019 – 30 June 2020

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31 August 2020
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Contents

A. Executive Summary

This Annual Report of the Borders, Trade, and Immigration Institute covers the effort of the Management Team, Research Committee, and individual Principal Investigators over the Program Year 5 (PY5; 01 July 2019 – 30 June 2020).

This report summarizes PY5 activities in support of the BTI Institute's continuing mission to conduct research and develop educational curricula to support the men and women of the Department of Homeland Security in their efforts to secure our borders, facilitate legitimate trade and travel, and ensure the integrity of our immigration system. In keeping with the BTI Institute's strategic vision and recent focus in the thematic areas of trade, travel and immigration, the vast majority of PY5 activities pertain to research topics related to these themes.

During PY5, the BTI Institute Research portfolio included: fourteen active projects (four concluding in PY5, nine beginning during PY5, one carried over from PY4); five work plans; and five White Papers. The four concluded projects achieved all milestones and deliverables, including compilation of final project reports that were distributed to stakeholders across the Homeland Security Enterprise.

The BTI Institute Education portfolio included: a Curriculum Development project with two courses developed and available for The University of Houston students or Professional Certifications; 31 students enrolled in three course offerings in PY5; one course developed pending DHS approval; and a summer internship in Homeland Security designed for U.S. Coast Guard Academy cadets.

The team at BTI would like to take this opportunity to thank all DHS personnel for their tireless efforts to secure our nation and safeguard our economic prosperity by facilitating lawful travel and trade. We specifically would like to acknowledge the champions of our research projects and contributing stakeholders for their efforts in ensuring the research we oversee is valuable to the Homeland Security Enterprise.

B. Administration and Execution (A&E)

B.1. Effort Summary

The Administration and Execution line of effort encompasses the management processes the Institute utilized in organizing and executing the Institute's mission.

Management Team. The BTI Institute core personnel includes its Director, Executive Director and four full-time staff members whose effort is co-funded by financial resources from both the University of Houston (UH) and the Department of Homeland Security (DHS). UH contributes a significant amount of support for BTI in the form of salaries, equipment and facilities use. The following table lists the individuals who support the efforts of the BTI Institute.

			Funding	
NAME	**TITLE**	**UH DEPT**	**DHS**	**UH**
Amr Elnashai	Vice Chancellor	Research	No	Yes
Anthony Ambler	Director	Technology	Yes	Yes
Kurt Berens	Executive Director	Technology	Yes	Yes
Philip Boedeker	Manager, Communications	Technology	Yes	Yes

Abria Magee*	Manager, Research	Technology	Yes	Yes
Maura Pereira	Senior Researcher	Technology	Yes	Yes
Virginia Hernandez	Administrative Asst.	Technology	Yes	Yes
George Zouridakis	Chairman Research Comm	Technology	Yes	Yes
Richard Willson	Research Comm	Chemical Engineering	Yes	Yes
Elaine Liu	Research Comm	Economics	Yes	Yes
Luca Pollonini	Research Comm	Computer Engineering	Yes	Yes
David McMullen	Executive Director (DBA)	Technology	No	Yes
Suleyka Cruzalta	Business Administrator	Technology	No	Yes
Debbi Davis	Asst. Business Admin	Technology	No	Yes
Beverly Rymer	Executive Director	Research	No	Yes
Benjamin Mull	Director	Research	No	Yes
Grace Rosanes	Director	Research	No	Yes
Debborah Dowell	Research Administrator	Research	No	Yes
Jennifer Potocki	Research Administrator	Research	No	Yes
Douglas Williams	Financial Analyst	Research	No	Yes
Alicia Vargas	IRB Compliance Specialist	Research	No	Yes
Ha Nguyen	Research Accountant	Research	No	Yes

*A. Magee transferred to Research mid-PY6 and was employed with BTI from 01 July 2019-10 January 2020.

The Director of the BTI Institute is responsible for all activities and outputs of the Institute. Daily BTI Institute operations are managed by the Executive Director and responsibility for operational decision-making rests primarily with the Executive Director. Project execution is managed by the Executive Director with consultation from the Research Committee and overall guidance from the Director. BTI Institute budget and financial matters are managed by the Department Business Administrator in conjunction with staff from the Department of Research and coordinated by the BTI Executive Director.

External Advisory Board

The BTI Institute hosted a telephonic meeting with three members of the External Advisory Board on 4 February 2020. The BTI team provided an update on the current status of the Institute and reviewed the Institute's priorities and objectives. There was a discussion of who are BTI Institute's customers and how the Institute serves to support the Department of Homeland Security and its various components. Further, the Board discussed methods for need identification and solution development. This included operator identified needs that were then advocated by BTI to the appropriate headquarters element. Further, the Board noted that it was also their role to be an advocate of BTI to those headquarter elements as well. The attendees also discussed looking at the current research portfolio and seeing what outcomes and deliverables can be applied across other DHS components. The Board expressed concern that they were not being effectively utilized and collectively they encouraged increased interaction to maximize their potential value. The board convened with the intent of holding an in-person meeting towards the end of the program year.

The Board next convened on 3 June 2020 telephonically. The Director and Executive Director gave an update on the programmatic status of the Institute, including the Institute entering its sixth and final year under the cooperative agreement through DHS S&T OUP. The Executive Director gave an update on the following: 1) current research portfolio and curriculum development; 2) plans to utilize the Basic Order Agreement mechanism for additional projects; 3) strategy to engage future projects to solve problems at the nexus of the Trade and CBP. The Board was notified that no support was being offered for Board activities in PY6 as it was deemed by the OUP PM to be unnecessary. The Board ended

the meeting by officially dissolving as the EAB although each member expressed their desire and commitment in continuing to support BTI in its mission on an *ad hoc* basis.

B.2. Milestones, Deliverables, Performance Metrics

B.2.1. Milestones Table

ID	Description	Effort Period	Status
M.1	Submit work plans for projects selected by DHS	ongoing	5 Submitted
M.2	Negotiate work plan, budget and contract implementation for each project	ongoing	5 completed
M.3	Submit Quarterly Action Status update	Quarterly	Complete (18 Oct 2019)
M.4	Submit Annual Report	7/2019 + 60 days	Complete (narrative 14 Aug 2019; financial 30 Aug 2019)
M.5	Conduct Annual PI Meeting	6/2020	Complete with modification
M.6	Respond to Annual OUP Data Call	3/2020	Complete (12 Feb 2020)
M.7	Submit Draft Annual Work Plan & Incremental Funding Request	3/2020	Complete (30 March 2020)
M.8	Submit Revised Final Annual Work Plan and Budget to OUP	4/2020	Complete (28 May 2020)

B.2.2. Milestones Report

M1. Submit work plans for projects selected by DHS

During this reporting period, the following Work Plans were submitted to DHS for review and consideration:

"Borders of the Future," Andy Hines, University of Houston. The DHS CBP Office of Trade originally requested a future borders project. The BTI Institute reached out to the PI and requested development of a White Paper leading to a Work Plan during PY4. Through PY5, the project went through several rounds of review but was ultimately not supported by the project champion. The decision was made in September 2019 that the project should no longer be developed.

"DNA Assays for Determining Honey Origins: DNA Sequencing, PCR, and Filtered Honey Analysis," Richard Willson, University of Houston. The Work Plan for the project was carried over from PY4. The project work plan was approved on 31 January 2020 and the project was added to the PY5 BTI Research portfolio.

"A Retrospective Study on the U.S. Economic Effects of Raising the De Minimus Value Threshold," C. McDaniel, Senior Research Fellow, Trade Partnerships Worldwide, LLC. The Work Plan for the project was carried over from PY4. As of the

end of this reporting period, the Office of Trade, CBP and BTI Institute have determined to utilize a Basic Ordering Agreement as the project requires utilization of law-enforcement sensitive data.

“Promoting the Integration of Immigrants into Mainstream US Society Through Language Learning” Ferenc Bunta, University of Houston. In July 2019, the US Citizenship and Immigration Services (USCIS) requested a Work Plan be developed. The Work Plan was developed and as of the end of this reporting period is under review by USCIS.

“Criminal Organizations in the Northern Triangle and Their Effects on United States Security,” Carlos H. Pacheco. The White Paper was submitted during PY5. The Executive Director and PI traveled to San Antonio, TX to meet with Joint Task Force – West (JTF-W). The Director of JTF-W, and the Region Special Agent in Charge (SAC) for Immigration and Customs Enforcement (ICE), agreed to review a more fully developed project plan, i.e., a Work Plan. By the end of November, a Work Plan was drafted by the PI and submitted to the BTI Institute for review. In December, the revised draft work plan was submitted to the project champion. The project work plan was approved by the project champion on 27 March 2020, but funding was not available, and the project did not receive approval from OUP. As of the end of this reporting period, BTI was informed by the Project Champion that the project Work Plan was forwarded to the Criminal Investigation Network Analysis (CINA) Center of Excellence for consideration of funding.

M2. Negotiate work plan, budget and contract implementation for each project

OUP approved nine Work Plans during PY5. Four projects were from RFP 19-01: 1) “The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Northern Triangle Migrants,” Marcus Boyd, Ph.D., START; 2) “Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment,” Skye Cooley, Ph.D., Oklahoma State University; 3) Economic Motivations of Migrants at the Northern Triangle,” Detlof von Winterfeldt, Ph.D., USC CREATE; “Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States,” Andrew Selee, Ph.D., Migration Policy Institute. The other five were: : 1) “Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination,” Juan Villa, Texas A&M Transportation Institute; 2) “Tactical Mapping of Border Security Impacts: El Paso Sector,” Mayra Maldonado, the Hunt Institute, University of Texas at El Paso; 3) “DNA Assays for Determining Honey Origins: DNA Sequencing, PCR, and Filtered Honey Analysis,” Richard Willson, University of Houston; 4) “Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program, Andrew Farrelly, CT Strategies; and 5) “Addressing Cross Border E-commerce Challenges with Emerging Technologies,” Weidong Shi, University of Houston.

M3. Submit Quarterly Action Status update

In addition to the weekly phone calls between the Executive Director, BTI Institute, and the DHS S&T OUP Program Manager, the Institute submitted a status update at the end of the first quarter in PY5. The status update provided an overview of the current status of each line of effort and milestones. The update for PY5Q1 was submitted on 16 October 2019. These status updates were provided in the prior

program year to supplement the weekly, monthly and quarterly reporting between the Annual Report submission. Following the addition of the Semi-annual reporting requirement, no further quarterly updates were submitted.

M4. Submit Annual Report
The Program Year 4 Annual Report was submitted on 29 July 2019 to DHS S&T OUP. The BTI Institute then submitted a revised PY4 Annual Report on 24 August 2019, to include more details of the findings from the customer discovery efforts and synopsis of the proposals to address those findings. Additionally, the BTI Institute focused on detailing the actions and reports of the Research Committee as it related to research project management during PY4. A final copy was submitted to DHS OUP on 30 October 2019. On 9 December 2019, the Program Year 4 Annual Report was accepted and approved by DHS OUP.

M5. Conduct Annual COE Meeting
Due to precautions in light of COVID-19, the BTI Institute chose not to conduct the Annual PI meeting in person. As an alternative, BTI conducted individual meetings via teleconference. Standard quarterly meetings were conducted for those projects that were still ongoing. Final meetings were conducted for projects that concluded during PY5, and information for each meeting is provided below.

"Validating Deterrence Models for Scanning Technologies," with Principal Investigator George Thompson, ANSER Inc., was conducted on 5 MAY 2020 with the Project Champion & stakeholders from DHS Countering Weapons of Mass Destruction. A follow-on briefing was scheduled with DHS stakeholders from the Countering Weapons of Mass Destruction Office and Transportation Security Administration and occurred outside of this reporting period.

- "Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports," with Principal Investigators Ben Rohrbaugh and David Hansell, Lantern UAS LLC, was conducted on 6 MAY 2020 with the Project Champion and stakeholders from DHS Countering Weapons of Mass Destruction Office and CBP UAS. Observations from several briefings on this project with DHS stakeholders from CWMD Office and the following CBP components: UAS, OFO, CCS & CTPAT include:

    - Possibility of using drone-based thermal imaging to check freezer containers to identify narcotics smuggling as it is apparently common for criminals to remove the insulation in the container walls and replace it with narcotics, which should affect the heat signature.
    - Checking non-refrigerated containers for unusual temperatures to identify possible storage of biological weapons, which would need to be kept at a stable temperature which could be reflected in the surface temperature of the containers.
    - Possibility of testing neutron-detection on drone-based radiation detection systems.
    - Using this platform's cameras to identify the presence of plant pests on hard to reach maritime shipping containers making agricultural inspections more efficient.
    - Capturing images of seals on containers to check against manifests for containers that are not otherwise going to be searched.
    - Using drones to check train cars in situations where stationary NII is not available.
    - Using RFID devices on drones to identify containers and confirm the manifests.
    - Incorporating drones in the break bulk area at the port to scan cargo.

- Using drone-based radiation detection in situations, like at the Port of Philadelphia, where cargo moves through a populated area along a river channel before it arrives at the port and is scanned for radiation.
- Using drones to collect swipes from handles or vents of containers that can subsequently be analyzed in detail, especially when it would be dangerous for an officer to do so.
- Scanning float planes for radiation. When a float plane arrives across the northern border a pair of officers has to drive out, often several hours, to scan it by hand, and have trouble scanning the side facing the water. A system like the one developed in this project could potentially make this a much simpler process.

"Venezuela and Nicaragua: Regional Migration Crisis in the Making," with Principal Investigators Andrew Selee and Randy Capps, Migration Policy Institute, was conducted in combination with the Quarterly Meeting for "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States" on 7 MAY 2020 with of the Project Champion and stakeholders from DHS Office of Strategy, Policy, and Plans.

M6. Respond to Annual OUP Data Call
The BTI Institute responded to the Annual OUP Data Call on 12 February 2020. BTI reported delivery of code for five new software packages, 31 publications, two new courses developed, and 39 requests for assistance or advice from DHS for the calendar year 2019. The response is available as <BTI_Outputs_2019.xlsx>.

M7. Submit Draft Annual Work Plan & Incremental Funding Request
The BTI Institute submitted the draft Annual Work Plan and Incremental Funding request to OUP on 14 February 2020. Based on feedback from OUP, a revised draft Work Plan and funding request was submitted on 11 May 2020. A further revised Work Plan was submitted on 28 May 2020.

M8. Submit Revised Final Annual Work Plan and Budget to OUP
This revised final Annual Work Plan and Budget was submitted on 28 May 2020. The revised Work Plan was approved by OUP on 8 June 2020.

B.2.3 Deliverables Table

ID	Description	Effort Period	Status
D.1	BTI Annual Report	7/2019 + 60 days	Complete
D.2	Submit Draft Annual Work Plan	3/2020	Complete
D.3	Submit Revised Final Annual Work Plan	5/2020	Complete

B.2.4. Deliverables Report

D1. BTI Annual Report
The BTI Institute Program Year 4 Final Report was submitted to DHS OUP on 30 October 2019. The PY4 Annual Report was accepted and approved on 9 December 2019.

D2. Submit Draft Annual Work Plan
The initial draft Annual Work Plan and Incremental Funding request was submitted to OUP on 14 February 2020.

D3. Submit Revised Final Annual Work Plan
A revised Annual Work Plan and Incremental Funding request was submitted to OUP on 11 May 2020. A further revised Work Plan was submitted on 28 May 2020.

B.2.5 Performance Metrics Table

ID	Description	Quantitative Performance Measure	Effort Period	Status
P.1	BTI Institute establishes strong, effective dialogue with PM, OUP	Conduct customer survey	Biannual	Customer defined
P.2	Annual Report accurately and succinctly captures BTI activities for the program year 4.	Acceptance and approval by OUP PM	8/2019	Achieved
P.3	Approved FY6 work plan and budget	Approval by OUP PM	6/2020	Achieved
P.4	BTI Institute regularly and actively collaborates on initiatives and research with other DHS Centers of Excellence and Federal Research Laboratories	Three projects and/or initiatives in which BTI Institute collaborates with other COE and Federal Research laboratories	ongoing	Achieved

B.2.6. Performance Metrics Report

P1. BTI Institute establishes strong, effective dialogue with PM, OUP
Throughout this reporting period, the Executive Director had a standing, weekly telephonic update with the DHS S&T OUP PM. This telephonic update, in conjunction with a weekly outline sent to the PM, details the activities of the management team. Also participating in this phone call, pending availability, was the BTI Director and/or Research Committee Chair.

P2. Annual Report accurately and succinctly captures BTI activities for the program year 5
The PY5 Annual Report was written to align with the PY5 Work Plan. The Annual Report accounts for the efforts, milestones, deliverables, and performance under each line of effort that the BTI Institute management team undertakes (Administration and Execution, Research and Development, Education and Training, Outreach and Communication). The Annual Report also lays out a timeline of highlighted activities throughout Program Year 5. The BTI Institute Management team is confident that the PY5 Annual Report accurately and succinctly chronicles the BTI activities for PY5.

P3. Approved FY6 work plan and budget
The Program Year Six Work Plan and Incremental Funding Request was approved by OUP on 5 June 2020.

P4. BTI Institute regularly and actively collaborates on initiatives and research with other DHS Centers of Excellence and Federal Research Laboratories

BTI engaged with multiple Centers of Excellence during PY5.

In July 2019, BTI continued engagement with Randy “Church” Kee, Executive Director of ADAC, in co-developing Track One “Gray Zone Threats” for the 2019 COE Summit. This track required coordination with leadership from 6 COE’s including ADAC, CCICADA, CINA, CIRI, ALERT and START.

In August 2019, Fred Roberts, Director of CCICADA, reached out to the COE network to solicit interest in participating in a supply chain workshop, BTI expressed interest in participating and offered BTI’s recent projects in this area including "Secure and Transparent Cargo Supply Chain: Enabling Chain-of-Custody with Economical and Privacy Respecting Biometrics and Blockchain Technology" and "Transforming Trade and Ensuring Global Supply Chain Security with Blockchain and Smart Contracts" as potential case studies.

BTI was asked to participate in a proposed multi-COE project with CIRI and CINA to evaluate a new LIDAR-based facial recognition system. BTI agreed to participate but no further activity occurred as of the end of the reporting period.

BTI invited all the COE’s to submit research presentations to the Port of the Future Conference Research Showcase in March 2020. Participation/representation from the following nine COE’s included: ADAC, ALERT, BTI, CCICADA, CAOE, CIRI, CBTS, & START.

BTI had an introductory conversation with Henry Willis, Deputy Director of the Homeland Security Operational Analysis Center from the Rand Corporation about the possibility of collaborating on future projects. The project report from a previously conducted BTI study in collaboration with Ben Melamed was sent as case study material. No formal collaboration had been implemented as of the end of the reporting period.

The Executive Director and a member of the Research Committee met with the Laboratory Director of the Southwest Regional Science Center in Houston, TX on 14 February 2020. The Laboratory Director of the CBP Southwest Regional Science Center, along with members of the petroleum team, subsequently traveled to the University of Houston on 5 March 2020, to meet with faculty to discuss collaboration opportunities. Specific opportunities included the ability to “fingerprint” crude oil samples to identify country of origin. On 9 March 2020 two unique petroleum crude oil samples were provided to BTI by the CBP-LSS Southwest Regional Laboratory National Petroleum Chemist. Samples were transported immediately to the University of Houston Center for Petroleum Geochemistry for analysis. As of the end of the reporting period, the analyses were ongoing.

C. Research and Development (R&D)

C.1. Effort Summary

Research Committee Personnel. The BTI Institute Research Committee for this reporting period includes the following members (*denotes Chairman):

George Zouridakis, Ph.D.,* Associate Dean for Research & Graduate Studies, College of Technology;
Luca Pollonini, Ph.D., Assistant Professor, Engineering Technology;
Elaine Liu, Ph.D., Associate Professor, Department of Economics;
Richard Willson, Ph.D., Huffington-Woestemeyer Professor of Chemical and Biomolecular Engineering.

The BTI Manager, Research, had the primary responsibility for tracking milestones, deliverables, and performance metrics associated with the Research line of effort. The Manager coordinated and facilitated: project initiation meetings (Kick-Offs); Quarterly Meetings; agenda and meeting minutes for Research Committee meetings; drafts of written reports and memoranda of record for research progress reporting. Upon the resignation and departure of the Research Manager on 10 January 2020, these duties were divided between the Executive Director and the Manager of Communications and Outreach while a search for a replacement was initiated. Due to lack of suitable candidates and due to interviewing/hiring constraints imposed by COVID-19, no replacement had been identified as of the end of the reporting period. Two primary duties assigned to the Research Manager per the Work Plan included coordination of Research Committee Workflow and organizing and leading project quarterly meetings with PI and DHS Project Champion. These duties, including their associated milestones and deliverables, were significantly impacted by the position being vacated. While the projects themselves were not negatively impacted by the departure, the management timelines of the Institute were made less efficient, e.g., detailed tracking of Research Committee workflow and some delays in scheduling Kickoff and Quarterly meetings.

Overview of Research Portfolio

The following projects were carried over from Program Year 4 and concluded in Program Year 5:

- "Transforming Trade and Ensuring Global Supply Chain Security with Blockchain and Smart Contracts," Larry Shi, University of Houston, Eleftherios Iakovou, Ph.D., Texas A&M
- "EDGE: The 'Eye in the Woods' Image-based Human Detection and Recognition System: Phase II," Ioannis Kakadiaris, University of Houston
- "Validating Deterrence Models for Scanning Technologies," George Thompson, ANSER
- "Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports," Ben Rohrbaugh, Lantern UAS
- "Venezuela and Nicaragua: Regional Migration Crisis in the Making," Andrew Selee, and Randy Capps, Migration Policy Institute

The following projects began during Program Year 5:

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," Juan Villa, Texas A&M Transportation Institute
- "Tactical Mapping of Border Security Impacts: El Paso Sector," Mayra Maldonado, Hunt Institute, University of Texas at El Paso
- "DNA Assays for Determining Honey Origins: DNA Sequencing, PCR, and Filtered Honey Analysis," Richard Willson, University of Houston
- "Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program," Andrew Farrelly, CT Strategies
- "Addressing Cross Border E-commerce Challenges with Emerging Technologies", Weidong "Larry" Shi, University of Houston

The following projects are RFP 19-01 projects that began in PY5 with work plans carried over from PY4:

- "Mexican and Northern Triangle Perspectives on Mass Migration: Strategic Narrative and the Assessment of Common-Good Action," Skye Cooley, Oklahoma State University, Robert Hinck, Monmouth College, Asya Cooley, OK State, Sara Kitsch, Monmouth College
- "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States," Andrew Selee, Migration Policy Institute
- "Economic Motivations of Migrants from the Northern Triangle," Detlof von Winterfeldt, University of Southern California and Director of the Center on Risk and Economic Analysis of Terrorism Events (CREATE), Jonathan Eyer, University of Southern California
- "The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Facilitate the Southern Flow of Northern Triangle Immigrants," Marcus Boyd, University of Maryland College Park (UMCP), Barnett Koven, National Consortium for the Study of Terrorism and Responses to Terrorism, Kathryn Lindquist, University of Maryland

The following are Work Plans that were under development carried over from Program Year 4:

- "A Retrospective Study on the U.S. Economic Effects of Raising the De Minimus Value Threshold," Christine McDaniel, Senior Research Fellow, MacroDyn Group
- "Evaluation of Face Recognition Performance in Understudied Populations: Minors Through the Aging Cycle," Ioannis Kakadiaris, University of Houston
- "Borders of the Future," Andy Hines, University of Houston

The following is a White Paper carried over from PY4:

- "Understanding, Assessing and Addressing Risk Factors and Protective Factors in Suicide Prevention Strategies in Complex Workplace Environments," Lisa Sullivan, President, INFUSE Corporation and Director, Texas Suicide Prevention Council

The following project was a White Paper received in PY4 and developed into Work Plan in PY5:

- "Promoting the Integration of Immigrants into Mainstream US Society Through Language Learning", Ferenc Bunta, University of Houston

The following project was a White Paper received in PY5 and developed into a Work Plan in PY5:

- "Criminal Organizations in the Northern Triangle and Their Effects on United States Security," Carlos Pacheco, Felade, San Juan, Costa Rica

The following were White Papers received in PY5:

- "Parenting within the Context of Migration: The Role of Parent Decision Making to Shepherd Children Across the U.S. Mexico Border," Mark Trahan, Beatrize Aldana Marquez, Texas State University
- "Standoff Detection of Opioids," Ali Passian, University of Tennessee
- "Adaptation of Methods Used in 'Operation Drawbridge' for Use in the Northern Border Environment," Joe Aud, Lean Tail Labs, LLC
- "Movement Detection near US Borders Using Cost-Efficient Long-Distance WiFi," Ahmed Abdelhadi, and Kamran Nishat, University of Houston

C.2. Milestones, Deliverables, Performance Metrics

C.2.1. Milestones Table

ID	Description	Effort Period	Status
M.1	Conduct kick-Off Meetings for new projects	Within 1st month of project budget start	9 Kick-off meetings conducted
M.2	Review and provide recommendations on White Papers submitted to BTI and make necessary edits prior to submission for DHS routing via OUP	Within 30 days of receipt	4 White Papers reviewed & edited
M.3	Distribute DHS feedback to White Paper author(s). If interest, work with PI to develop a work plan for submission to OUP.	Ongoing	Ongoing

M.4	Review draft work plans for new projects	Ongoing	2 Draft Work plans reviewed & edited
M.5	Work Plan Approval by OUP	Ongoing	9 approved Work Plans in reporting period
M.6	Completion of Kick-Off Meetings for Projects Approved by DHS	Within 1st month of project budget start	9 Kick-off meetings conducted
M.7	Conduct quarterly teleconference with each PI and the project Champion	Ongoing	21 conducted in PY5
M.8	Review each PI's project monthly report	Monthly	Complete
M.9	Review updated work plans for Y6 for continuing projects	March 2020	Complete
M.10	Issue Request for Proposals for Y6 projects	April 2020	Not Applicable

C.2.2. Milestones Report

M1. Conduct Kick-off meetings for new projects

During PY5, the following projects had a kick-off meeting:

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," 2 August 2019.

  The Project team held their kick-off meeting on 2 August 2019. Attendees included the project team (Juan Carlos Villa, Justin Malnar, Carlos Silva and Swapnil Samant), BTI Management (Kurt Berens, Abria Magee), the BTI Research Committee (George Zouridakis and Richard Willson), CBP Office of Field Operations, and DHS OUP. The purpose of this meeting was to review the approved project work plan and ensure it was aligned to the Champion's needs. All data collected for this project was entered into the CBP Border Wait Times (BWT) website in real-time. There is a similar project occurring at the northern border and TTI will be involved in sharing best practices and lessons learned.

- "Tactical Mapping of Border Security Impacts: El Paso Sector," 06 November 2019

  The Project team held their kick-off meeting on 15 November 2019. Attendees included the project team (Mayra Maldonado, Roberto Ransom, Rafael Perez, Jose Angel, Rafael Pena, Adriel Moreno), BTI Management (Kurt Berens, Abria Magee), BTI Research Committee (Elaine Liu, Richard Willson, Luca Pollonini), and US Border Patrol. The purpose of the meeting was to review the approved project work plan and ensure it still aligned with the Champion's needs. The research team discussed the purpose and objectives of the project. The Champion mentioned desiring to review the data as it is being collected to ensure

there are no gaps. The Champion also mentioned to review the US Border Patrol strategy that had just been released to ensure the project conforms to the overall strategy of Border Patrol.

- "Economic Motivations of Migrants from the Northern Triangle," 08 January 2020.

  The Project team held their kick-off meeting on 17 January 2020. Attendees included the project team (Detlof von Winterfeldt; Jonathan Eyer; Bryan Roberts), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis; Richard Willson, Elaine Lui, Luca Pollonini), DHS OUP, and DHS Office of Policy, Strategy, and Plans. The Project team introduced themselves and stated that the goal of the project is to identify characteristics and motivations specifically related to improving economic lives and family reunion. In order to best derive an economic motivation for migration, the research team will look at the changing economic environment and identify the migrants that would be responsive to said change. The team discussed their data sources and the areas where they intend to take a deeper dive through case studies. In response to a question from the BTI Research Committee Chair, the Project team stated that the data source they are using will produce a large number of useable variables that will be consolidated and presented as four high level variables, with two or three subset variables on each.

- "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States," 15 January 2020

  The Project team held their kick-off meeting on 27 January 2020. Attendees included the project team (Andrew Selee, Randy Capps, Ariel Ruiz Soto, Jessica Bolter, Andrea Tanco), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (Luca Pollonini), DHS OUP, and DHS Office of Policy, Strategy, and Plans. The PI team discussed the work plan and objectives of the project. The PI mentioned the addition of Costa Rica and Panama due to the significant migrant flows those countries had experienced. The project evaluated the absorptive capacity of countries around the Northern Triangle at managing migration. This included the legal framework those countries operate under as well as the ability to distinguish capacity native to that countries resources versus those provided by the U.S. government. Additionally, based on a question by the Champion, the PI mentioned that, while data from DHS would be beneficial and more up to date than publicly available data, the PI had not built the work plan with DHS data sources solely in mind.

- "Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Facilitate the Southern Flow of Northern Triangle Immigrants," 10 January 2020

  The Project team held their kick-off meeting on 27 January 2020. Attendees included the project team (Marcus Boyd; Barnett Koven, Katy Lindquist), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis, Luca Pollonini), DHS OUP, and DHS Office of Policy, Strategy, and Plans. The Project team stated that the project will look at the absorptive capacity of Panama and Costa Rica to understand what short term and long-term

strategies can help increase capacity and reduce Northern migration. The Project team combined quantitative deskwork reviews of existing open source data with qualitative fieldwork derived from in person interviews. At the time of the kick-off meeting, the project has already reached Milestone 1 (IRB approval). The Project team also stated they intended to hold monthly stakeholder meetings in order to remain engaged with and responsive to stakeholders.

- "Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment," 30 January 2020

  The Project team held their kick-off meeting on 14 February 2020. Attendees included the project team (Skye Cooley, Robert Hinck, Asya Cooley, Sara Kitsch, Ethan Sample), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis, Elaine Liu, Luca Pollonini), DHS OUP, and DHS Office of Policy, Strategy, and Plans. During the meeting, the Project team presented an overview of what narrative imaging is, to include how the brain makes sense of things it perceives. The Project team stated they believe that a narrative approach would add greater context to the data that DHS is already collecting. This will give a comprehensive perspective on migration, particularly, the narrative around migration from the Northern Triangle.

  In response to a question from the Champion related to the development of a lexicon, the Project team stated that they would create a database and user-response system that would provide the lexicon.

- "DNA Assays for Determining Honey Origins," 31 January 2020

  The Project team held their kick-off meeting on 21 February 2020. Attendees included the project team (Richard Willson, Aniko Sabo, Katerina Kourentzi, Dimple Chavan, Suman Nandy), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis, Elaine Liu, Luca Pollonini), DHS OUP, and CBP Laboratories and Science Services. The Project team presented an overview of the honey-sample collection plan as well as discussed, the scientific process within each task of the work plan. The Project team also reported that, as of the date of the kick-off meeting, Task 3 (Development of Pollen Purification and DNA Sample Preparation) was near completion.

  Per requests from the Champion and the DHS S&T OUP Program Manager, the PI agreed to produce a test plan as well as work closely with the CBP labs in order to ensure that testing procedures and methodologies comport with how the government conducts their testing.

- "Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program," 10 March 2020

  The Project team held their kick-off meeting on 19 March 2020. Attendees included the project team (Andrew Farrelly, Brett Laduzinsky), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis, Elaine Liu, Luca Pollonini, Richard Willson), DHS OUP, and CTPAT. The Project team presented the primary goals and objectives of the research project. The PI

stated that the team wanted to ensure they are delivering a quality product that is useful to CTPAT. They wanted to ensure that they were going to provide the CTPAT leadership something that was valuable to their organization. The ultimate objective of the project is to provide the benefit vs cost as to why industry should participate in the CTPAT program. This project is also a good opportunity to discuss metrics (current or new) to improve how CTPAT assesses their own success. In discussion of data, there was acknowledgement by all parties involved that quality data was critical to success of the project, including access to CTPAT data and CTPAT team members.

In discussion with the Champion and Research Committee, the value of the surveying CTPAT employees directly was viewed as being critical to adequately assess needs to map viable solutions. Further, in discussion of the data, the Project team stated that based on the analytical findings actionable recommendations would be provided for consideration by the Project Champion.

- "Addressing Cross Border E-Commerce Challenges with Emerging Technologies," 01 April 2020.

  The Project team held their kick-off meeting on 14 April 2020. Attendees included the project team (Larry Shi, Christine McDaniel, Vincent Iacopella), BTI Management (Kurt Berens, Philip Boedeker), BTI Research Committee (George Zouridakis, Elaine Liu, Luca Pollonini, Richard Willson), DHS S&T OUP, and Office of Trade. The Project team discussed the goals and objectives of the project. The primary goal is to investigate and explore potentials of emerging technologies such as distributed ledgers and artificial intelligence for addressing the e-commerce challenges that CBP and the global e-commerce stakeholders are facing.

M2. Review and provide recommendations on White Papers submitted to BTI and make necessary edits prior to submission for DHS routing via OUP

White Papers submitted to the BTI Institute were reviewed by the management team and research committee. Recommendations and edits were returned to the authors for further refinement before being submitted to DHS via OUP. The following White Papers were submitted to the BTI Institute in this reporting period:

- "Parenting Within the Context of Migration: The Role of Parent Decision Making to Shepherd Children Across the U.S. Mexico Border" from Mark Trahan and Beatriz Marquez at Texas State University, received 16 October 2019. The Research Committee reviewed the White Paper, and overall, the committee determined they would like to move the White Paper forward to DHS after certain comments were addressed, including; 1) include the "how" and "where" of the data collection process, 2) the feasibility of the project being completed in one year, 3) how will the subjects be contacted and persuaded to cooperate, 4) what is the best outcome? Specific triggers for leaving, and 5) define self-efficacy. Comments and recommendations were provided to the PIs on 25 October 2019.

- "Stand-off Detection of Opioids" from Ali Passian at University of Tennessee, received 27 August 2019. The Research Committee reviewed the White Paper and determined they would like to move the White Paper forward to DHS after certain comments were addressed, including: 1) provide more detail surrounding

performance metrics, 2) provide more specifics about quantitative aspects of expected performance, and 3) include research methods of the subsequent sections. The comments and recommendations were provided to the PI on 27 August 2019. The White Paper was submitted to Opioid Detection Challenge Program Lead, Amy Schapiro, on 27 August 2019. On 02 October 2019 BTI received notification from the OUP PM that OUP received a formal "no interest" in the white paper from the DHS S&T portfolio manager overseeing the opioid detection challenge.

- "Adaptation of Methods Used in 'Operation Drawbridge' for use in the Northern Border Environment", from Joel Aud at Lean Tail Labs, LLC, received 25 July 2019. The Research Committee reviewed the White Paper and requested additional information and further comments be addressed. A few comments were 1) need to provide detailed performance metrics that allow DHS to determine the impact of deliverables, 2) explain the unique challenges of the Northern Border in relation to the Southern Border, and 3) how easy is it to implement the "human only" detection algorithm? The BTI Research Committee and BTI Management could not reach consensus on whether or not to submit the White Paper and remained on hold as of the end of the reporting period. Comments and recommendations were provided to the PI on 5 August 2019.

- "Movement Detection near US Borders Using Cost-Efficient Long-Distance WiFi," from Ahmed Abdelhadi and Kamran Nishat was received on 8 June 2020. The Research Committee reviewed the White Paper and had a few comments including 1) refine and define the benefit of their solution compared to alternate ones, 2) start with a lay approach to better inform a reader that may not understand the technical aspects of the project, 3) state where the training data for the AI will come from, and 4) create a better defined budget. The comments were given to the principal investigator on 24 June 2020.

M3. Distribute DHS feedback to White Paper author(s). If interest, work with PI to develop a work plan for submission to OUP.
The following White Papers were developed into Work Plans during this reporting period:

- "Criminal Organizations in the Northern Triangle and Their Effects on United States Security", PI Carlos Pacheco. At the request of the Director of Joint Task Force – West, the White Paper was developed into a Work Plan and submitted to the BTI Institute at the end of November 2019. On 18 May 2020 the BTI Executive Director was notified by the Project Champion's designee that OUP was no longer considering providing funding for the project via BTI. The Project Champion's designee sent the work plan to CINA for consideration in PY6.

- "Promoting the Integration of Immigrants into Mainstream U.S. Society through Language Learning", PI Ferenc Bunta. The Work Plan was provided to the Research Committee for review on 9 July 2019. The Research Committee approved the Work Plan pending the clarification of 1) temporal sequence, and 2) funding requirements for foreign travel. The Work Plan was also sent to an external reviewer. As of the end of this reporting period, the Work Plan remains under review with Project Champion at USCIS.

M4. Review draft work plans for new projects.
The following Work Plans were iteratively reviewed by the BTI Institute Management team and Research Committee:

- "Addressing Cross Border E-commerce Challenges with Emerging Technologies", PI Weidong "Larry" Shi. This project investigated and explored the potential of emerging technologies such as distributed ledgers, machine learning, and Internet of Things, for addressing E-commerce challenges faced by CBP and global E-commerce stakeholders. A draft Work Plan was submitted to the Research Committee to review on 10 December 2019. On 12 December 2019, the Research Committee approved the Work Plan for submission to the Project Champion. The Work Plan was approved on 01 April 2020 and a Kick-Off meeting was held 14 April 2020.

- "Promoting the Integration of Immigrants into Mainstream US Society Through Language Learning," PI Ferenc Bunta. The Work Plan was provided to the Research Committee for review on 9 July 2019. The Research Committee approved the Work Plan pending the clarification of 1) temporal sequence, and 2) funding requirements for foreign travel. The Work Plan was also sent to an external reviewer. The work plan has been under review with USCIS and continues to be modified based on feedback and user need.

Project work plans were developed from the following four proposals submitted to RFP-019:

- "Mexican and Northern Triangle Perspectives on Mass Migration: Strategic Narrative and the Assessment of Common-Good Action," PI Skye Cooley

- "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States," PI Andrew Selee

- "Economic Motivations of Migrants from the Northern Triangle," PI Detlof von Winterfeldt

- "The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Facilitate the Southern Flow of Northern Triangle Immigrants," PI Marcus Boyd

All four project work plans were approved by the Project Champions and each project held its respective kick-off meeting during PY5.

M5. Work Plan approval by OUP
Nine Work Plans were approved by OUP in this reporting period. Those projects were:

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," PI Juan Villa. The "Wait Times" Work Plan was approved on 24 July 2019. The main goals of the research project are to improve the border crossing wait time measuring system and analyze emerging technologies to strengthen the system capabilities to provide accurate crossing

times for commercial vehicles and personally operated vehicles. Specific objectives include 1) Analyze current system operation and maintenance practices, 2) finalize installation of RFID equipment at Otay Mesa border crossings, 3) identify improvements to POV border wait time measurement, 4) research emerging technologies for dynamic vehicle wait time reporting, and 5) overhaul the current border wait time measurement system software. The Project Champion is a Program Manager for Office of Field Operations, US Customs and Border Protection.

- "Tactical Mapping of Border Security Impacts: El Paso Sector," PI Mayra Maldonado. The "Tactical Mapping" Work Plan was approved on 6 November 2019. The practical benefit of the tool and economic impact analysis is to strengthen the ability of CPB and USBP to understand comprehensively the nature of the impact that border security deployments have had and could have in the future in order to optimize resource allocation and its risk mitigation efforts. Specific objectives are 1) a tactical mapping of historical social, demographic, and economic indicators against historical border security deployments, namely physical and technological infrastructure, personnel deployments, and regulatory change in the El Paso Sector border counties, for all years where data is available, and 2) a forward-looking economic impact analysis for future potential border security measures based on historical CBP resource deployments for the El Paso Sector border counties. The Project Champion is an Assistant Chief in the U.S. Border Patrol.

- "Economic Motivations of Migrants from the Northern Triangle," PI Detlof von Winterfeldt, USC CREATE. The research looks to ways to promote strong economic institutions in Northern Triangle countries in order to reduce illegal migration flows. To accomplish this, the project has three core components. The first, is an analysis of the characteristics of actual and potential migrants in terms of where they live, what their economic situation is, and the degree to which economic motivations cause them to want to emigrate. The second core component is development of a graphical-interface tool that will allow users to project changes in migrations from the Northern Triangle based on assumptions about the impact of U.S. policies on local economic and security conditions in the Northern Triangle. The third core component includes an assessment of historical evidence on policies that have affected emigration flows from the Northern Triangle, Puerto Rico, and Mexico to the U.S. The DHS Project Champion is from the Office of Strategy, Policy and Plans.

- "Developing A Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States," PI Andrew Selee, Migration Policy Institute. Through extensive interviewing of government and non-government leaders, the Project team is assessing: the institutional and policy capacity of Guatemala, El Salvador, Honduras, Costa Rica, and Panama to implement current agreements; their ability to strengthen their institutional structures to deal with migration flows, potentially provide asylum, and reintegrate repatriated migrants; and other potential options for regional cooperation in managing migration effectively. The Project team is also mapping migration flows from Central America and from countries outside the region. They will use publicly available datasets, supplemented by qualitative interviews in Central American countries, to construct a more detailed map of primary

sending regions and how these have shifted between 2014 and 2019. The DHS Project Champion is from the Office of Strategy, Policy and Plans.

- "Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Facilitate the Southern Flow of Northern Triangle Immigrants," PI Marcus Boyd, University of Maryland. The project is evaluating the rate at which Northern Triangle (and other) migrants choose to emigrate south as opposed to north. The DHS Project Champion is from the Office of Strategy, Policy and Plans.

- "Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment," PI Skye Cooley, Oklahoma State University. This project is developing a comprehensive perspective on migration coming from the Northern Triangle by examining the last 20 years of related Salvadoran, Honduran, Guatemalan, Mexican and US news media and by conducting field interviews and focus groups with relevant stakeholders in locations near the Mexico-Guatemala and US-Mexico borders. The Project expands upon a developing theory of strategic narrative that utilizes narrative as a tool to identify points of common concern, preferred solutions, and value standards mitigating competing interests relevant to Northern Triangle migration. In addition, this project is compiling and evaluating literature and proposals concerning effective comprehensive approaches to migration management including migrant worker programs, workforce and vocational training, assisted voluntary return and reintegration programs, and migrant educational programs. The DHS Project Champion is from the Office of Strategy, Policy and Plans.

- "DNA Assays for Determining Honey Origins," PI Richard Willson, University of Houston. This project is developing a means to identify honey countries of origin (especially India and China to start) using the DNA in pollen, and DNA dissolved in filtered honey. The DHS Project Champion is from Customs and Border Protection Laboratories and Scientific Services.
- "Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program," PI Andrew Farrelly, CT Strategies. The Project team is collecting the necessary data to identify the CTPAT trouble areas and provide recommendations for how to improve the program through staffing, policy and messaging. In addition, the project is identifying a return on investment in CTPAT, e.g., supply chain security specialist workload and use of time, as well as identify the most beneficial attributes for Trade partners. The DHS Project Champion is from the Customs Trade Partnership Against Terrorism (CTPAT).

- "Addressing Cross Border E-Commerce Challenges with Emerging Technologies," PI Weidong (Larry) Shi, University of Houston. This study is examining how CBP could re-engineer the entry process to close the loopholes created by the higher de minimis threshold, ensure incoming e-commerce imports meet product and safety standards, are not counterfeit, and comply with US trade policy. The project tasks include: investigate and explore potentials of emerging technologies such as distributed ledgers, artificial intelligence, and machine learning for addressing the e-commerce challenges that CBP and the global e-commerce stakeholders are faced with. The DHS Project Champion is from the Office of Trade, Business Transformation and Innovation Division.

M6. Completion of Kick-off meetings for projects approved by DHS
Nine projects held kick-off meetings during PY5:

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," 2 August 2019.

- "Tactical Mapping of Border Security Impacts: El Paso Sector," 15 November 2019

- "Economic Motivations of Migrants from the Northern Triangle," 17 January 2020

- "Developing a Regional Approach to Managing Migration Flows form the Northern Triangle through Mexico to the United States," 27 January 2020

- "Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Facilitate the Southern Flow of Northern Triangle Immigrants," 23 January 2020

- "Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment," 14 February 2020

- "DNA Assays for Determining Honey Origins," 21 February 2020.

- "Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program," 19 March 2020

- "Addressing Cross Border E-Commerce Challenges with Emerging Technologies," 14 April 2020.

M7. Conduct quarterly teleconference with each PI and the Project Champion
Each ongoing project's quarterly meeting was attended by the project team, BTI Institute management team, BTI Institute Research Committee, and the Project Champion or his/her designated representative. A written review was prepared by the Research Manager and reviewed by the BTI Executive Director. The Quarterly Meetings with written reviews for this reporting period were:

- "EDGE: The 'Eye in the Woods' Image-based Human Detection and Recognition System: Phase II," 19 September 2019. Attendees included the Project Champion, representatives from CBP OFO, a representative from USBP, representatives from OUP, the PI (Ioannis Kakadiaris, Ph.D.), the BTI Research Committee Chair (George Zouridakis, Ph.D.), and the BTI team (Kurt Berens, Abria Magee, Ph.D.)

  Summary. The investigator reported on the overall progress of the project and the specific results obtained from Tasks 5, Image collection and annotation; Task 7, Automatic detection and tagging of human presence; and Task 10, Evaluation of the VIS-NIR face recognition modules

The investigator has collected data for person detection, face detection in VIS and NIR images, and NIR-VIS for facial recognition. The image dataset included 205 different individuals with the images differing in the overall scale compared to the background, the absolute number of pixels, and image acquisition modality, i.e., visible light (VIS) or near infrared (NIR). The image annotation statistics included correct placement of bounding boxes around a target, correct detection of frontal and lateral views of faces, overall frontal and lateral subject profiles, and detection of the back of a subject's head. None of the annotators employed had previous experience with image annotation—they were students with 0-4 years of university experience. However, all inter-annotator scores were, on average, consistently high across annotators and modalities.

The investigator has developed an improved algorithm for face detection, the Context-aware Single-stage Face Detector (CS2FD), compared to existing algorithms. The investigator designed a new feature aggregation module (FAM) to model non-rigid, unsupervised geometric transformation and a joint-face detection and alignment module to model non-rigid supervised facial contextual information. The investigator has also evaluated the current state-of-the-art Face Detection algorithm (ArcFace trained with 6.4 million images) using the VIS subset of images and the complete set of NIR+VIS images. All algorithms were evaluated using as metrics the mean average precision, log average miss-rate, and the Rank 1 identification rate (e.g., top match).

Additionally, the investigator has informed the Research Committee that he is analyzing false-detection-rate data, as they relate to frame processing, i.e., the real-time performance of the algorithm. Finally, for comparison purposes, at the next reporting period, the investigator would report on the performance of a commercially available image matcher used with the new dataset.

Overall, the committee is satisfied with the investigator's performance, as this project is on track to meet all milestones and deliverables set forth in the performance metrics of the work plan. Decision Point 2 (State-of-the-art detection and analysis) was accomplished this quarter within Task 7 and Task 10.

- "Transforming Trade and Ensuring Global Supply Chain Security with Blockchain and Smart Contracts," 19 September 2019. Attendees include the Project Champion, the project team (Weidong Shi, Ph.D., Eleftherios Iakovou, Ph.D., Vince Iacopella, Keshav Kasichainula, Dana Alsagheer), the Research Committee (Richard Willson, Ph.D.), and BTI (Kurt Berens, Abria Magee, Ph.D.)

  Summary. The 3rd quarterly meeting was approximately one month delayed because the BTI Institute and investigator had an in-person meeting with the project Champion on 31 July 2019 and the Champion was due onsite at the University of Houston in September of 2019. The meeting was held in September in order to facilitate an in-person meeting. The Project PI presented the quarterly report and began the discussion with data sharing and creation among trade stakeholders. These stakeholders included banks, carriers, brokers, etc. The investigator mentioned trade as a stakeholder and the project champion defined trade and asked that the term importer be used instead. The first question asked by the Project Champion during the meeting was, "what approach is the

research team recommending to CBP?" The investigator referenced the United Nations Economic Commission for Europe (UNECE) white paper titled "Technical Applications of Blockchain to UN/CEFACT deliverables." The investigator agrees with the processes described in the white paper and will recommend multiple blockchains for re-engineering the entry process in his final report. The Project Champion agreed with this recommendation. He envisions industry to provide blockchains and companies will work together with their competitors to share the cost and in the end, the data sharing process will need to be clearly communicated. Other questions asked by the Project Champion were: How much data will clients be willing to share amongst each other? How much should be exposed on the blockchain? How will access controls be assigned? In the final report, the Project Champion would like some information on the recommended technology, whether it will be blockchain, blockchain-compatible or another type of technology. The Project Champion is looking for the process to be mapped out to these four steps: manufacturer to loading point, actual shipment, movement through the port, and movement to the consumer. The Project Champion advised the Project team to make very careful recommendations regarding the financial side of process (*e.g.* letter of credit) to ensure proper legal processes are followed. Lastly, the investigator provided details on zero knowledge proof as an auditing/verification tool that does not reveal data-specific details yet provides confirmation/validation. The Project Champion requested reading material on this subject. The Project Champion would like the following addressed in the final report or in the next phase of the research: completely digital data for every step of the entry process, an entry dataset (even reduced) for every shipment, the role of a consortium in the process, and an estimate of large-scale costs of implementing new technology to the entry process. The BTI Institute Research Committee agrees that the project is progressing successfully and look forward to a draft final report and a copy of the stakeholder survey. During the final quarterly meeting (15 November 2019), the Project PI reviewed current status of all project deliverables. The outline of the final report was completed this past quarter and was approved and reviewed by the project Champion. Task 5 (Engagement and communications with government and industry stakeholders) of the work plan was to begin in month 7 of the project and end at month 10. This task did not start on time due to the challenges of scheduling interviews with industry stakeholders. All industry stakeholders are global executives with large companies. The industry consultant on the project has managed to schedule all of the interviews in the second half of November 2019. Due to stakeholder schedules, there will be multiple stakeholder meetings. The interviews and meetings will not be completed until the end of November 2019. A draft version of the final report will be completed at the end of November and contain the majority of sections and will be shared with amongst the project team for comments. By the second week of December 2019 the team plans to have revised the first draft of the final report based on internal comments, include survey data/results and draft the executive summary and conclusion. The final report is scheduled to be delivered to BTI and the project Champion by the third week of December 2019.

- "Venezuela and Nicaragua: Regional Migration Crisis in the Making," 18 November 2019. Attendees include the Project Champion, the project team (Andrew Selee, Ph.D., Jessica Bolter), representatives from OUP, the research

committee (Luca Pollonini, Ph.D., Elaine Lui, Ph.D.), and BTI (Kurt Berens, Abria Magee, Ph.D.).

Summary. The Research Committee has reviewed the progress and quality of the results produced from this research. The results of Objective 1 (assess the number of Venezuelans and Nicaraguans and their legal status in the principal countries of reception), include the total Venezuelan population in case study countries, total Venezuelan asylum applications filed in case study countries, a review of regularization programs and total Venezuelan migrant population with residency or special regular statuses. The results of Objective 2 (understand growth of flows and integration efforts) provide data on education, healthcare and employment for Venezuelan migrants in case study countries. The results describe the laws and administrative policies guaranteeing equal access to education and the challenges that have been associated with those policies, these include, documentation requirements, capacity limits, language barriers, inadequate dissemination of information on requirements. The investigators found that emergency care is generally accessible across countries, but primary care is often limited by pre-existing resources issues and that the labor market is accessible but informal.

The research team described the policy recommendations as a result of Objective 3 (provide policy options for U.S., regional governments). As a part of the deliverables, the stakeholders' roundtable was conducted and attended by the Research Committee Chairman. The final report was released in January of 2020. After reviewing the research results, the Research Committee was interested in the age-distribution of migrants and whether they differed by receiving countries. The researchers have not investigated that topic specifically but believe that the majority of the migrants are working adults, based on the data collected.

- "Validating Deterrence Models for Scanning Technologies," 25 September 2019. Attendees included the Project Champion, the project team (George Thompson, Dennis Wagner, Lisa Pogue), the research committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D., Elaine Lui, Ph.D.), and BTI (Kurt Berens, Abria Magee, Ph.D.)

  Summary. The investigators discussed their meeting with the Project Champion previously on 23 August 2019. The investigators reported that they had finished collecting case information and establishing model parameters for nuclear and radiological terrorism. The investigators had collected 64 cases along with the state of screening for the past 20 years. The Project team also identified outliers in the case set. The literature review provided no prior information, so the team determined the next step is to analyze the outliers to determine whether nuclear smugglers are willing to make risky attempts or are only willing to make attempts if there is a higher change of success. The Project Champion understands that there are knowledge gaps but is interested in data collection to define the gaps. Addressing Decision Point 1, the Project Champion, the research investigators, and the BTI Research Committee agree that there is enough data to proceed with meeting the project goals and objectives. The investigators reported that they were slightly behind schedule on collecting drug smuggling cases due to the time and effort spent on characterizing the nuclear/radiological screening

environment across many countries and several border crossings. The Research Committee stated that they were aware of the delay and anticipated it will not affect the delivery of the final reports.

- "Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports," 24 September 2019. Attendees included the Project Champion, the project team (Ben Rohrbaugh), representatives from OUP, the research committee (George Zouridakis, Ph.D.), and BTI (Kurt Berens, Abria Magee).

  Summary. The Project team completed *Milestone 1: Determine UAS/sensor configurations, obtain necessary hardware, determine the contraband types and cargo configurations to be prioritized, find controlled testing location*. The Project team added a high-resolution passive gamma radiation detector as well as high-resolution and thermal imaging packages. The latter were used to create initial test images of the container surface. Additional test images were collected from several angles from the surface of shipping containers. The containers that were tested are not port ready as they have sustained minor damages (e.g., dents, non-functioning hinges).

  The Project team established a controlled testing site on the campus of the University of Houston. Work towards Milestone 2 (Complete CONOPS for UAS operations and identify which sensor modalities will be most effective for this purpose based on stationary testing) was initiated. On 26 September, the investigator began on-site controlled testing for sensor configuration and calibration purposes. Geolocation data were calculated and transmitted in real-time for the radiation detectors to test the validity of the predicted trajectory simulations and radiation estimations. All personnel and test facilities were in compliance with the guidelines established by the University of Houston Radiation Safety Committee. were compliant to

  The project progressed ahead of schedule and the test report was expected to be delivered on time. The Project team successfully moved passed decision points 1 and 2 and the Research Committee was satisfied with the team's progress. The team remained on track to meet all milestones/deliverables on time.

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," 25 October 2019. Attendees included the DHS Project Champion from the Customs and Border Protection Office of Field Operations, the project team (Juan Carlos Villa, Swapnil Samant, Carlos Silva, Daniel Escoto), representatives from OUP, the research committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D.), and BTI (Kurt Berens, Abria Magee, Ph.D.).

  Summary. The main goal of this project was to improve the border crossing wait time measuring system. There were 5 specific objectives for this project: 1) analyze current system operation and maintenance practices, 2) finalize installation of RFID Equipment at Otay Mesa border crossings, 3) Identify improvements to POV border wait time measurements, 4) research emerging technologies for dynamic vehicle wait time reporting, and 5) overhaul the current

border wait time measurement system software. The Project team had begun work on all objectives except objective 4. Although work on objective 2 had begun, the PI had not received a response from Mexican authorities (federal) regarding equipment installation in Mexico at Otay Mesa. The project Champion has worked with the PI to draft a letter that was sent directly from CBP requesting permission from the Mexican authority. The Research Committee asked the investigator for worst case scenarios if the authorization was not approved in a timely manner, since this is decision point 2, which had a February 2020 drop dead date. The PI assured the Committee that he would move to working with city officials in Mexico to complete the installation. The BTI Executive Director asked if there would be any operational impacts incurred when moving the installation and working with city officials instead of federal officials as well as any impacts due to administration changes between the two entities. The PI assured the BTI team that there would be no impact because the federal and city locations are a few feet away from each other and that the team is looking to get approval and documentation from the head of infrastructure at Mexican Customs.

Ahead of schedule, the researchers initiated work on objective 5 and upgrading the Border Crossing Information System (BCIS). The Project team were migrating the system to a cloud provider and creating a preliminary design of the BCIS website. BTI Institute staff were interested in the architecture strategy for backup and recovery procedures for the system and backup verification. The researchers made everyone aware of the fact the cloud providers handle the backup and provide a time guarantee and they will be providing more information on the verification process in the future. The Research Committee questioned the levels of accessibility of the website and whether CBP would have access to more information. The investigators mentioned the website is publicly accessible and all data associated with the project will be publicly available.

With the delay in completing Task 3 (Finalize installation of RFID equipment at Otay Mesa border crossing) timelines have shifted. The investigators began work Task 4 (Identify improvement to passenger vehicles border wait time measurement) 4 months earlier and on Task 6 (Develop a more efficient border wait time measurement system) 1 month earlier. The Research Committee will be monitoring the timeline, drop dead dates and the first deliverable which is due in January 2020.

- “Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports,” 19 December 2019. The meeting was attended by the project team (Ben Rohrbaugh, David Hansell), the DHS Project Champion from the Countering Weapons of Mass Destruction Office, the BTI Institute Research Committee (Richard Willson, Ph.D.), and the BTI Institute Team (Kurt Berens, Abria Magee, Ph.D., Philip Boedeker).

  Summary. The Project team reported that work had been completed for milestones 2 and 3, they had completed a CONOPS for UAS operations and provided a report and briefing as a result of simulations of the sensors. The investigators delivered a briefing via email regarding the results of simulations and the most effective modalities for sensors used on UAS.

The Research Committee had questions as to the scientific progress around the radiation sources and what profile of the shipping container are the readings being taken. The investigator revealed that the radiation sources are isotropic. The CsI crystal size of the Kromek detector is 1" x 1" x 2" and that they are collecting the data with the source facing the long-side and considering the scenario with the drone flying around the container. The investigator also mentioned that they would consider short run to take data with the source facing the short size. After this discussion, the investigator completed a series of tests to check different detector positions against the sources to test the readings and to calibrate the detector, and the best results were observed when the detector was set horizontally, it pointed the most surface space of the crystal towards the source. All experiments have been completed with the detector set on the side of the drone so that the longest side is towards the source.

The team also stated that the senior scientist that was working on the project would be leaving in January. The team had already sent the CV of the replacement to the Research Committee. They determined that the credentials provided adequate assurance that the project would continue without disruption.

- "Validating Deterrence Models for Scanning Technologies," 19 December 2019. The meeting was attended by the project team (George Thompson, Lisa Pogue), the DHS Project Champion from the Countering Weapons of Mass Destruction Office , and the BTI Institute Team (Kurt Berens, Abria Magee, Ph.D., Philip Boedeker).

  Summary. The Project team focused on compiling summary information for drug smuggling cases and completed the case analysis for nuclear smuggling in efforts to complete Objective 3 (define the feasible ranges for deterrence parameter values). They also characterized organization structure and the effect of punishments and rewards at various levels of criminal organizations to identify external/testable assumptions (Objective 4).

  In summary, for the extended deterrence model parameters the investigator found nuclear smuggling is largely opportunistic, varies widely by country and depends on the object and shielding. While, illegal drug smuggling is an ongoing enterprise where success and total smuggling attempt vary with the role, it is homogenous across countries and depends on the amount of material.

  The drug smuggling milestones, which include milestones 3-5, were behind schedule. This delay was caused by the increased time it took to complete the characterization of the nuclear environment. This delay was mentioned in the last quarterly report; the investigator requested a 90-day no cost extension to finalize the deliverables for this project.

  The Research Committee was not concerned about this delay due to the fact that the investigator has completed all of his research and is only needing an extension to finalize the report.

- "Border Management, Trade, and Transport Security Course Curriculum Development," 19 December 2019. Attendees included the PI (Maria Burns), the DHS Project Champion from the Customs and Border Protection Office of

Training and Development, the BTI Research Committee (Richard Willson, Ph.D., Luca Pollonini, Ph.D.), and the BTI Team (Kurt Berens, Maura Pereira, Ph.D., Abria Magee, Ph.D., Philip Boedeker).

Summary. The Project team completed Task 2 (Curriculum Plan Development) and Task 4 (Instructional Strategies Development). The Champion and his team have approved Course 1: Introduction to Homeland Security, it has been added to the academic catalog for spring 2020 and registration opens in January of 2020. Currently, there are seven students slated to take the course. The Champion and his team have also approved Course 2: Fundamentals of Border Operations Management, this course is to be added to the summer 2020 academic catalog with registration opening in March 2020. All other course content is currently under development.

Two deliverables have been provided this past quarter, course content analysis (Deliverable 1) for Courses 1 and 2 and ten modules have been developed and reviewed by the Champion (Deliverable 2, eight online modules developed).

- "EDGE: The 'Eye in the Woods' Image-based Human Detection and Recognition System," 15 January 2020. Attendees included the PI (Ioannis Kakadiaris, Ph.D.), the DHS Champions, OUP, Research Committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D., Richard Willson, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The investigator reported on the completion of Task 7 (Automatic detection and tagging of human presence) and Task 8 (Demo for Task 7). The investigator presented the EDGE19 Dataset and showed examples of the VIS and NIR images captured during the creation of that data set. For Task 7, the investigator explained the problem set and challenges of Human Body Detection, to include pose, illumination, occlusion, and multi-scale. The Project team undertook the objectives of designing, developing, and evaluating a human detector for 2D images to overcome occlusion challenge in the wild. The research team used existing related work with acknowledged limitations, and proposed solutions that would help the network in full-body predictions and learn more discriminative features.

  The Project team tested their DVRNet (Decoupled Visible Region Network for Pedestrian Detection) on the dataset CityPersons for miss rate quantitative results. The DVRNet miss rate was lower than other methods. For qualitative results, the investigator presented the "good, bad, and ugly" of the results, to include images of all human bodies predicted (good), one of five human bodies missed due to occlusion behind a street sign (bad), and multiple human bodies missed due to scale (ugly).

  The investigator concluded the presentation by presenting an opportunity for the Project Champion and other DHS stakeholders to view the demo through AWS, however, in order to save on cost, coordination will have to be made with the investigator to ensure the system is running.

  The project progressed satisfactorily, and the Project Champion remained engaged. The Research Committee expressed interest in hearing what Border

Patrol thinks about the demo once their office has had an opportunity to view the demo.

- "Measuring Border Wait Times at Land Ports of Entry: Technology Assessment and Data Dissemination," 5 February 2020. Attendees included the PI Team (Juan Carlos Villa, Swapnil Samant, Carlos Silva, Daniel Escoto), the DHS Project Champion from the Customs and Border Protection Office of Field Operations, OUP, Research Committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The Project team, beginning with Swapnil Samant, gave an update on Objective 5 (Border Wait Time System Software). The team developed the software and testing with simulated data was ongoing. The next steps included a test with live data and then finalize the website design. The objective was on target to finish by the end of February.

  Objective 2 (Finalize implementation at Otay Mesa) along with the associated deliverables (Otay Mesa RFID Penetration test, Otay Mesa Final Installation Report) had not been started because of a delay from the Mexican government approving permits. This same issue was identified at the previous quarterly meeting and had been tracked as a decision point. The PI has received verbal approval to install the measuring systems, but written confirmation was pending.

  For Objective 3 (Identify improvements to POV border wait time measurement) the research team detailed a test plan across three detection points. The first detection point uses Bluetooth and Radar. The second uses Bluetooth and Automatic License Plate Reader (ALPR). The third is at the CBP Inspection Booth and includes Bluetooth and ALPR. The radar would identify individual vehicle presence for better lane-specific identification. The Champion mentioned that there is already a Bluetooth-based system reporting data. The PI acknowledged the system and stated that those were only reporting average times as it cannot distinguish between vehicles. The additional measuring equipment would add significant fidelity to the wait time measurements. This would be an integrated system that can give the length of the queue as well as distinguish lanes and individual vehicles.

  In cases where a gantry is present, e.g., the Bridge of the Americas, APLR could be mounted in these locations as well.

- "Tactical Mapping of Border Security Impacts: El Paso Sector," 27 February 2020. Attendees included PI (Mayra Maldonado), DHS Project Champion from the US Border Patrol, OUP, Research Committee (George Zouridakis, Ph.D., Elaine Liu, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The Project team discussed the current status of their project, to include the completion of Task 1 (Collection of Previous Mappings and Impact Analyses) that was captured as Deliverable 1. The team stated that Task 2 (Collection and Consolidation of Historical Baseline Border Security Data) was underway and would be completed on time with the deliverable at the end of the March 2020.

The Project team discussed the data indicator of border security deployments that will be mapped against the migration, social, demographic, public health, and education indicators. The Project team then presented some options for graphical representation and data mapping as they develop the mapping tool deliverable.

Questions posed related to the mapping tool:

BTI: How do you measure healthcare delivery in different communities?
PI: Utilize the cost of living index to determine healthcare delivery. The PI team stated they will deliver the medical delivery cost index to BTI and Project Champion, as requested.
BTI: As it relates to mean wage, are the mapping tools able to provide for other parts of income distribution, such as bottom or top 10%?
PI: Yes, the mapping tool can be configured to produce those distributions.
Further, the PI team explained that the tool would allow a selection by border patrol sector that could then drill down into specific apprehension, deployment, or any other indicator that has been listed in previous data charts.
DHS: Is there a way to add additional data points to the graph tool?
PI: Yes, there is a way to indicate as many indicators as requested of the tool.
DHS: Is it possible to overlay crime statistics? And then drill down on specific crimes?
PI: Yes. And if desired, it can be built in as a density map as well to show groupings over time.
BTI: Is there the ability to present the data in the form of a heat map and/or 3D histogram?

PI: Yes. The display can be rendered in a number of ways.

Questions posed related to El Paso Sector specific data:

The Project team requested CBP program funding levels for the El Paso Sector specifically in order to better directly tie spending to impact. If these data were not available, the results will be based on the national level information only combined with an estimate that would be developed by the Hunt Institute.
DHS: As it stands now, chief counsel has advised to not give specific numbers on funding, but they are working to find a way to provide unofficial numbers as estimates. UPDATE: as a follow up email sent on Monday, 2 March 2020, Border Patrol would like the Hunt Institute to develop an estimate.
PI: The team would work with the estimates and note that it is based on unofficial estimates.
BTI: Would it be possible for Border Patrol to use the tool and input the actual numbers themselves, and not publish that data?
PI: Yes, it can be designed to plug in the data and give a result.

Both the Research Committee and Project Champion indicated that they are satisfied with the way the project is coming along and look forward to the next step in the project.

- "Border Management/Cross Border Trade Course Curriculum Development," 28 April 2020. The meeting was attended by the PI (Maria Burns), the Project Champion from the Customs and Border Protection Office of Training and Development, DHS S&T OUP, the Research Committee (George Zouridakis, Ph.D., Elaine Liu, Ph.D., Luca Pollonini, Ph.D., Richard Willson, Ph.D.), and the BTI Team (Kurt Berens, Maura Pereira, Ph.D., Philip Boedeker).

  Summary. The PI relayed the status of the Curriculum Development project to include 23 courses developed by UH, 2 new courses developed and offered, 1 new course developed and under internal review, and 11 new courses under development.

  The graduate level program has a slightly different approach due to the level of University requirements. A review of programs at other universities, both in the United States and Europe, is complete. A review of the CBP stated requirements for executive level leadership is also complete. Both of these reviews are going to be incorporated in a needs analysis to be submitted to CBP-OTD by the BTI Institute.

  BTI: As part of the graduate level development, focusing on innovation and developing leaders. The curriculum will be less about giving tools and more about teaching how to think beyond the current issue and generate unique solutions.

  DHS: Ensure the students only need the standard requirements from the state to enter the graduate program. There should be no additional requirements from the professional side such as being in a leadership position to take the graduate level courses. Want those who strive to be in leadership positions to take the course, not just those already in position.

  Due to an administrative delay and a reworking of processes in light of COVID-19, the PI requested a three month no cost extension. The Executive Director and OUP Program Manager acknowledged the request and are working the process through the BTI Institute PY6 Work Plan.

  The Project Champion indicated the BTI Institute could market the course offerings to local DHS personnel. Both BTI and DHS will coordinate efforts in marketing to ensure the same message is being relayed.

  Both the Research Committee and the Champions indicated they are very satisfied with what had been produced so far as course work and content. All acknowledged the delay in development of all the courses scheduled and agreed to work toward solutions for streamlining review.

- "Tactical Mapping of Border Security Impacts: El Paso Sector," 30 April 2020. Attendees include the PI Team (Mayra Maldonado, Jose Angel Moreno, Roberto Ransom, Rafael Perez Pena, Leo Orea), DHS Project Champion, members of USBP, OUP, Research Committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

Summary. The PI discussed the status of the project, noting the completion of Task 1 (Collection of Previous Mappings and Impact Analyses) and Task 2 (Collection and Consolidation of Historical Baseline Border Security Data). The team has begun work on Task 3 (Collection of Historical Social, Demographic, and Economic Data Mapping). The team completed Deliverable 1 (Briefing Report) and Deliverable 2 (Briefing Report, Comparable Tables, and Mapping Tool Samples).

For Task 3, the Project team noted that indicators used will be divided into the categories of Social and Demographic, Public Health, Education, Crime, Cross Border Flows, and Economic.

The PI mentioned the following challenges:

COVID-19 – variability in access to datasets and server due to work-from-home orders and variability in the connection type/quality of team members' home internet service provider.

Data Source Challenges – for input into the dataset, the data sources are all variable in composition, including PDFs, images, or tabulated. The tabulated sources are easier to automate into the dataset. The PDFs and images must be manually input to ensure accuracy. This causes a need for either personnel to be assigned the task or the possibility of developing an automated system that could work through the identity process.

DHS: can/will data be analyzed statistically to determine significance of differences?

PI: yes, such analyses can be performed with the final data set.

BTI: reminder that portions of the data set contain estimates at present so conducting significance testing would only be meaningful once the mapping tool data sets were updated with actual numbers.

As it relates to final report on impact analysis:

DHS: will the final report include town halls or interviews to gather any additional information beyond the current historical datasets?

PI: not currently scheduled to conduct any interviews. The Hunt Institute has conducted interviews in the past for impact analysis and, if not able to be conducted for this iteration, can be considered for the impact analysis of other sectors.

As it relates to transition:

> The final mapping tool and dataset will be made available to Border Patrol, however, there will need to be continuous updates to the data pool as there are various issues with data sources and the ability to automate data input. This will be part of the transition effort discussed leading up to the target month of January for an onsite, in-person transition. Additionally, the office

of Data Science has done some recent analysis of second order effects and is willing to share their process and elements in case that is useful for the project team.

Both the Research Committee and Project Champion indicated that they were satisfied with the project's progress and looked forward to utilizing the dynamic, web-based mapping tool. The Chairman of the Research Committee emphasized that the tool was agile and low maintenance, an important aspect in transition and use after the project.

- "The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Northern Triangle Migrants," 7 May 2020. The meeting was attended by the PI Team (Marcus Boyd, Ph.D., Barnett Koven, Ph.D., Katy Lindquist, Ph.D.), DHS Project Champion from the Office of Strategy, Policy and Plans, OUP, Research Committee (George Zouridakis, Ph.D., Luca Pollonini, Ph.D., Richard Willson, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The Project team presented the current status of their project, to include the focus on the bottom-line question of "are Panama and Costa Rica being underutilized for migration?" The team reported that the project is on time and the tasks are being accomplished. The team had held its kickoff meeting (Task 1) and collected data sources (Task 2).

  The Project team raised the issue of fieldwork in light of COVID-19 restrictions. Looking at the possibility of shifting some of the fieldwork to the latter half of the project as well as convert some in-person engagement to virtual in order to remain on track. This would raise data privacy concerns and IRB protocols that would need to be addressed. The team acknowledged the delay due to COVID-19 may require a no-cost extension depending on how long the travel restrictions linger, however, they will continue to monitor the situation and provide updates as appropriate.

  DHS: as to fieldwork – inquired as to how many interviews and whether or not the PI team was planning on interviewing government officials

  PI: Currently have 120 interviews planned, but were not going to rely on interviewing high level government officials due to issues of access

  BTI: offered to connect the PI team with current officials in Costa Rica and former consul general for Panama.

  DHS: as to changes in migration due to COVID – inquired if the PI team had considered integrating questions into interviews related to the how COVID has influenced decisions and capabilities to migrate

  PI: The team was planning to modify the questions in light of COVID as well as get the ground truth from nonprofits about changes in flow of migration. Additionally, looking at comparative risk of infection vs economic factors (is its worth risking infection because of the pull factor of improved employment changes, for instance).

The Champion requested the questions sent to her before the interviews began.

The project was currently on track. All involved will continue to monitor the impact and travel delays of COVID-19 and anticipate changes to effort, specifically as it relates to the fieldwork.

- "Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment," 7 May 2020. Attendees included the PI Team (Skye Cooley, Ph.D., Asya Cooley, Ph.D., Robert Hinck, Ph.D., Sara Kitsh, Ph.D.), DHS Champion, OUP, Research Committee (George Zouridakis, Ph.D., Elaine Liu, Ph.D., Luca Pollonini, Ph.D.), and BTI (Philip Boedeker).

  Summary. The Project team presented the adjustments required due to COVID-19 and the impact to the current timeline. Primarily, the team had to reschedule the on-site visits to the fall and instead are focusing on telephone interviews with all demographics besides migrants. This would allow the team to focus on migrants when they are able to do on site interviews.

  As an update to the policy brief review, the Project team reviewed 50 policy briefs from 17 nonprofit organizations and developed four policy fields (economic, humanitarian, social, cultural). The team conducted 12 interviews with 10 policy experts, 1 migrant shelter worker, and 1 migrant. The team continued to contact via telephone shelters along the US border during the pandemic.

  For media analysis, the team has completed the development of search terms and collection parameters, identified core media sources, and is now in the process of data collection and sampling.

  The Project team raised two specific issues:

  Mexican Research Visas had not been issued

  Adding additional stakeholders – the team requested to add additional stakeholders to interview specific to law enforcement implementation

  DHS: It would be best to deal with law enforcement that focuses on enforcing migration; more than likely the personnel at DHS Policy would be the best source for that information and the Champion will take the request back to the office

  BTI: Any specific impact of COVID-19 restrictions beyond what was already stated.

  PI: So are, the project is able to keep on track by focusing now on telephonic interviews on the front end of the project and pushing the in-person interviews towards the back end of the project; additionally oversaturating on phone interviews to ensure there is enough useable data.

  The Project Champion reiterated that he is excited about this project because of the need to understand the language that can be best used when discussing policy with other nations. The Research Committee indicated that the adjustments to the efforts within the current timeline is appropriate for the project

in light of COVID-19. Additionally, they reiterated the importance of monitoring delays and reporting as soon as feasible if the research team foresees any milestones missed.

- "Economic Motivations of Migrants from the Northern Triangle," 7 May 2020. The meeting was attended by the PI Team (Detlof von Winterfeldt, Ph.D., Jonathan Eyer, Ph.D., Bryan Roberts), DHS Champion, OUP, Research Committee (George Zouridakis, Ph.D., Elaine Liu, Ph.D., Luca Pollonini, Ph.D.), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The Project team presented construction of migrant characteristic datasets and the statistical analysis of the migration drivers.

  The team took the LAPOP (representative sample of populations in Latin America) and EMIF-SUR (returned by US Authorities) data sets and merged them with economic data. The PI team presented some initial analysis based on the LAPOP data set. Analysis based on the EMIF-SUR dataset was ongoing.

  The Project team also presented two case studies:

  Puerto Rico to US. Case study due to large migration in the 1950s that suddenly declined in the 60/70s; this was due to economic improvement in PR, however, when economic stagnation occurred, there was not an uptick in migration, as would be expected from a purely economically motivated perspective

  Mexico. There has been a significant change in flow over the past 10 years. Some hypothesis that it may be due to a demographic change, but that may actually only explain a small portion.

  On the LAPOP Impact of Income and Impact of Education graphs:

  DHS: Excited about the findings and the nonlinear nature of income and the decision to migrate. It seems Guatemala always acts differently when it comes to migration trends, and these models reflect that.

  BTI: Inquiry as to the conclusions that can be drawn from different countries using the different data terms.

  PI: Eventually believe they will be able to massage out specifics within the data to be able to draw reasonable conclusions per country.

  BTI: With respect to non-parameters and non-linears.
  PI: constructed based on the data in hand and the form of that data

  DHS: With Mexico, is there an impact of NAFTA.
  PI: No current evidence of convergence of income for US and Mexico economies, but there is evidence of increased migration that may tie to NAFTA; more analysis is needed.

DHS: Why choose Puerto Rico as a case study? PI: Due to the significant variance in PRs economy and the United States and the lack of limits to migration, became a good point to look at purely economic incentive or disincentive.

DHS: Would the recommendations from the project come in the form of strategic policy or actual program implementation?
PI: Will not speak to specific programs but will rather speak to the broader changes that could impact the intent to migrate.

The Project Champion indicated that the DHS Policy team was excited about the initial findings and look forward to further results from the project. The project is on time and making satisfactory progress.

- "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States," 7 May 2020. Attendees of the meeting include the PI Team (Andrew Selee, Randy Capps, Ariel Ruiz, Jessica Bolter, Andrea Tanco), DHS Champions, OUP, Research Committee (George Zouridakis, Luca Pollonini), and BTI Team (Kurt Berens, Philip Boedeker).

  Summary. The Project team reported that this past quarter they have been able conduct more research than expected even in light of COVID-19 restrictions. Because of existing relationships, the PI team focused on Mexico's capacity, to the point of adding an additional deliverable of a report focused on Mexico. The PI team reports 19 completed interviews with informants in Mexico and Costa Rica, and additional interviews completed by consultant in Guatemala.

  The Project team also reported preliminary findings from Mexico and for Costa Rica and Panama.

  DHS: Very interested in the data coming out of Costa Rica and Panama and the increase in migration from Africa.
  PI: Initial discussions have begun but the relationships are not as strong in those regions, and the PI team is still needing to pull data, but initial thoughts are that Colombia and Brazil are having difficulty dealing with the migration and thus much is being pushed to Panama. Additionally, there is capacity in Mexico for the increased flows, but they have to expand their relationships with the countries of origin for the migrants (such as countries in Africa).

  DHS: Very interested in the respective legal and regulatory structures and immigration framework for each country and how that impacts the US's ability to support. The US government currently lacks a detailed understanding of the legal structures that underpin the allowance of legal migration; lack objective legal analysis of the countries that are being looked at, thus a country-by-country immigration law summary that captures what they can and cannot do legally, compared to US immigration law, would be helpful to DHS Policy.
  PI: The team will emphasize that aspect of the project.

  BTI: More of a programmatic question, what is the impact of timeline in light of COVID-19.

PI: The team will focus on the legal research for now and will be able to extend the in-person travel to towards the back end of the project.

The project is currently on track. All involved will continue to monitor the impact and travel delays of COVID-19 and anticipate changes to effort, specifically as it relates to the fieldwork.

- "Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination," 12 May 2020. Attendees included the PI Team (Juan Carlos Villa, Swapnil Samant, Carlos Silva, Daniel Escoto, Jose Rivera), DHS Champion, OUP, Research Committee (George Zouridakis, Ph.D., Elaine Liu, Richard Willson), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The Project team presented their key activities and efforts for the quarter to the Project Champion and the members of the BTI Institute Research Committee.

  For Objective 1 (Analyze Current system operation and maintenance practices) the PI is in discussion with stakeholders involved with the Santa Teresa NM border crossing due to construction on those locations and the requirement to re-locate and power current wait time equipment. The Project team planned on traveling in June (post COVID-19) in order to meet with stakeholders on ground and ensure there would no loss of reporting.

  For Objective 2 (Finalize Implementation at Otay Mesa), the Project team received all required permits to install but were delayed due to travel restrictions for COVID-19. Some equipment, such as the solar equipment had been installed in Tijuana, but the team still needed to install the final components before data collection could begin.

  For Objective 3 (Identify improvements to POV border wait time measurements), the Project team developed a system utilizing the existing BlueTooth® technology by adding Automatic License Plate Reader that would allow the data to have Multi-Lane fidelity. The Project team developed a prototype to demonstrate the effectiveness and conducted initial testing. Testing would resume once the travel restrictions for COVID-19 were lifted.

  For Objective 4 (research emerging technologies for dynamic vehicle wait time reporting), the Project team developed a Hybrid Wait Time Measuring System that utilized a primary data source in the fixed-location RFID-based system and integrated the secondary source GPS data.

  From Project Champion, re Objective 4: Is the hybrid system only for trucking companies and commercial travel?
  PI: Initially yes, but they will include recommendations on how the secondary GPS tracking can also be done for POVs.

  For Objective 5 (Overhaul the current border wait time measurement system software), the team has determined a cloud service provider system would work best, has completed container services and SQL server and are testing in a

simulator to ensure it is accurately reporting. Testing should be complete by end of May.

The Project team also proposed including an out of scope real-world test of the hybrid system in El Paso at no additional cost to the Sponsor. Based on discussion, the best timeline might be July to February to conduct the real-world testing.

Based on the potential ability to travel beginning in June, the Project team envisioned no issue completing all current tasks in accordance with the timeline in the approved Work Plan. The Project Champion noted satisfied with the work and believes the project is moving along well. The Research Committee is satisfied with the management of not only the technical aspects but also the ability of the Project team to continue some aspects of installation despite the COVID-19 restrictions. The project, based on current timelines, will complete on time with all milestones and deliverables met.

- "EDGE: The 'Eye in the Woods' Image-based Human Detection and Recognition System: Phase II," 19 May 2020. Attendees include the PI (Ioannis Kakadiaris), DHS Champions, OUP, Research Committee (Richard Willson), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The PI reported on the EDGE20 dataset and the associated annotations for carrying actions. Carrying actions related to the EDGE20 data set include carrying a backpack or carrying tube. The PI team also used UHSINICA Data Set, a publicly available data set compiled for YouTube Videos to train the system on recognizing six different carrying actions including load, backpack, handbag, phone, weapon, or not carrying.

  The PI team also reported the accomplishment of the tasks developing and evaluating a face detection algorithm. The PI developed an occlusion-aware face recognition system with attribute predictions (OREO) which accomplished the task Discriminative Facial Feature Extractions from Facial ROI. The next task, Meta-information Enrichment for Images, focused on carrying-related actions from a single image. The PI developed RECASPIA, a method that recognizes carrying actions in static images using person, object and scene attributes, not restricted to one action, and using information that is not available during deployment. Compared to two other methods (ResNet-34 and SVM), and using UHSINICA and EDGE20, the RECASPIA method outperformed in identifying carrying actions.

  The BTI Institute Executive Director led a discussion on transition opportunities for the project. The PI acknowledge there are two areas where further research is needed (facial recognition of juvenile populations and how facial recognition has been affected by the recent need for face masks in public spaces). The PI also stated that with what has been learned with this project, a new type of trail camera that could do the analysis within the camera and then can send notice to the operator of specific instances can be developed.

  The PI, BTI Institute, and Research Committee acknowledge the difficulty of completing KPI-D-1 (One event showcasing the EDGE technologies) due to the

cancellation of the Research Showcase portion of the Port of the Future Conference due to COVID-19 restrictions. The Champions indicated no issue with the status of the project. All task, milestones, and deliverables are being met and the project should complete as scheduled.

- "DNA Assays for Determining Honey Origins," 21 May 2020. Attendees included the PI Team (Richard Willson, Aniko Sabo, Katerina Kourentzi, Dimple Chavan), DHS Champion, OUP, Research Committee (George Zouridakis, Ph.D., Luca Pollonini, Elaine Liu), and BTI (Kurt Berens, Philip Boedeker).

  Summary. The PI team presented the status of their project based on the first quarter of effort. The PI reported that none of the tasks should be impacted by the COVID-19 restrictions with the exception of obtaining 300 honey samples by the sixth month of effort. The team currently has 149 and has begun effort on Task 3 (Honey pollen DNA sequencing), Task 5 (Honey plant DNA sequence clustering informatics analysis), Task 6 (samples Purification and analysis of soluble DNA from filtered honey), and Task 7 (curation and detection of country-specific plant barcodes) with the sample they already have. The PI believes that the team will still be able to collect up to 300 samples, it just may not be within the 6-month effort window. This delay should not impact the overall timeline of the project or cause any other milestones or deliverables to miss.

  BTI: If you can heavily filter and then adulterate honey, can that be detected?
  PI: Based on what the team has seen so far, they can use the soluble method to determine the honey source. The PI is also fascinated with the possibility of determining how quickly diluted honey leaks DNA to filtered honey.

  DHS: Is ITS2 the only database that will be used to determine the variations in "barcode" sequences found in most plants?
  PI: Based on preliminary studies the ITS2 library is useful although other sources can be used as well.

  BTI: What is the possibility of supplementing your honey samples through E-Commerce?
  PI: There is a potential but would have to be very selective as the team is creating the standard for the test and must ensure the honey is location specific and authentic.

  BTI: Is the technology intended to be used just by the US or can it be made public as a means to differentiate between authentically sourced honey?
  PI: There seems to be a general desire to ensure that locally sourced honey is in fact locally sourced. This is something that both the consumer and the merchants want to ensure.

  The PI, BTI Research Committee, and BTI management acknowledged the potential delay in reaching 300 samples due to travel restrictions placed by COVID-19. The Champion team is very excited about the work, and despite even having a more limited sample size of honey, is interested in seeing what results the team comes up with and how that can be used to help DHS as a whole.

- "Addressing Cross Border E-Commerce Challenges with Emerging Technologies," 29 June 2020. Attendees included the PI Team (Larry Shi, Christine McDaniel, Vince Iacopella, Meagan Martin), DHS Champion (London McCloud), OUP (Theophilos Gemelas), BTI (Kurt Berens, Philip Boedeker).

  Summary. The PI team presented the status of their project, to include the results of efforts in mapping e-commerce data flow and an initial report outline. For the Map of E-Commerce Data Flow, the PI team gathered data items based on data communication specifications defined by selected carriers, fulfillment service providers, and marketplaces/platforms. The team also extended the WCO e-commerce data flow model by adding seller, fulfillment, and broker stakeholders. The team also mapped the physical flow of data in order to better understand the complexity of data sharing across multiple stakeholders with different logistics strategies.

  The PI team also laid out the initial report outline to include proposed chapter subjects. The final report will align with the objectives of the project.

  There was a discussion initiated by the project champion related to the logistics strategies (direct mail, goods collection, and bonded import) and how these strategies integrate E-Commerce. As it stands, a seller can use any of the current strategies to fulfill an E-Commerce request. This shows that any new policy on data collection or sharing would have to take in to account all three strategies to have the greatest impact and least disruption.

  The project is currently on track. The PI team is working now to secure stakeholder meetings.

M8. Review each PI's project monthly report
Each PI submitted a monthly report to the BTI Institute Management team. The report captured the efforts of the project team that month and a detailing of any tasks, milestones, deliverables or performance measures reached. The report was reviewed to ensure that the project remained on track.

M9. Review updated work plans for PY6 for continuing projects
The work plans were reviewed as part of the PY6 Work Plan and Incremental Funding Request.

M10. Issue request for proposals for PY6 projects
There was no formal Request for Proposals during PY5.

C.2.3 Deliverables Table

ID	Description	Effort Period	Status
D.1	Produce Memorandum of Record (MORs) for project Kick-Off Meetings	10 days after scheduled Meeting	MORs complete

D.2	Produce Memorandum of Record (MORs) for operational meetings conducted between the project Champion and PI	Ongoing	Complete, ongoing
D.3	Quarterly Assessment Reports from PIs to be provided to DHS OUP PM	Ongoing	Accomplished, ongoing
D.4	Written Review of Quarterly Reports to be provided to PIs	Within 30 days of report receipt	Accomplished, ongoing
D.5	Produce Memorandum of Records (MORs) for Research Committee Meetings	Monthly	Accomplished, ongoing
D.6	Review BTI research safety plans and other associated documents for relevancy and update accordingly.	Nov-Dec 2019	Accomplished
D.7	Produce White Papers for review by DHS OUP PM and other DHS Customers	Ongoing	Five White Papers produced
D.8	PI Meeting and Showcase	5/2020	Outside of this reporting period
D.9	Produce Proposals from RFP 20-01	June 2020	Outside of this reporting period

C.2.4. Deliverables Report

D1. Produce Memorandum of Record for Project Kick-Off Meetings

Memoranda of Record for all project kick-off meetings were completed and are available upon request.

D2. Produce Memorandum of Record for operational meetings conducted between the project Champion and PI

There have been no separate operational meetings requiring an MOR. Meetings between the project Champion and PI occurred during Kick-Off and Quarterly Meetings.

D3. Quarterly assessment reports from PIs to be provided to DHS OUP PM

The Quarterly Assessments are prepared as PowerPoint presentations and delivered prior to the quarterly meeting.

D4. Written review of Quarterly Reports to be provided to PIs

A written review is completed after the Quarterly Meetings by the BTI Manager, Research. The written review is based off the discussion within the Quarterly Meetings and input from the Research Committee during the monthly Research Committee meetings. The review is then provided to the PI. These written reviews are available upon request.

D5. Produce Memorandum of Records for Research Committee Meetings

There have been ten Research Committee meetings and one MOR for each meeting.

D6. Review BTI research safety plans and other associated documents for relevancy and update accordingly

The Research Safety Plans for the BTI Institute went through significant updates and were approved for use at the end of PY4. The plans have been reviewed in this

reporting period for existing and new projects to ensure they remained relevant. No updates have been required. The review was completed by 3 December 2019.

D7. Produce White Papers for review by DHS OUP PM and other DHS customers

Five White Papers have been received and reviewed by the BTI Institute during this reporting period. One of the five White Papers was approved by both the BTI Research Committee and the Project Champion and moved to the development of a work plan.

D8. PI Meeting and Showcase

Due to COVID-19 travel restrictions, the BTI Institute held individual, online final meetings for those research projects that concluded in PY5.

"Validating Deterrence Models for Scanning Technologies," with Principal Investigator George Thompson, ANSER Inc., was conducted on 5 MAY 2020 with DHS Countering Weapons of Mass Destruction.

"Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports," with Principal Investigators Ben Rohrbaugh and David Hansell, Lantern UAS LLC, was conducted on 6 MAY 2020 with the Project Champion, with DHS Countering Weapons of Mass Destruction, and CBP UAS.

"Venezuela and Nicaragua: Regional Migration Crisis in the Making," with Principal Investigators Andrew Selee and Randy Capps, Migration Policy Institute, was conducted in combination with the Quarterly Meeting for "Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States" on 7 MAY 2020 with members of DHS Office of Strategy, Policy, and Plans.

D9. Produce Proposals from RFP 20-01

Due to the delay in the selection & funding of projects from RFP-19 and since the Cooperative Agreement between DHS and UH was scheduled to terminate in PY6, no request for proposals was offered for PY5.

C.2.5. Performance Metrics Table

ID	Description	Effort Period	Status
P.1	Conduct 100% of Kick-Off Meetings for RFP19-01 Projects	Within 30 days of project budget start date	Achieved
P.2	Review Concept White Papers within 30 days of receipt	Ongoing	Complete & Ongoing
P.3	Project description clearly addresses a knowledge gap identified a Homeland Security Enterprise problem or need	Ongoing	Achieved
P.4	Ensures scientific progress of research efforts and relevancy to customers	Ongoing	Achieved
P.5	100% of Initiated projects have an identified customer	Ongoing	Achieved

P.6	Projects have meaningful performance metrics	Ongoing	Achieved
P.7	Research Committee is continuously engaged with project PIs	Ongoing	Achieved
P.8	Produce X number of Work Plans from RFP 20-01	June 2020	Not Applicable

C.2.6. Performance Metrics Report

P1. Conduct 100% of Kick-off meetings for RFP 19-01 projects
Four projects from RFP19-01 were approved for funding and the kick-off meetings were held within 30 days of project funding start date.

P2. Review concept White Papers within 30 days of receipt
White Papers submitted to the BTI Institute are immediately reviewed by the BTI Institute Management team for completeness and relevancy. The Research Committee then reviewed the White Papers as part of the Research Committee meeting or ad hoc reviews with consolidated notes.

P3. Project description clearly addresses a knowledge gap identified as a Homeland Security Enterprise problem or need
Each project team is in regular communication with their Project Champion to ensure their project continues to address the knowledge gap for DHS. All White Papers are aligned with a DHS organization before developing into Work Plans to ensure the project addresses a problem or need for DHS. The Champions have input during each Quarterly Meeting to ensure the project remains aligned with their problem or need.

P4. Ensures scientific progress of research efforts and relevancy to customers
The Research Committee reviewed each ongoing project during the project team's quarterly meetings for scientific progress and relevancy to customer.

P5. 100% of Initiated projects have an identified customer
All projects initiated during PY5 had an identified customer and Project Champion.

P6. Projects have meaningful performance metrics
Project Performance Metrics are reviewed by the Research Committee and Project Champion to ensure measurability and that they provide the Research Committee a means to measure project success.

P7. Research Committee is continuously engaged with project PIs
The Research Committee has participated in and provided feedback during 21 quarterly reviews and nine project kickoffs during PY5.

P8. Produce X number of Work Plans form RFP 20-01
The BTI Institute did not initiate an RFP during PY5.

D. Education and Training (E&T)

D.1. Effort Summary

The overall effort in this period has been focused on the accomplishment of the objectives of the Curriculum Development project, which was approved to start on 1 July 2019. The

Education and Training Manager, in conjunction with the BTI team and faculty from the University of Houston, created the following: guidelines for course design, needs analysis to inform academic curriculum development, a curriculum plan for a Bachelor of Science in Border Operations Management, Trade, and Transport Security. Activities accomplished for the Curriculum Development project are reported under the BTI research portfolio.

D.2. Education and Training Initiatives

Training Activities. The primary Education and Training activity for PY5 has been the Border Operations Management and Cross-Border, Trade, and Transport Security Curriculum development project. Activities, milestones, deliverables and performance metrics for the curriculum development project are captured under the BTI Institute research portfolio later in this report.

D.3. Summer Internship Program

D.3.1. Internship Milestones Table

ID	Description	Effort Period	Status
M.1	Contact Institutions to express interest in hosting summer Interns	10/2019	Complete
M.2	Identify BTI project activities suitable for summer interns	1/2020	Complete
M.4	Students arrive at BTI Institute	6/2020	Outside of this reporting period
M.5	Students deliver end-of-internship presentations	7/2020	Outside of this reporting period

D.3.2. Internship Milestones Report

M1. Contact Institutions to express interest in hosting summer Interns

In October 2019, the Executive Director contacted the United States Military Academy at West Point and the US Coast Guard Academy to express interest in hosting summer interns. We were informed that both Academies were interested in sending cadets to BTI in summer 2020 and had started the application process.

In April 2020, the U.S. Military Academy at West Point informed the BTI Institute that they would not be able to support onsite internships due to the COVID-19 restrictions.

M2. Identify BTI project activities suitable for summer interns

The topics for the research projects included: Mexico and Northern Triangle communication perspectives, Port Resilience, Complex Coordinated Terrorist Attack and Active Attacks, and Analysis of Migrant Caravans from the Northern Triangle countries.

M3. Students arrive at BTI Institute

The USCGA cadets arrived after 6/30/2020 due to the internship timeline shifting based on COVID-19 travel restrictions. The activities of the internship will be reported as part of the Program Year 6 final report.

M4. Students deliver end-of-internship presentations

This Milestone will be completed outside of this reporting period for the four Coast Guard cadets during summer 2020. During summer 2019, Cadet Sarah Donaldson with the United States Military Academy at West Point presented her research findings under the mentorship of Weidong "Larry" Shi and Chris Bronk. Cadet Donaldson conducted literature reviews focused on cryptocurrency, illicit marketplaces, and overall concerns of cybersecurity. She presented the results of her research on 12 July 2019. The presentation can be found here: https://uh.edu/bti/news/stories/py5/donaldson-internship/donaldson_presentation_final.pdf

D.3.3. Internship Deliverables Table

ID	Description	Effort Period	Status
D.1	Students' summary report	8/2020	Outside of this reporting period
D.2	Students' evaluations of the summer program	8/2020	Outside of this reporting period
D.3	Students' presentations	8/2020	Outside of this reporting period
D.4	Faculty sponsor evaluation of the summer program	8/2020	Outside of this reporting period

D.3.4. Internship Deliverables Report

D1. Students' summary report

For the summer 2020 internship, students' summary report will be submitted in August 2020. This deliverable will occur outside of this reporting period.

D2. Students' evaluations of the summer program

For the summer 2020 internship, students' evaluation report will be submitted in August 2020.

For the summer 2019 internship. Cadet Donaldson assessed sponsor support and accommodations as excellent. She evaluated relevance of research topic to her studies and sponsor's support toward research as above average. Cadet Donaldson noted that she was less satisfied with the lack of in person interaction with her sponsors and would have preferred more opportunities.

D3. Students' presentations

For the summer 2020 internship, students' presentations will be held at the end of the summer 2020 internship.

For the summer 2019 internship, the presentation is here: https://uh.edu/bti/news/stories/py5/donaldson-internship/donaldson_presentation_final.pdf

D4. Faculty sponsor evaluation of the summer program

Faculty sponsor evaluation of the summer program will be submitted in August 2020.

For summer 2019, faculty sponsor evaluation of the program was satisfactory. Specifically noted was Cadet Donaldson's ability to summarize a great deal of information and deliver a condensed report was outstanding.

D.3.5. Internship Performance Metrics Table

ID	Description	Effort Period	Status
P.1	Program completion 100%	8/2020	Outside of this reporting period
P.2	Program effectiveness measured by students' rating: 95%+	8/2020	Outside of this reporting period
P.3	Program effectiveness measured by faculty sponsor's rating: 95%+	8/2020	Outside of this reporting period

Several of the above milestones, deliverables, metrics fall outside of the program year (July 1, 2019 – June 30, 2020). However, they were included in the work plan for completeness.

D.3.6. Internship Performance Metrics Report

P1. Program completion

This metric will occur in the next reporting period. This is on track to complete with no anticipated issues.

P2. Program effectiveness measured by students' rating: 95%+

This metric will occur in the next reporting period.

P3. Program effectiveness measured by faculty sponsor's rating: 95%+

This metric will occur in the next reporting period.

D.4. Cross-Border Fellowship

D.4.1. Fellowship Milestones Table

ID	Description	Effort Period	Status
M.1	Develop guidelines for the fellowship	10/2019	Complete
M.2	Announce Fellowship opportunity	12/2019	Complete
M.3	Select Fellows	2/2020	No Candidate Selected

D.4.2. Milestones Report

M1. Develop guidelines for the fellowship

The Guidelines for the Fellowship were developed and submitted to Associate Deans for Research and faculty members who could identify candidates aligned with the BTI portfolio on 17 October 2019.

M2. Announce Fellowship opportunity

BTI chose to align the BTI Fellowship to support the Curriculum Development Project. A professor in the College of Education, Curriculum and Instruction Department was identified and contacted on 23 October 2019. A candidate, a Ph.D. student in Curriculum and Instruction, was identified. The Chair of the Research Committee evaluated the application.

M3. Select Fellows

A former student of the BTI Research Committee Chairman was considered to be the optimal choice for this fellowship based on candidate's STEM background. The secondary candidate from the College of Education was also considered and the Senior Researcher and Research Committee Chairman discussed the options on 14 January 2020 and again on 02 March 2020. The Research Committee Chairman reached out to his former student who did not reply to the request, so the Chairman opted for the College of Education candidate. BTI received notice that the fellowship would not be supported beyond the current program year and as a resultno fellowship was awarded.

D.4.3. Fellowship Deliverables Table

ID	Description	Effort Period	Status
D.1	Guidelines for the fellowship	10/2019	Complete
D.2	Fellowship award	2/2020	No candidate Selected

D.4.4. Deliverables Report

D1. Guidelines for the fellowship

The Guidelines for the Fellowship were developed and submitted to Associate Deans for Research and faculty members who could identify candidates aligned with the BTI portfolio on 17 Oct 2019.

D2. Fellowship award

The fellowship was not awarded.

D.4.5. Fellowship Performance Metrics Table

ID	Description	Effort Period	Status
P.1	Successful award of fellowship as scheduled 100% on-time completion	2/2020	No candidate selected

D.4.6. Performance Metrics Report

P1. Successful award of fellowship as scheduled 100% on-time completion

The fellowship was not awarded.

E. Customer Outreach and Communications (O&C)

E.1. Effort Summary

The overall communication effort for this reporting period has been focused on informing the Institute's audiences of the milestones and deliverables of the projects carried over to and begun in PY5. These projects are the fruit of the customer discovery efforts, the Request for Proposals, and aggressive White Paper development during PY4. The communication efforts were divided into three lines of effort: outreach, marketing, and communication. These efforts were in line with the BTI Institute Communication Strategy that was submitted to OUP on 25 September 2019.

Outreach.

The outreach line of effort focused on stakeholder engagement at the location of our stakeholders. This was accomplished through conference presentations and attendance.

Conference Schedule 2019-2020		
Announced Date	Conference	Location
23 July-24 July 2019	CBP Trade Symposium	Chicago, IL
31 July 31 – 3 Aug 2019	COE Summit 2019	Arlington, VA
20-22 Nov 2019	Homeland Security Week	Washington, DC
11 – 12 Mar 2020	Border Security Expo 2020	San Antonio, TX
10 – 13 March 2020	Sea, Air and Land: Ports of the Future Conference	Houston, TX
1 – 4 April 2020	Association for Borderlands Studies	Portland, OR

CBP Trade Symposium (23, 24 July 2019)
The Executive Director attended the CBP Trade Symposium in Chicago, IL, on 23 and 24 of July 2019. The Executive Director was able to interact with stakeholders from the CBP Office of Trade, Canadian Border Services and numerous industry professionals.

A conversation with Brent Lepp of the Canadian Border Services Agency occurred in which Mr. Lepp expressed interest in a concept under development by BTI to conduct a pilot study on the border between the US and Canada to replicate and evolve the methods and technology used in Operation Drawbridge on the Southern US border.

A brief discussion with Mary Jo Muoio from GEODIS centered around the possibility of conducting a project utilizing Big Data Analytics in collaboration with GEODIS.

A group discussion with Richard DiDonna, an International Trade Analyst from the law firm of Wiley Rein LLP and Meredyth Welsman, a Trade Compliance Manager from Samuel, involved the challenges in determining country of origin for steel imported into the United States. Both DiDonna and Welsman were interested in hearing more about the BTI proposal to use isotopic elemental analysis in steel samples (collaboration with Philip Monecke at Colorado School of Mines).

BTI was able to participate in one-on-one discussions with the Directors (and in some cases Assistant Directors) from the following Centers of Excellence and Expertise: Base Metals; Machinery; Petroleum, Natural Gas and Minerals; Pharmaceuticals, Health and Chemicals. An overview of BTI was presented to inform the Center Directors of the existence of BTI and the role that BTI can play in assisting the CEE's.

The CBP Trade Symposium agenda can be found here: https://www.cbp.gov/sites/default/files/assets/documents/2019-Jul/2019%20TS%20External%20Agenda%20V13.pdf.

COE Summit 2019 (30 July to 1 August 2020)
The BTI Institute management team and research committee chair attended the COE Summit 2019 in Arlington, VA, from 31 July to 3 August 2019. Information about the COE Summit, including agenda, can be found here coesummit.org.

The theme of the summit was “Homeland Security Challenges: Evolving Threats and Dynamic Solutions.” The members of the BTI Institute were involved in the planning process for the summit, including the co-development of one of the plenary tracks, co-chairing of the communications committee and education committee, and participation in the showcase committee. The Executive Director co-developed Track 1: Gray Zone Threats, in collaboration with the Executive Director from ADAC. The thrust of the Track 1 centered around the ‘who’ and the ‘what’ of the threats within those areas in which both traditional state actors and non-state actors target the nation’s security in non-traditional ways.

The Institute also hosted a booth during the Innovation Showcase. The Institute team presented current and past research initiatives as well as discussed upcoming research opportunities. Additional highlights included BTI Director participating in an interview about the BTI Institute, and a booth visit by William Bryan, Senior Official Performing the Duties of the Undersecretary of Science and Technology.

The BTI Institute Manager, Research and the Manager of Communications and Outreach attended the Homeland Security Week in Washington, DC, from 20 to 22 November 2019. The conference themes primarily revolved around biometrics and identify science, cyber and critical infrastructure security, and the security nexus between DHS and the Department of Defense. The meeting was attended by approximately 500 government and private industry representatives. Through hosting a vendor booth, key contacts were made that will be pursued for opportunities in collaboration with the BTI Institute education initiative and industry partnerships for transition of current project portfolio.

Homeland Security Week (20-22 November 2019)
The Manager, Research, and the Manager, Communications and Outreach, traveled to Washington, D.C. to participate in the 2019 Homeland Security Week conference. BTI Institute representatives met with multiple industry-leading commercial providers to DHS as well as educators that could partner with the Institute on the Curriculum Development project. The Institute also hosted a vendor booth to discuss the Institute’s education and research initiatives. The conference themed around biometrics and identity science, cyber and critical infrastructure security, and the security nexus between DHS and the Department of Defense. A few booth visit highlights included the chair of the Department of Homeland Defense for the College of International Security Affairs at the National Defense University and the assistant group leader for Counter-WMD systems at the MIT Lincoln Laboratory.

Port of the Future Conference (11 – 13 March 2020) – Showcase portion Cancelled
The BTI Institute co-hosted the inaugural Port of the Future Conference with the University of Houston College of Technology on 11 – 12 March 2020 in Houston, TX. The Conference brought influential members of industry, government and academia together to discuss the current challenges and solutions relevant to land, air, and seaports. Additionally, the discussions revolved around the future ports and the potential technologies or policies that can be implemented now to facilitate the needs of the future. The Director gave opening remarks. A research showcase portion of the conference (13 March 2020) was canceled due to increased precaution and guidance over COVID-19. Multiple researchers associated with the BTI Institute were able to present during the conference to highlight their research efforts and initiatives. This event was not supported with OUP funding.

Border Security Expo (11 – 12 March 2020) – Final (Demo) Day Cancelled

The Executive Director attended a portion of the Border Security Expo (due to overlap and conflict with execution of the Port of the Future Conference. On Thursday 12 March following the first plenary session, the Executive Director had a brief conversation with Elizabeth A. Cappello, Acting Chief Information Officer, Department of Homeland Security, regarding data challenges faced by BTI and the other Centers of Excellence. Subsequent plenary panels that followed included Procurement and Biometrics. In the afternoon it was announced that the final day activities would be cancelled due to COVID-19 and the meeting concluded. The BSE2020 conference agenda can be found here: https://www.bordersecurityexpo.com/conference/

Association for Borderlands Studies (1 – 4 April 2020) – Entire Conference Cancelled

The Association of Borderlands Studies meeting was canceled due to precaution of COVID-19 pandemic. A single-page and quarter-page advertisement for the Institute was developed and delivered for promotion during the conference and a paper was submitted and selected in order to present at the conference.

Other outreach/engagement efforts included:

Innovation Summit. On 7 August 2019, BTI Executive Director attended 2019 Innovation Summit hosted by US Customs and Border Protection, Office of Trade, Trade Transformation Office, Business Transformation and Innovation Division at the Julie Meyers Conference Center, 500 12th Street SW, Washington, DC. Mark Clarke, Associate Provost for Faculty Development and Faculty Affairs at the University of Houston, gave a presentation summarizing the UH Innovation and Entrepreneurial Enterprise Ecosystem. The presentation described the successful transition of intellectual property and experiential learning opportunities for students involved in transitioning IP. BTI was one of two COE's invited to attend this Summit and was the only COE invited to participate by giving a presentation.

Leadership Training Offsite. The Executive Director attended the Office of Trade Leadership Training off-site at the DHS St. Elizabeth Campus in Washington, D.C., in order to facilitate a panel session at the request of the Deputy Executive Assistant Commissioner for the Office of Trade on 13 August 2019. The topic of the panel centered on China and its impact on trade. The panel consisted of four presentations and was moderated by Richard Willson, BTI Institute Research Committee member.

West Gulf Maritime Association. The Executive Director attended the 28 August 2019 Membership meeting of the West Gulf Maritime Association. The guest speaker for this event was John Deputy, Assistant Port Director, Tactical Operations Division, Houston Galveston Seaport. On short notice, Mr. Deputy was called to a meeting in Washington, DC and could not attend this event. In Mr. Deputy's absence, the alternate speaker was Edward "Tommy" Byrnes, Watch Commander from the Houston Galveston Seaport, OFO, CBP. Also, in attendance was Chief Charles Rust. The Executive Director gave a brief overview of BTI to Chief Rust and Commander Byrnes and distributed flyers for the Port of the Future conference.

CTPAT Houston Field Office. The BTI Institute hosted the Customs Trade Partnership Against Terrorism (CTPAT) Houston Field Office over four days in October. The single-day workshops brought over 800 representatives from businesses related to import and export to the University of Houston campus to participate in the minimum-security workshop.

Joint Task Force West. The Executive Director traveled to San Antonio, TX to attend a meeting at the Headquarters of Joint Task Force West on 14 November 2019 to provide an overview of the history of the DHS Centers of Excellence and the activities of the BTI Institute. The JTF-W Director gave insight into the challenges faced on the Southern US Border.

Consulate General of Costa Rica. The BTI Institute hosted Consul General Herbert Espinoza, Consulate General of Costa Rica in Houston on 15 November 2019. The Director and Executive Director met with Hon. Espinoza to continue developing the relationship between BTI and Costa Rica initiative by the Honorable Consul General Carlos Pacheco in 2016 and more recently (June 2019) with the Honorable Ambassador of the Republic of Costa Rica, Fernando Vicente Llorca Castro. The meeting with Consul General Espinoza involved the exchange of information including the role of the Consul General in Houston and the region and the history and current portfolio of activities at BTI.

Texas Southern University. The BTI Institute Research Committee Chair, The Manager of Research and Development, and the Manager of Education and Training met with the Department Chair of Transportation Studies with the College of Science Engineering and Technology at the Texas Southern University on 5 December 2019. The team discussed the curriculum development program and the opportunities to share coursework, subject matter experts, and students with TSU's Department of Homeland Security Scientific Leadership Award program.

Texas Homeland Security Council Meeting. The Executive Director traveled to Austin, TX to attend the Texas Homeland Security Council meeting at the Texas Department of Public Safety Headquarters on 11 December 2019. The council heard two presentations. One presentation was by Organized Retail Crime Unit specialists from Home Depot that discussed their retail crime investigations and collaboration with federal, state, and local law enforcement agencies. Richard Henderson (Texas Department of Public Safety) discussed details of the multi-agency, multi-jurisdictional response to the Midland-Odessa mass shooting on August 31st, 2019. Other agenda items included: 2019 Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR); Texas Cross-Border Mass Migration Plan; Texas Homeland Security Strategic Plan (HSSP) Agency Implementation Plans.

Texas Higher Education Coordinating Board Commissioner. The Director met with the Texas Higher Education Coordinating Board Commissioner at the University of Houston on 16 January 2020. The Director detailed the accomplishments of the BTI Institute and the impact on education in Texas.

CTPAT Director. The Executive Director met with the Director of CTPAT at the University of Houston Technology Bridge in Houston, TX on 13 February 2020 to discuss logistics of and tour the location for a proposed CTPAT Commercial Customs Operations Advisory Committee onsite meeting.

OFO Houston. The Director of Field Operations Houston visited the test site location for "Exploring Homeland Security Applications for Unmanned Autonomous Systems" at the University of Houston Technology Bridge at the University of Houston on 20 February 2020 in order to see a live demonstration of the sensor capabilities and deployment.

Marketing

For the reporting period, the BTI Institute has developed marketing materials for the curriculum development program (certificates, undergraduate degree, graduate degree), a technology fact sheet on "Identifying Human Crossers Between Ports of Entry" (submitted to OUP Communications Committee on 24 October 2019), videos about the utilization of Unmanned Aerial Systems at Maritime Ports, videos from the Port of the Future Conference, final project reports for three completed projects, and the associated backgrounders for each.

The BTI Institute additionally invested in branded Pens, Notebooks, Stickers, Calendars, and Sticky Notepads to support brand recognition and trust. Brand trust is created when the BTI branding is associated with quality of work and ability to perform. For example. The BTI branded pen in the hands of the CTPAT director causes not only recognition from others that see it in use but the association with the quality and ability to perform that CTPAT holds. The same for a BTI notebook in the hands of a U.S. Coast Guard cadet who interned over the summer. The branded notebook is recognized at the academy as it is associated with a quality summer internship experience.

Communication.

The communication effort for PY5 focused primarily on highlighting efforts, milestones, and deliverables of the current project portfolio. This effort is in line with the BTI Institute PY5 Communication Strategy. Efforts to this end included the Quarterly Newsletter (three editions published, all contacts), Monthly Reports (eleven editions, limited contacts), and the BTI Institute digital presence (website, social media).

Some highlights from communication in this reporting period include the UAS, Rohrbaugh project being highlighted by the UH Moment (https://www.youtube.com/watch?v=2DJijKbd6_E&feature=youtu.be) and KXAN Austin (https://www.kxan.com/news/project-looks-into-whether-drones-could-help-with-port-security/).

E.2. Milestones, Deliverables, Performance Metrics

E.2.1. Milestones Table

ID	Description	Effort Period	Status
M1	Create and distribute Monthly updates on BTI activities to the limited audience of team members, PIs, EAB, Champions, and DHS S&T OUP.	Monthly	Complete
M2	Create and distribute Quarterly Newsletters to entire distribution network.	Quarterly	Complete
M3	Review and update BTI Institute factsheet.	Quarterly	Complete
M4	Post to Social Media (LinkedIn and Twitter)	Monthly	Complete
M5	Update web-based systems (UH website,)	Monthly	Complete
M6	Create backgrounders based on BTI Institute research data	6/2020	Complete
M7	Review communication strategy and adjust based on updated priorities and desired stakeholders.	9/2019	Complete

E.2.2. Milestones Report

M1. Create and distribute Monthly Updates on BTI activities to the limited audience of team members, PIs, EAB, Champions and DHS S&T OUP

The Monthly Updates are a limited audience communication with the purpose of informing our key stakeholders (External Advisory Board, Current Project Champions, Current Project PIs, OUP management, BTI leadership) of the activities and efforts of the Institute staff.

July Update – 6 August 2019 – included COE Summit 2019, 21st Century Customs Framework meeting, summer internship presentations, and CBP Trade Symposium.

August Update – 5 September 2019 – included white paper and work plan updates, curriculum development updates, the CBP Innovation Summit, and CBP Office of Trade Leadership Training Off-site.

September Update – 3 October 2019 – included on-site visits of project champion and research team, a roll up of the four project quarterly reports, a list of the projects currently under review or work plan development, updates from curriculum development, and a highlight of National Research Administrators day.

October Update – 5 November 2019 – included CTPAT workshop, an update on RFP 19-01, an update on the education initiatives, and the Blockchain news article.

November Update – 4 December 2019 – included engagement with Joint Task Force West, engagement with Consul General Costa Rica, the kickoff of the Hunt Institute project, and media engagement for the Institute's UAS project.

December Update – 6 January 2020 – included Texas Homeland Security Council Meeting, Research Committee meeting updates, notification of acceptance of a paper for the Association of Borderlands Studies Conference, notice of follow on funding for the DHS MSI SRT.

January Update – 5 February 2020 – included THECB Commissioner visit, updates on project meetings, notice on approval of projects, and the offering of the first BTI Institute developed course.

February Update – 4 March 2020 – included the EAB telephonic meeting, Data Call, meeting with CTPAT Director, and meeting with CBP Southwest Regional Science Center staff.

March Update – 3 April 2020 – included follow on meeting with CBP Southwest Regional Science Center director, the Port of the Future Conference, and the availability of the BTI Institute course for professionals.

April Update – 5 May 2020 – included the CTPAT analysis project overview, specifics on this PY's DHS MSI SRT, and update on the summer internship, and the publishing of the newsletter.

May Update – 3 June 2020 – included CBP COAC Unified Entry Process team briefing, presentation to UH College of Technology Industry Advisory Board, final meetings, and an update on final reports.

June Update – 3 July 2020 – including EAB meeting, project programmatic updates, and final project reports.

M2. Create and distribute Quarterly Newsletters to entire distribution network
The Quarterly Newsletter is a maximum audience communication intended to highlight key activities and accomplishments of the researchers, educators, and staff of the BTI Institute.

Quarter 1 (July to September) – 17 October 2019, with a correction resend 18 October 2019. Subjects included a summer of student success, an article on the DHS COE Summit, and a highlight of the Institute engagement (CBP Trade Symposium, CBP Trade Innovation Summit, Office of Trade Leadership Offsite).
The PY5Q1 Newsletter can be found here:
http://www.uh.edu/bti/news/newsletter/newsletter_py5_q1_201910161.pdf

Quarter 2 Newsletter (October to December) – 15 January 2019. Subjects include news coverage of Weidong "Larry" Shi, news coverage of Lantern UAS, new project kickoff, Executive Director meeting with Joint Task Force – West, and Homeland Security Week. The PY5Q1 Newsletter can be found here:
https://uh.edu/bti/news/newsletter/newsletter_py5q2_.pdf

Quarter 3 Newsletter (January to March) – 22 April 2020. Subjects included RFP 19-01 projects, UAS-Based Sensors project video, Port of the Future video, and DHS COE Summit Highlight video. The PY5Q3 Newsletter can be found here: https://uh.edu/bti/news/newsletter/newsletter_py5_q3_final.pdf

Quarter 4 Newsletter (April to June) – 17 July 2020. Subjects included Honey DNA project highlight, BTI Institute Summer Research Team, the professional course offerings, and transition of final reports from three projects. Newsletter can be found here: https://uh.edu/bti/news/newsletter/newsletter_py5_q4_final.pdf

M3. Review and update BTI Institute factsheet
In addition to the BTI Institute Fact Sheet (https://uh.edu/bti/about/bti-institute_fact-sheet_print_20190522.pdf), the Institute created two certificate flyers (https://uh.edu/bti/education/certificates/) to advertise current education development initiatives. The Institute submitted one project technology fact sheet to OUP Communications group on 24 October 2019 based on Ioannis Kakadiaris' project, "EDGE: The 'Eye in the Woods" Image-based Human Detection and Facial Recognition System."

M4. Post to Social Media (LinkedIn and Twitter)
The BTI Institute has maintained its social media presence through LinkedIn and Twitter. Social media messaging has been utilized in accordance with the Communication Strategy to highlight the milestones and deliverables of the BTI Institute research and education projects. Additionally, the Institute has re-messaged DHS hiring opportunities, DHS S&T engagement opportunities, messages from other DHS COEs, and other relevant funding opportunities.
BTI Institute Twitter: @bti_uh (https://twitter.com/BTI_UH)
BTI Institute LinkedIn: Business: Borders, Trade, and Immigration
(https://www.linkedin.com/company/borders-trade-and-immigration-institute/)

M5. Update web-based systems (UH website)
BTI Institute Website: www.uh.edu/bti/

The BTI Institute website is the primary public facing information source. The website is constructed under the University of Houston Cascade Content Management System and modeled after the standard University of Houston front page. The website is divided into "About the Institute," "Research," "Education," "Partner with BTI," and "News and Media."

M6. Create backgrounders based on BTI Institute research data

Three backgrounders were created based on completed BTI Institute research projects during Program Year 5:

- **"**Transforming Trade and Ensuring Global Supply Chain Security with Blockchain" https://uh.edu/bti/research/shi-iakovou-blockchain/blockchain-factsheet-reduced1.pdf
- "Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports" https://uh.edu/bti/research/lantern-uas/factsheet-uas-basedsensors-reduced-28may2020.pdf
- "Validating Deterrence Models for Scanning Technologies" https://uh.edu/bti/research/deterrence-models/factsheet-deterrence-reduced.pdf

M7. Review communication strategy and adjust based on updated priorities and desired stakeholders

The BTI Institute communication strategy has been focused on disseminating information regarding the milestones and deliverables of the projects initiated during PY4, with a heavy emphasis on actual impact of the research and education initiatives of the BTI Institute. This strategy incorporates sublines of efforts, including outreach, marketing, and communication as identified in our PY5 Work Plan.

E.2.3. Deliverables Table

ID	Description	Effort Period	Status
D1	12 editions of the Monthly Report	Disseminated within three working days of the end of the month	Complete
D2	Four editions of the Newsletter	Quarterly	Complete
D3	One BTI Institute factsheet (digital and hard copy)	6/2020	Complete
D4	Two unique posts per month across the social media platforms	Two per month	Complete
D5	All project information and deliverables updated on web-based systems (UH website)	As occurs and monthly	Complete
D6	Backgrounders created based on finalized research projects	As available	3 complete
D7	Updated Communication strategy	9/2019	Complete

E.2.4. Deliverables Report

D1. 12 editions of the Monthly Report

In this reporting period, one edition of the Monthly Report for PY4 (June) and twelve editions of the Monthly Report for PY5 (July, August, September, October, and November) have been disseminated. Are were disseminated through Emma Email Marketing to a limited audience of OUP, Researchers, and the EAB.

D2. Four editions of the Newsletter
Quarter 1 Newsletter (July to September) – 17 October 2019, with a correction resend 18 October 2019.
Quarter 2 Newsletter (October to December) – 15 January 2019.
Quarter 3 Newsletter (January to March) – 22 April 2020.
Quarter 4 Newsletter (April to June) – 17 July 2020.

D3. One BTI Institute factsheet (digital and hard copy)
Complete and available. Reviewed for updates on a quarterly basis and as needed. (https://uh.edu/bti/about/bti-institute_fact-sheet_print_20190522.pdf)

D4. Two unique posts per month across the social media platforms
For Twitter: July (14), Aug (12), Sep (6), Oct (10), and Nov (11), Dec (6), Jan (7), Feb (6), Mar (11), Apr (6), May (2), June (8)
For LinkedIn: July (2), Aug (2), Sep (2), Oct (1), and Nov (3), Dec (0), Jan (5), Feb (3), Mar (2), Apr (4), May (3), June (3)

D5. All project information and deliverables updated on web-based systems (UH website)
For this reporting period, updates included a webpage for the new research projects.

"Tactical Mapping of Border Security Impacts: El Paso Sector" (https://uh.edu/bti/research/hunt-tacticalmapping/) to include abstract and graphic.

"Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination" *(*https://uh.edu/bti/research/border-wait-time/*)* to include abstract and graphic.

"Addressing Cross Border E-Commerce Challenges with Emerging Technologies" (https://uh.edu/bti/research/ecommerce-shi/) including abstract and graphic.

"Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program" (https://uh.edu/bti/research/ctpat-project/) including abstract and graphic.

"DNA Assays for Determining Honey Origins" (https://uh.edu/bti/research/honey-dna/) including abstract and graphic.

"The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Northern Triangle Migrants" (https://uh.edu/bti/research/start-roadless/) including abstract and graphic.

"Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment" (https://uh.edu/bti/research/perspectives/) including abstract and graphic.

"Economic Motivations of Migrants from the Northern Triangle" (https://uh.edu/bti/research/create-econmotive/) including abstract and graphic.

"Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States" (https://uh.edu/bti/research/mpi-regionalapproach/) including abstract and graphic.

Final Project Reports were updated on the research webpages.

"Validating Deterrence Models for Scanning Technologies" final report (https://uh.edu/bti/research/deterrence-models/).

"Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports" final report (https://uh.edu/bti/research/lantern-uas/).

"Transforming Trade and Ensuring Global Supply Chain Security with Blockchain" final report (https://uh.edu/bti/research/shi-iakovou-blockchain/).

D6. Backgrounders created based on finalized research projects
The BTI Institute created three backgrounders based on finalized research projects during PY5.

D7. Updated communication strategy
The BTI Institute Communication Strategy was submitted to the DHS S&T OUP PM on 25 September 2019.

E.2.5. Performance Metrics Table

ID	Description	Quantitative Performance Target	Effort Period	Status
P1	Monthly Report	Within three working days of end of month; distribution list	Monthly	Achieved
P2	Newsletter	Reach based on open rate and click rate (20% and 6%)	Quarterly	Achieved
P3	Social Media	150 impressions per post (across both platforms)	Ongoing	Achieved
P4	Websites	100 users per month (UH website)	Ongoing	Achieved

E.2.6. Performance Metrics Report

P1. Monthly Report
The July and August reports were distributed on the morning of the fourth working day at the end of the month. The September, October and November reports were distributed by the third working day at the end of the month. The distribution list included the External Advisory Board, DHS S&T OUP contacts, project Principal Investigators, project Champions, and the leadership of the University of Houston College of Technology.

P2. Newsletter
July to September 2019 – Open Rate: 24.6% and Click Rate: 11.1%
October to December 2019 – Open Rate: 23.8% and Click Rate: 5%
January to March 2020 – Open Rate: 24.0% and Click Rate: 16.4%
April to June 2020 – Open Rate: 20.0% and Click Rate: 12.5%

P3. Social Media

Utilizing the analytics provided by each platform, the following is the per month breakdown of impressions utilizing social media:
July – 16 posts/6873 total impressions – 430 impressions per post
August – 14 posts/4688 total impressions – 335 impressions per post
September – 8 posts/2203 total impressions – 275 impressions per post
October – 11 posts/3783 total impressions – 344 impressions per post
November – 14 posts/3053 total impressions – 218 impressions per post
December – 6 posts/1901 total impressions – 317 impressions per post
January – 12 posts/1819 total impressions – 151 impressions per post
February – 9 posts/1598 total impressions – 178 impressions per post
March – 13 posts/1904 total impressions – 146 impressions per post
April – 10 posts /1807 total impressions – 180 impressions per post
May – 5 posts/1453 total impressions – 290 impressions per post
June – 11 posts /1842 total impressions – 168 impressions per post

P4. Websites
Utilizing Google Analytics, the below is the reported users by month:
July – 356
August - 436
September – 410
October – 663
November – 461
December – 383
January – 562
February – 545
March – 547
April – 371
May – 366
June - 395

F. Transition

Education

Two original courses are offered as a result of the Curriculum Development project. These courses are offered as both for-credit courses for University of Houston students and as part of a certificate program from professional students. The online course offerings for University of Houston students are at https://www.uh.edu/bti/education/uh-courses/. The online course offerings for Certifications for Professionals are at https://www.uh.edu/bti/education/certificates/.

The Venezuela-Nicaragua project (MPI-Selee) transitioned their findings through Stakeholder Roundtables on 29 October 2019. There were three public roundtables and one private roundtable. Additionally, efforts have begun on their Report and Launch Events that will be held at MPI and in the U.S. Congress. Those transition events will take place outside of this reporting period.

The EDGE project (UH-Kakadiaris) publicly presented the *EDGE19: A Cross Spectral Evaluation Dataset for Multiple Surveillance Problems* by submitting to the 2020 Winter Conference on Applications of Computer Vision. The dataset is a referenced annotated data set taken specifically for this project on the University of Houston campus.

The final report for project "Transforming Trade and Ensuring Global Supply Chain Security with Blockchain and Smart Contracts," authored by PIs Weidong "Larry" Shi and Eleftherios Iakovou, Vincent Iacopella with review and approval by DHS Project Champion Vincent Annunziato, is available at https://www.uh.edu/bti/research/shi-iakovou-blockchain/.

The final report for project "Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports," authored by PIs Ben Rohrbaugh and David Hansell, with review and approval by DHS Project Champion Namdoo Moon, is available at https://www.uh.edu/bti/research/lantern-uas/.

The final report for project "Validating Deterrence Models for Scanning Technologies," authored by PI George Thompson, with review and approval by DHS Project Champion Namdoo Moon, is available at https://www.uh.edu/bti/research/deterrence-models/. Briefings scheduled to occur outside of the project period include a 13 July 2020 a virtual briefing with representatives from Countering Weapons of Mass Destruction Office, Transportation Security Administration, Office of Strategy, Policy & Plans.

G. BTI Institute Project Portfolio

G.1. Venezuela and Nicaragua: Regional Migration Crisis in the Making; Andrew Selee, President, Randy Capps, Director of US Research; Migration Policy Institute

G.1.1. BTI Management Summary

This project completed as scheduled in February 2020. The final report was published in February 2020 and the results were publicly distributed via two webinars and a congressional briefing. Other programmatic events for the project during this program year included a Quarterly Meeting in August 2019 and November 2019. A final meeting was held in conjunction with the "Regional Approach" Quarterly Meeting on 7 May 2020.

The final report can be viewed here: https://www.migrationpolicy.org/research/latam-caribbean-responses-venezuelan-nicaraguan-migration

The press release is here: https://www.migrationpolicy.org/news/open-door-venezuelan-and-nicaraguan-migrants-latin-america-caribbean-closes-bit-amid-scale

This project met all milestones, deliverables and performance measures. The Research Committee and BTI Institute Management is satisfied with the results of the outcome of the project and believe the deliverables to be of scientific merit.

G.1.2. Executive Summary

Project PI: Andrew Selee, President
Lead Institution: Migration Policy Institute
Co-PI: Randy Capps
Co-PI Institution: Migration Policy Institute
Project Champion: David Cloe, Director, Latin America and Caribbean Affairs, Office of Strategy, Policy and Plans, DHS
Reporting Period: Project Year 1 (July 2019 to February 2020)

Objectives: 1) understand the dimensions of the Venezuelan and Nicaraguan migration outflow; 2) understand whether these outflows are likely to continue and increase/decrease; 3) understand how the U.S. government and regional governments can work together to manage these flows and prevent a wider crisis that could destabilize individual countries, generate a backlash against Venezuelan and Nicaraguan migrants, and potentially lead to greater flows northward to the United States

Baseline: There are no fully reliable data on the total number of Venezuelan and Nicaraguan migrants in each country of the region.

Methodology: The original plan for the project team to conduct fieldwork in Mexico and Central America (Guatemala, Honduras, El Salvador, Costa Rica, and Panama) on government policies, institutional capacities, and future options to cooperatively manage migration had to be modified due to the travel restrictions imposed by COVID-19. The project team pivoted to conducting remote interviews. In addition, the project team conduct research on migration flows to Mexico and to the U.S. Southwest border, working with publicly available databases from DHS, Mexico's National Immigration Institute (INM), the International Organization for Migration (IOM), and other available information sources. The project team conducted additional interviews of public authorities, migrant-serving organizations, and migrants themselves in Guatemala, Honduras, and El Salvador to build a detailed map of the sub-regional variation in migration patterns from those countries and the migration patterns of those from other source countries in Latin America, the Caribbean, Africa, and Asia.This project was completed on schedule in February 2020, achieving the target dates in a revised work plan. MPI published the final project report and hosted two webinars (one in English and one in Spanish) on Venezuelan migration on 11 February 2020. To supplement the report, Project PI Andrew Selee and MPI Associate Policy Analyst Jessica Bolter published an op-ed in *Foreign Policy*, titled "Could Venezuela's Loss Be Latin America's Gain?" on 7 February 2020. On the report launch date, Selee and Bolter engaged with the project champion and other Latin America and Caribbean Affairs staff in a conference call to discuss the final report. On 25 February 2020, Selee participated in a House Foreign Affairs staff briefing on Central American and Venezuelan migration in the region.

The other milestone completed during the reporting period was the roundtable discussion on policy responses to Venezuelan migration, held at MPI on 29 October 29 2019. The more than 30 participants included high-level government officials from Mexico, Costa Rica, Colombia, Ecuador, and Peru, as well as leaders from international organizations and civil society groups in the region. The Project team was pleased to have representatives of DHS, the State Department, and BTI as part of these discussions.

The findings from the research provided a high-level overview of how Latin America is responding to new migration flows from Venezuela and Nicaragua, along with an in-depth understanding of the nuances of migrant reception and integration in the most important receiving countries. The MPI team has transitioned this knowledge to the project champion and stakeholders and communicated it to broader audiences through the BTI research report and associated op-eds, public events, and the media. Selee and Bolter have become go-to sources for several reporters covering Venezuelan migration, and helped Americas Quarterly, an important regionally

focused journal, prepare an issue on migration in Latin America. This project also allowed the Project team to grow and deepen its network of contacts in Latin America, including government officials, international organizations, and civil society. Through regular engagement the Project team will periodically update findings about how migration and the public response to it is evolving in the region—information which will be shared with stakeholders and the general public.

Timeline of Key Events

- 7/10/19: June monthly report and Annual report submitted
- 7/12/19: Meeting with DHS project champion and Latin America and Caribbean Affairs staff to discuss preliminary findings
- 7/29/19-7/30/19: Field work in Colombia
- 7/31/19-8/2/19: Field work in Ecuador
- 8/5/19-8/7/19: Field work in Costa Rica
- 8/7/19: July monthly report submitted
- 9/3/19: August monthly report submitted
- 9/18/19: Additional field work in Ecuador
- 9/19/19: Keynote presentation at Global Forum on Migration and Development regional workshop, “Providing regular pathways from crisis to safety,” in Quito, Ecuador, by Bolter (funded under a separate grant)
- 10/3/19: September monthly report submitted
- 10/15/19: Presentation given to the European Union's Regional Seminar for the Service for Foreign Policy Instruments on “Migration Crises in the Americas” by Selee and Bolter (funded under a separate grant)
- 10/29/19: Private roundtable to discuss policy options and three public events on Venezuelan and Nicaraguan migration held at MPI (public events funded under a separate grant)
- 11/6/19: October monthly report submitted
- 11/18/19: Quarterly meeting held with project champion, other DHS staff, and BTI
- 12/4/19: November monthly report submitted
- 1/7/20: December monthly report submitted
- 2/6/20: January monthly report submitted

- 2/7/20: Op-ed published in Foreign Policy (https://foreignpolicy.com/2020/02/07/could-venezuelas-loss-be-latin-americas-gain/)

- 2/11/10: Final report published (https://www.migrationpolicy.org/research/latam-caribbean-responses-venezuelan-nicaraguan-migration), launch webinars and briefing call with DHS held, by Selee and Bolter

- 2/14/20: Op-ed published in El Universal (https://www.eluniversal.com.mx/opinion/andrew-selee/el-momento-migratorio-latinoamericano)

- 2/25/20: Congressional staff briefing convened by the House Committee on Foreign Affairs on Migration in the Americas by Selee

- 3/6/20: February monthly report submitted

G.1.3. Milestones, Deliverables, and Performance Metrics

G.1.3.1. Milestones Table

ID	Description	Due Date	Status
M1	Roundtable Discussion	10/2019	Complete
M2	Report on Policy Options	1/2020	Complete
M3	Launch events	1/2020	Complete

G.1.3.2. Milestones Report

M1. Roundtable Discussion

This milestone was completed in October 2019. On 29 October 2019, the Project team hosted a series of three-public panels funded by a separate grant (though taking advantage of the presence of the government officials through the BTI project)—on regional responses to Venezuelan migration, Costa Rica's responses to Nicaraguan migration, and the international response to migration crises in Latin America—as well as the private roundtable associated with this DHS-funded project. The Project team convened, for both the public and private events, high-level government officials from Latin America, influential civil society leaders from the region, representatives of international organizations, and various U.S. stakeholders—from DHS, State Department, the private sector, think tanks, foundations and civil society organizations—for substantive and productive discussions on the migration-related challenges the region is facing and recommendations to meet these challenges. The private roundtable included more than 30 external participants, including most notably:

- Christian Krüger Sarmiento, Director, Migration Colombia
- Frieda Roxana Del Águila Tuesta, Superintendent of Migration, Peru
- Hernán Yánez González, Under Secretary of International Protection and Assistance for Immigrants, Ministry of Foreign Affairs and Human Mobility of Ecuador

- Jose Tomás Vicuña, National Director, Servicio Jesuita de Migrantes, Chile
- Carlos Andrés Torres Salas, Vice Minister of the Interior and Police, Costa Rica
- Chiara Cardoletti-Carroll, Deputy Regional Representative for the United States and the Caribbean, UNHCR
- Dana Francis, Director, Office of Assistance for Europe, Central Asia, and the Americas, Bureau of Population, Refugees, and Migration, U.S. Department of State
- Betilde Muñoz-Pogossian, Director, Department of Social Inclusion, Organization of American States (OAS)
- Susan Kamerer, Science and Technology Directorate, DHS
- Viviana Salcedo, Deputy Director, Latin America and the Caribbean, Office of International Affairs-Office of Policy, DHS
- George Zouridakis, Research Committee Chairman, BTI

M2. Report on Policy Options
This milestone was completed in February 2020, when the final project report was published. The report included detailed analyses of government documents and surveys on migrant demographics in 11 countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guyana, Mexico, Peru, Trinidad and Tobago, and Uruguay. Researchers affiliated with MPI, including the authors, conducted both documentary research and field work for ten countries and documentary research and phone interviews in the eleventh (Guyana). Altogether the team conducted more than 100 interviews with key informants, including government officials, representatives of NGOs, migrant-led groups, and international organizations.

M3. Launch Events
The milestone was completed in February 2020, with the conduct of the two webinars and participation in the congressional briefing.

G.1.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Roundtable Discussion	10/2019	Complete
D2	Report on Policy Options	2/2020	Complete
D3	Launch events (2)	2/2020	Complete

G.1.3.4. Deliverables Report
D1. Roundtable Discussion
This deliverable was completed in October 2019. In October, we completed a draft of the report and circulated it in advance of the private roundtable discussion. On October 29, the Project team hosted a series of three public panels funded by a separate grant—on regional responses to Venezuelan migration, Costa Rica's response to Nicaraguan migration, and the international response to migration crises in Latin America—as well as the private roundtable associated with this DHS-funded project. The Project team convened, for both the public and private events, high-level government officials from Latin America, influential civil society leaders from the region,

representatives of international organizations, and various U.S. stakeholders—from DHS, State Department, the private sector, think tanks, foundations and civil society organizations—for substantive and productive discussions on the migration-related challenges the region is facing and recommendations to meet these challenges.

D2. Report on Policy Options
This deliverable was completed in February 2020, when the final project report was published. The reported included detailed analyses of government documents and surveys on migrant demographics in 11 countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guyana, Mexico, Peru, Trinidad and Tobago, and Uruguay. Researchers affiliated with MPI, including the authors, conducted both documentary research and field work for ten countries and documentary research and phone interviews in the eleventh (Guyana). Altogether then team conducted more than 100 interviews with key informants, including government officials, representatives of NGOs, migrant-led groups, and international organizations.

The report concludes "The massive and sudden flow of Venezuelan migrants to almost every country in Latin America and the Caribbean, and of Nicaraguan migrants to Costa Rica, has forced receiving countries to re-examine their immigration and integration policies, or in some cases to develop them from scratch. Overall, these countries have tried to find pragmatic ways of accommodating recent arrivals, providing some form of legal status to many and at least basic education and emergency health-care services to most, even those who lack legal status. Some have been more expansive in what they offer to recent Venezuelan and Nicaraguan arrivals than others, but almost all have tried to find ways to incorporate these immigrants into their societies and national institutions in some way. For many countries that have little prior experience with large-scale migration, this has meant building immigration systems and integration mechanisms almost overnight." The authors provide several suggestions to help shape future policy including:

- Balancing security and flexibility when designing entry requirements
- Exploring new ways to provide legal status, including through targeted regularization or employment-based programs
- Strengthening asylum systems, while maintaining other, more nimble legal pathways
- Improving access to education through flexible enrollment practices and ongoing support
- Overcoming health-care barriers through clear policies on access and financing
- Unlocking migrants' skills to boost labor market integration and local economies
- Developing constructive narratives about immigration to highlight opportunities, while not ignoring its challenges
- Building whole-of-government responses to complex issues

-

In the final paragraph of the report the authors succinctly note that “Migration continues through the region, and many Venezuelans and Nicaraguans appear likely to remain in their host countries for years to come, if not permanently. These countries will need to continue to evolve their policies and institutional structures to adapt to this new reality, and they will need support from the international community to do so successfully.” Themes that the international community are encouraged to focus on include:

- Moving from emergency responses to long-term development and integration
- Strengthening support for local responses
- Financing immigrant integration and development initiative
- Encouraging regional responses to migration
- Investing in data collection and information sharing

D3. Launch events
The deliverable was completed in February 2020, when we held the two webinars and participated in the congressional briefing.

G.1.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Stakeholders Roundtable successful	10/2019	Complete
KPI-RI-2	Report on policy options provides innovative and forward-thinking ideas.	2/2020	Complete
KPI-D-1	Launch events at MPI and U.S. Congress	2/2020	Complete
KPI-D-2	Media and social media outreach	2/2020	Complete

G.1.3.6. Performance Metrics Report
KPI-RI-1. Stakeholders Roundtable successful
The Stakeholder Roundtable (public and private) occurred on 29 October 2019. They were successful, as more than 30 key stakeholders—many top government officials from the region—participated in substantive and productive discussions on migration-related challenges and policy responses in the region, and shared valuable information that the project team incorporated in the final project report.

KPI-RI-2. **Report on Policy Options Provides Innovative and Forward-Thinking Ideas**
The final project report on policy options was published on 11 February 2020. The report provided a broad range of recommendations for receiving countries and the international community. The Project team received interest in following up on these recommendations from the Senate Foreign Relations Committee staff and positive feedback from senior colleagues in the US government, Costa Rican and Colombian governments, and several international and nongovernmental organizations.

KPI-D-1. Launch Events at MPI and U.S. Congress

The launch events—the two webinars held on 11 February 2020 and the congressional briefing held on 25 February 2020—were successful. A variety of experts, with different regional and national focuses, participated in the English and Spanish webinars. The English webinar featured Feline Freier, one of Peru's leading migration experts, and Juliana Miranda Rocha, from the Jesuit Refugee Services in Brazil. The Spanish webinar featured Diego Beltrand, IOM's Special Envoy for the Venezuelan Situation; Luciana Gandini, one of the leading experts on migration in the region and a professor at Mexico's National Autonomous University; and Luis Carlos Rodriguez, the Advocacy Director for the Jesuit Refugee Services in Latin America. The English webinar had 140 attendees; the audio posted on the MPI website has received 555 plays, and the video has received 81. The Spanish webinar had 67 attendees; the audio posted on the MPI website has received 547 plays, and the video has received 95.

KPI-D-2. Media and Social Media Outreach

The report was widely disseminated through the media, as was the authors ' expertise. In February 2020, the report and the authors were cited in the following outlets:

- Final report cited in *Los Angeles Times* article on regional responses to Venezuelan migration: https://www.latimes.com/world-nation/story/2020-02-12/fewer-options-abroad-for-fleeing-venezuelans
- Final report cited in The New Humanitarian article on xenophobia toward Venezuelan migrants in Latin America: https://www.thenewhumanitarian.org/news-feature/2020/02/13/Venezuelan-migrants-xenophobia-Latin-America
- Bolter quoted in *Washington Post* article on Venezuelan migration to the United States: https://www.washingtonpost.com/immigration/trump-venezuela-asylum-border/2020/02/27/c9c827cc-54de-11ea-9e47-59804be1dcfb_story.html
- Selee quoted in ImpactAlpha on the role of investment to integrate Venezuelan migrants: https://impactalpha.com/investing-to-integrate-the-growing-wave-of-displaced-people-in-latin-america/
- Bolter interviewed on TV Venezuela on Venezuelan migration: https://www.youtube.com/watch?v=Fo1St1zBe3Y
- Final report cited in *Reforma* article on the situation of Venezuelan migrants in Mexico: https://www.reforma.com/aplicacioneslibre/articulo/default.aspx?id=1872671&md5=d33b9eacb9e88b600f512cff20dd3c66&ta=0dfdbac11765226904c16cb9ad1b2efe
- Final report cited in Americas News Network article on Venezuelans in Trinidad & Tobago and Guyana: https://www.newsamericasnow.com/caribbean-news-venezuelans-in-the-caribbean/

- Bolter quoted in Reporte Confidencial article on migration of unaccompanied Venezuelan children: https://www.reporteconfidencial.info/2020/02/12/aumenta-el-numero-de-ninos-venezolanos-no-acompanados-que-salen-por-las-fronteras/
- Selee and Bolter's *Foreign Policy* op-ed translated into Spanish in Ecupunto, an Ecuadorian news site: https://ecupunto.com/2020/02/14/venezuela-america-latina/
- Final report press release published in Agenparl: https://agenparl.eu/open-door-for-venezuelan-and-nicaraguan-migrants-in-latin-america-amp-caribbean-closes-a-bit-amid-scale-of-flows-strains-on-public-services/

Since the project ended, Selee also published an article in *Americas Quarterly*, in April 2020, based on the work done for this project: "The Creative Thinking Shaping Latin America's Migrant Response," https://www.americasquarterly.org/article/the-creative-thinking-shaping-latin-americas-migrant-response/.

G.2 EDGE: The "Eye in the Woods" Image-based Human Detection and Recognition System; Ioannis A. Kakadiaris; University of Houston

G.2.1. BTI Management Summary

The "EDGE" project, a multi-year endeavor, completed its program period as of 30 June 2020. During this program year, the project held Quarterly Meetings in September 2019, January 2020, and May 2020. In the May Quarterly Meeting, The PI reported on the EDGE20 dataset and the associated annotations for carrying actions. Carrying actions related to the EDGE20 data set include carrying a backpack or carrying tube. The PI team also used UHSINICA data set, a publicly available resource compiled for YouTube Videos to train the system on recognizing six different carrying actions including load, backpack, handbag, phone, weapon, or not carrying.

The Project team also reported the accomplishment of the tasks developing and evaluating a face detection algorithm. The team developed an occlusion-aware face recognition system with attribute predictions (OREO) which accomplished the task Discriminative Facial Feature Extractions from Facial ROI. The next task, Meta-information Enrichment for Images, focused on carrying-related actions from a single image. The team developed RECASPIA, a method that recognizes carrying actions in static images using person, object and scene attributes, not restricted to one action, and using information that is not available during deployment. Compared to two other methods (ResNet-34 and SVM), and using UHSINICA and EDGE20, the RECASPIA method outperformed in identifying carrying actions.

The BTI Institute Executive Director led a discussion on transition opportunities for the project. The PI offered two areas where further research is needed (facial recognition of juvenile populations and how facial recognition has been affected by the recent need for face masks in public spaces). Based upon the results of this project, the team proposed development of a new type of trail camera with algorithms internally hard coded and the ability to remotely alert operators at monitoring stations.

The PI, BTI Institute, and Research Committee acknowledge the difficulty of completing KPI-D-1 (One event showcasing the EDGE technologies) due to the cancellation of the Research Showcase portion of the Port of the Future Conference due to COVID-19 restrictions. The Champions indicated no issue with the status of the project. All tasks, milestones, and deliverables were achieved, and the project was completed as scheduled. The project has resulted in the publication of five articles and 11 conference presentations.

G.2.2. Executive Summary

Project PI: Ioannis Kakadiaris
Lead Institutions: University of Houston
Support Personnel: Ioannis Konstantinidis, (Project Coordinator), Ha Le (Graduate Research Assistant), Lei Shi (Graduate Research Assistant), Christos Smailis (Graduate Research Assistant), Charles Livermore (Graduate Research Assistant), Xiang Xu (Graduate Research Assistant), and Yuhang Wu (Graduate Research Assistant)
Project Champion: Arun Vemury, Director, Biometrics Technology Engine
Reporting Period: Project Year 2 (Project months 12 through 24)

Objectives: **(1)** Deploy a private cloud-based software system for analyzing the image data received from trail cameras and a database and information retrieval API for storing all data and meta-data; **(2)** Evaluate state-of-the-art algorithms and develop as needed algorithms to classify and tag the acquired images (VIS and NIR) by: (i) human presence or no human presence and (ii) if human presence is detected, classify whether or not the image is usable for face recognition (Module 1); **(3)** Acquire, curate and annotate images by trail cameras (VIS and NIR) in non-urban environments; **(4)** Evaluate state of-the-art algorithms and develop as needed algorithms to perform face recognition using VIS images and evaluate algorithms for NIR-based Face Recognition (Module 2); **(5)** Develop and implement an algorithm to extract (for each image tagged to have human presence) the following information: (i) direction of movement of the individual or group, and (ii) carry-weapon / carry-load / no-carry (Module 3); **(6)** Evaluate the proposed system, modules and algorithms

Baseline: Databases have been historically captured indoor under controlled conditions, contain limited number of subjects and have focused on detecting pedestrians in urban environments.

Methodology: An iterative design methodology was applied across all objectives to ensure that the annotation framework, the analysis modules, and the database are implemented according to the functional requirements described in the objectives and will be elaborated by the design team.

G.2.3. Milestones, Deliverables, and Performance Metrics

G.2.3.1. Milestones Table

ID	Milestone	Due Date	Status
M2	Robust pedestrian detection algorithm-based system is ready and tested	1/2020	Complete
M3	EDGE integrated system is validated and tested	6/2020	Complete

G.2.3.2. Milestones Report

All milestones scheduled have been reached

G.2.3.3. Deliverables Table

ID	Deliverable	Due Date	Status
D3	Image collection and annotation report	7/2019	Complete
D4	Detection and tagging of human presence in images	12/2019	Complete
D5	Processing of the head region-of-interest (ROI) for VIS-NIR images	6/2020	Complete
D6	Evaluation of cross-domain face recognition for VIS-NIR images	1/2020, 6/2020	Complete
D7	Meta-information enrichment for images	6/2020	Complete
D8	Quarterly reports on communication with project champion	quarterly	Complete

G.2.3.4. Deliverables Report

The results of the EDGE project indicate the feasibility to analyze trail camera images to detect the presence of people, detect and recognize faces that can be matched to known crossers, count the number of people, and detect carry-load (gun, bag) to characterize individuals. The project demonstrated capability with existing source infrastructure, (i.e., the network of trail cameras), and analyzed both daylight visible (VIS) and nighttime near infrared (NIR) images. The project has demonstrated (i) an integrated approach to image-based analysis for human crossing detection and (ii) a system that will provide meta-information to help the operators understand human crossing on the larger scale, reveal interdependencies between actors and places and derive possible patterns of movement and detailed activity parameters, such as carry load. The proposed system constructed on top of a scalable private cloud-driven prototype to facilitate quick and straightforward uptake for transition to industry level settings.

D3. Image Collection and Annotation Report

The report summarizes the effort related to collecting VIS and NIR images using appropriate cameras, annotating information related to persons, their faces and body landmarks and carrying labels, and producing an interactive exploration demo, a demonstration video, and a report. For overall data collection, four trail cameras were used to acquire from the visible and near-infrared spectrums. More than 25,000 raw images were collected from 205 subjects during day and night capturing sessions. The Report was submitted to the BTI Institute and was archived as <Report-D3.pdf>.

D4. Detection and tagging of human presence in images

Specifically, the Project team introduced a decoupled visible region network, dubbed (DVRNet+). To enable the network to learn discriminative features of occluded pedestrians by using the head, visible-body, and full-body supervision signals, three modules were designed. The first module is an attention-based feature interleaver module (AFIM), which is designed to incorporate additional contextual information and make the network focus on reliable information. The second module is a binary mask learning module

(BMLM), which is designed to learn binary masks of visible-body and full-body in the RPN stage to enhance the sensitivity of the network to object positions at pixel level. The third module is a head-aware feature enhancement module (HFEM), which is designed to provide stable and discriminative information for the network to learn discriminative features by using a supervised attention mechanism and a head supervision signal. Experimental results indicate the DVRNet+ achieves the same results with the stage-of-the-art but requires less parameters. Specifically, DVRNet+ achieves MR-2 of 10:5%, MR-2 of 62:02%, and MR-2 of 18:7% on the CityPersons, CrowdHuman, and EDGE20 benchmarks.

D5. Processing of the head region-of-interest (ROI) for VIS-NIR images
A pdf summarizing the results in this area called D5-HeadRegion.pdf has been uploaded at the deliverables section. The pdf denotes the quantitative results that the Project team achieved along with examples at which the performance of the algorithm is "good", "bad", and "ugly." The algorithm SANet achieves results of mAP of 85.5% and 22% at the day and night images of EDGE 20, respectively. This performance constitutes a statistically significant improvement over the state-of-the art algorithm.

D6. Evaluation of cross-domain face recognition for VIS-NIR images
A report summarizing the results in this area called D6-Evaluation-of-NIR-VIS FR.pdf has been uploaded at the deliverables section.

D7. Meta-information enrichment for images
A pdf summarizing the results in this area called D7-MetaInformation.pdf has been uploaded at the deliverables section. This pdf summarizes in detail the metainformation that we can capture from images.

D8. Quarterly reports on communication with project champion
The Project team utilized the Quarterly Meetings scheduled through the BTI Institute management team to meet this deliverable. A Quarterly Meeting was held on 19 May 2020.

Deliverable Location: https://uofh-my.sharepoint.com/:f:/g/personal/ikakadia_cougarnet_uh_edu/EhIp8LWoHqBNlW_8kVMojKgBCw_3pO_7RQxurq3_Ucsw0w?e=Zed6B9

G.2.3.5. Performance Metrics Table

ID	Performance Metric	Due Date	Status
KPI-RI-2	Achieve pedestrian detection accuracy within 5% of state-of-the-art both for VIS and NIR images	1/2020	Complete
KPI-RI-3	Achieve more accurate face recognition Rank-1 rates than COTS	7/2020	Complete
KPI-D-1	One event showcasing the EDGE technologies	10/2019	Complete
KPI-D-2	Two high impact publications	7/2020	Complete
KPI-D-3	Reference annotated dataset for VIS and NIR images	10/2019	Complete

G.2.3.6. Performance Metrics Report

KPI-RI-2. Pedestrian Detection Accuracy

Experimental results indicate the DVRNet+ achieves the same results with the stage-of-the-art but requires less parameters. Specifically, DVRNet+ achieves MR-2 of 10:5%, MR-2 of 62:02%, and MR-2 of 18:7% on the CityPersons, CrowdHuman, and EDGE20 benchmarks.

KPI-RI-3. Face Recognition rates

The recognition rates have been improved at a statistically significant rate as noted in the table below. See EDGE-FR-Rates.pdf at the deliverables' location:
(https://uofh-my.sharepoint.com/:f:/g/personal/ikakadia_cougarnet_uh_edu/EhIp8LWoHqBNlW_8kVMojKgB0GBiyW3017msWviwDXvuOg?e=sHt8FQ

Method	Rank 1				Rank 3				Rank 5			
	I01	I03	I05	All	I01	I03	I05	All	I01	I03	I05	All
COTS	87.81	88.24	88.38	87.86	87.01	87.26	87.32	88.24	88.84	89.33	89.68	88.43
FRADA+	**89.17**	**92.04***	**89.54**	**90.31***	**93.51***	**96.31***	**94.74***	**94.91***	**95.37***	**97.26***	**95.93***	**96.23***

(*): statistically significant

KPI-D-1. One event showcasing the EDGE technologies

The EDGE technologies were showcased at the 2019 DHS COE Summit from 30 – 31 July 2019 in Arlington, VA. Ha Le, presented the project as part of the Student Poster competition. His presentation and poster received first place overall.

KPI-D-2. Two high Impact publications.

The EDGE project resulted in a number of publications. Several articles have been published, and additional articles are currently either in review, or in preparation.

Journal Publications

1. L. Shi, I.A. Kakadiaris, "DVRNet+: A Robust Pedestrian Detector using Attention Mechanism and Feature Interaction", IEEE Transaction on Biometrics, Behavior, and Identity Science, 2020. (In preparation).
2. C. Smailis, K. Nguyen, M. Vrigkas, and I.A. Kakadiaris, "Recognizing Carrying Actions in Single Images Captured Under A Cross Spectral Surveillance Setting," Machine Vision and Applications, 2020. (In Preparation)
3. H. Le and I. A. Kakadiaris, "FRADA+: Face Relighting as Data Augmentation for Illumination-Robust Face Recognition," in IEEE Transactions on Biometrics, Behavior, and Identity Science, 2020 (In Preparation)
4. L. Shi, X. Xu and I. A. Kakadiaris. "Detecting Multi-scale Faces using Attention-based Feature Fusion and Context Enhancement." *IEEE Transactions on Biometrics, Behavior, and Identity Science*, 2020. (In Press)

5. L. Shi, X. Xu and I. A. Kakadiaris. “SSFD+: A Two-Stage Robust Face Detector.” IEEE Transactions on Biometrics, Behavior, and Identity Science. 1.3, 2019, pp. 181-191.

Conference Publications

1. X. Xu, N. Sarafianos, and I. A. Kakadiaris, “On Improving the Generalization of Face Recognition in the Presence of Occlusions,” in Proc. IEEE Conference on Computer Vision and Pattern Recognition Workshops, Jun. 16-18, 2020, Seattle, WA.
2. H. Le, C. Smailis, L. Shi, and I. A. Kakadiaris, “EDGE20: A Cross spectral evaluation dataset for multiple surveillance problems,” in Proc. IEEE Winter Conference on Applications of Computer Vision, Snowmass Village, CO, Mar. 1-5 2020, pp. 1-10.
3. X. Xu and I. A. Kakadiaris, “FaRE: Open source face recognition performance evaluation package,” in Proc. International Conference on Image Processing, Sep. 22-25, 2019, pp. 3272–3276.
4. C. Smailis, M. Vrigkas, and I.A. Kakadiaris, “RECASPIA: REcognizing Carrying Actions in Single images using Privileged InformAtion,” in Proc. IEEE International Conference on Image Processing, Sep. 22-25, 2019, pp. 26–30.
5. H. Le and I. A. Kakadiaris, “SeLENet: Semi-supervised low light face enhancement for mobile face unlock,” in Proc. IAPR International Conference on Biometrics, Crete, Greece, June 4-7, 2019, pp. 1-8.
6. Y. Wu and I. A. Kakadiaris, “Occlusion-guided compact template learning for ensemble deep network-based pose-invariant face recognition,” in Proc. IAPR International Conference on Biometrics, Crete, Greece, June 4-7, 2019.
7. L. Shi, X. Xu, and I. A. Kakadiaris, SANet: Smoothed Attention Network for Single Stage Face Detector, In Proc. International Conference on Biometrics, Crete, Greece, Jun. 4-7, 2019.
8. L. Shi, X. Xu, and I. A. Kakadiaris, SEFD: A Simple and Effective Single Stage Face Detector, In Proc. International Conference on Biometrics, Crete, Greece, Jun. 4-7, 2019.
9. H. Le and I. A. Kakadiaris, “Illumination-invariant Face Recognition with Deep Relit Face Images,” in Proc. IEEE Winter Conference on Applications of Computer Vision, Waikoloa Village, HI, Jan. 8-10, 2019, pp. 2146–2155.
10. X. Xu, H. Le, and I. A. Kakadiaris, “On the Importance of Feature Aggregation for Face Reconstruction,” in Proc. IEEE Winter Conference on Applications of Computer Vision, Waikoloa Village, HI, Jan. 8-10, 2019, pp. 922–931.
11. L. Shi, X. Xu, and I. A. Kakadiaris, SSFD: A Face Detector using a Single-scale Feature Map, In Proc. The IEEE International Conference on Biometrics: Theory, Applications, and Systems, Los Angeles, CA, Oct. 22-25, 2018.

KPI-D-3. Reference annotated dataset for VIS and NIR images

The *EDGE20: A Cross Spectral Evaluation Dataset for Multiple Surveillance Problems* has appeared at the 2020 Winter Conference on Applications of Computer Vision.

G.3 Transforming Trade and Ensuring Global Supply Chain Security with Blockchain and Smart Contracts; Weidong "Larry" Shi, University of Houston; Eleftherios Iakovou, Texas A&M University

G.3.1. BTI Management Summary

This project completed during Program Year 5. The project reached Milestone 1 (Completion of Artifacts) and Deliverable 3 (Artifacts). During this reporting period, the project team held the project's third quarterly meeting. The meeting was delayed one month to 9 September 2019 because the BTI Institute and investigator had an in-person meeting with the project Champion on 31 July 2019 and the Champion was due onsite at the University of Houston in September. The meeting was held in person with the project Champion. At the meeting, the investigator began his discussion of data sharing and creation among trade stakeholders. In the meeting, the Champion and PI had a discussion on the approach to distributed ledgers that CBP should pursue, and both agreed that the solution involved multiple blockchains for re-engineering the entry process.

During the project's final quarterly meeting (15 November 2019), the investigator stated that the task of engagement and communications with industry stakeholders was not completed on time due to difficulty in scheduling interviews with global executives. The investigator stated that the team was able to schedule all the interviews, but those interviews would not be complete until the second half of November, which was two months after the original proposed time. The investigator indicated that the value of the information that would be gained from the industry stakeholders was too great to not hold the interviews. The BTI Institute management and DHS Champion representative agreed to the delay in receipt of the final report by roughly one month in order to incorporate these interviews. The Research Committee agreed with the Project Champion and the investigator recommendation that the final report be delayed until completion of the Industry Stakeholder interviews. The report was submitted on 20 December 2019 to the BTI Institute. The Institute reviewed the document, made edits, and sent for review with the project champion. The final report was approved for release in March 2020.

The final report was approved and published: https://uh.edu/bti/research/shi-iakovou-blockchain/bti-writtendeliverables-blockchainshi-final-reduced1.pdf

G.3.2. Executive Summary

Project PI: Weidong "Larry" Shi
Lead Institution: University of Houston
Co-PI: Eleftherios Iakovou
Co-Institution: Texas A&M University
Support Personnel: Vince Iacopella, Co-Chair of the 14th COAC Committee; Damon Spencer (Research Assistant); Abraham Baez Suarez (Research Associate); Lin Chen (Research Assistant Professor); Kelvin Gao (Research Associate)
Project Champion: Vincent Annunziato, Director, CBP Business Transformation & Innovation Division
Reporting Period: Project Year 1 (Project months 8 through 12)

Objectives: 1) Conducting research, and developing models to integrate support for Customs procedures (e.g., unique product identifiers, product classification, COO

certificates, certificates required for review by PGAs – for instance FDA), with e-commerce ecosystem to automate and facilitate legitimate flow of e-commerce goods; 2) Developing and evaluating data cooperation among e-commerce operators, sellers/buyers, and Customs for automation and simplification of e-commerce Customs declaration, assurance of data quality of e-commerce imports within the e-commerce value chain, in particular closing e-commerce data gaps of low valued shipment (e.g., product identifiers), and increased capability for Customs control on cross border e-commerce and risk based assessment; 3) Developing approaches to harmonize flow of information among e-commerce platforms, Customs, and cross border postal services for improving efficiency; 4) Engaging with stakeholders and evaluating the developed models along key dimensions such as trade facilitation, Customs control, risk management, and automation of Customs declaration process; 5) Identifying and analyzing potential barriers to e-commerce data cooperation, 6) Economic analysis of the benefits, costs, potential opportunities, and potential threats of integrating emerging technologies into Customs procedures and data cooperation among e-commerce operators, sellers, buyers, and Customs

Baseline: The entry process contains loopholes created by the higher *de minimis* value threshold, cannot ensure incoming e-commerce imports meet product and safety standards, cannot prevent counterfeit goods, and lacks compliance with US trade policy. This project is investigating and exploring the potential of emerging technologies such as distributed ledgers, artificial intelligence, and machine learning for addressing the e-commerce challenges that CBP and the global e-commerce stakeholders are faced with.

Methodology: The project requires working closely with CBP and government side stakeholders/subject matter experts (including USPS), as well as commercial e-commerce stakeholders, e.g., Customs authorities, carriers, brokers, sellers, buyers, and e-commerce marketplace providers. The technologies that will be applied are distributed ledgers and AI. The knowledge applied is data exchange and data cooperation environment facilitated by integrated distributed ledgers and big data. The eventual artifacts which are suggested are e-commerce data cooperation models for trade facilitation and Customs control.

In addition, the project methods include literature survey, in depth analysis, economic analysis, brainstorming sessions, teleconference meetings and discussions with private industry stakeholders, COAC consultants, and government side subject matter experts. Finally, application of a After/Before analysis, the project will yield an objective assessment of the e-commerce data cooperation and revenue collection models.

G.3.3. Milestones, Deliverables, and Performance Metrics

G.3.3.1. Milestones Table

Milestones for Phase II of the project

ID	Milestone	Due Date	Status
M1	Completion of artifacts including architecture, visual representation/infographics, and illustrations	9/2019	Complete
M2	Completion of documentation of recommendations	10/2019	Delayed, Complete

M3	Completion of final report	11/2019	Delayed, Complete

G.3.3.2. Milestones Report

M1. Completion of artifacts including architecture, visual representation/infographics, and illustrations.

The artifacts were included in the in-person presentation to the Champion on 31 July 2019, and in the presentations for the Quarterly Meetings on 9 September 2019 and 15 November 2019. The Project Champion made comments on the artifacts that were included in the Final Report.

M2. Completion of documentation of recommendations

This milestone has been rolled into Milestone 3. Completion of Final Report.

M3. Completion of final report

Due to the delay in scheduling industry stakeholders, the final report was delayed one month. The outline of the final report (30 September 2019) was completed and approved by the Project Champion. A draft version of the Table of Contents was completed by 1 December 2019. The Final Report was submitted to the BTI Institute on 20 December 2019. The report was reviewed by BTI Institute management, research team, and the project champion. The report was publicly released in March 2020.

G.3.3.3. Deliverables Table

ID	Deliverable	Due Date	Status
D3	Artifacts including architecture, visual representation/infographics, and illustrations	9/2019	Complete
D4	Recommendations including viable adoption approaches such as how government can be involved in the ecosystem encompassing private and public stakeholders in global supply chain – for instance, government is not in charge of the blockchain infrastructure but has the capability to be integrated as participator to pull data from the ecosystem and receive the benefits of supply chain visibility and sharing of trade information; and opportunities of PoCs.	10/2019	Delayed, Complete
D5	Final Project Report	11/2019	Delayed (12/2019; revised 1/2020), Complete

G.3.3.4. Deliverables Report

D3. Artifacts

The artifacts are visual representations (infographics) of the flow related to the distributed ledger. The artifacts are part of the Final Report.

D4. Recommendations

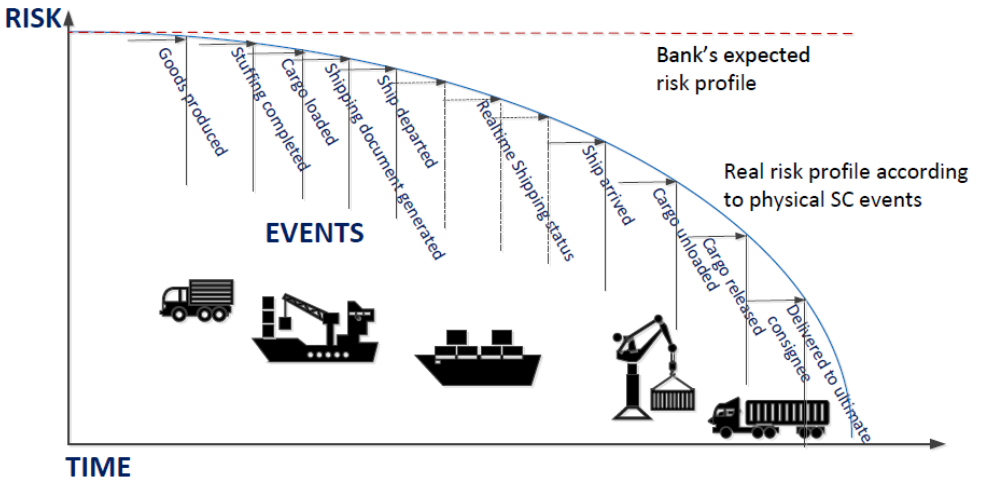
This deliverable is consolidated into the Final Report. Recommendations have been made throughout the project during the Quarterly Meetings.

D5. Final Project Report

One of the most salient observations from this study suggests that technological neutrality of blockchain applications to re-engineer the entry process is essential for guiding policy makers regarding future implementation. Regulatory requirements and laws should neither exclude, nor require and assume the use of a particular application of this technology. In a rapidly changing digital and technology environment, the principle should also ensure that future and emerging technologies can be accommodated.

A global observation based on preliminary discussion with the trade stakeholders suggests that the trade community is open to changes such as an entry process integrated with blockchain distributed ledger technology. A key component to implementing such a new system is protection of data confidentiality in the distributed ledger environment. With increased amounts of data being pulled from the blockchains, tools will be required to map, filter, link, and process the data. The process needs to be transparent to the filers and brokers so that they will be able to assist and certify the information.

The current project also demonstrated significant benefits to integrate trade finance and physical supply chains, and correlate financial flow with the movement of the goods. The traditional approach lacks transparency and visibility to the physical supply chains, which increases transaction costs in terms of administration and monitoring. With integration of trade finance with the physical movement of the goods under distributed ledgers, risk information can be shared in real-time, which reduces trade finance cost. The concept is illustrated in the below figure depicting the elements that a bank uses to determine the fee based on the expected risk profile of the physical supply chains. The solid line shows that a more competitive fee can be charged if the bank has more information available to adjust its risk profile as the physical supply chain evolves. Similar benefits in cost could be obtained if the regulatory agencies share risk data with the financial intermediaries.



The report further provides in Appendix A ways that current findings can impact the entry process from both the Customs and Trade perspectives. A few examples include:

- Proactive collection of data (start from trade agreement process between importer and exporter including purchase orders)
- Create a data matrix that maps entry data elements to stakeholders (buyer, seller, shipper, 3PL, bank, freight forwarder) and documents (purchase, invoices, B/L, packing list)
- Embed entry data collection process to blockchain based supply chain process (reduce direct interaction with customs, data available on the chain after each step of import activities)
- Targeting early (timeliness) as data elements of interests to customs are shared on the chain (within relevant stakeholders and with customs) – identify high risk import activity or shipping ahead of current submission time for entry.
- Using blockchain for ordering events and decisions (for instance, cancellation, hold decision by PGAs) – single order of certified actions or decisions (when, what and by whom)
- Leveraging automated data synchronization capability of blockchain for interagency entry data management/sharing (also with Port of Entry?).
- Improving post entry audit with stakeholder data recorded on the chain (cannot be altered at later time), in particular financial transactions such as payments, transfer between importer bank and exporter bank, other related financial transactions
- Possible benefits for detecting transfer price or profit shift when using blockchain as shared data platform– banks, customs, tax
- Detecting trade money laundering fraud
- Blockchain as an enabler for realizing continuous audit (a relatively new audit concept– automated audit process, possibly based on real-time data)
- Automatic collection of duty payment and fees (self-execution), e.g., e-commerce

- Possible application to valuation and detection of mis-invoices through data cooperation with trade finance blockchains
- Recording advance ruling on blockchain (faster clearance)

The project report deliverable was submitted to the Project Champion on 20 Dec 2019 for comment. The final project report was submitted to the Project Champion on 17 January 2020. On 26 March 2020 the project report was authorized for release by the Project Champion and distribution to a wider audience within the Office of Trade was initiated with the assistance of the Project Champion. The delivery of the final project report deliverable was delayed due to unforeseen challenges in scheduling interviews with industry stakeholders.

G.3.3.5. Performance Metrics Table

ID	Performance Metric	Due Date	Status
KPI-RI-1	Relevancy to CBP missions (trade facilitation, import security, and trade enforcement)	11/2019	Delayed (12/2019), Complete
KPI-RI-2	Adherence to A/B Test	11/2019	Delayed (12/2019), Complete
KPI-RI-3	Effectiveness of artifacts created (e.g., visual representations, infographics, diagrams)	11/2019	Delayed (12/2019), Complete
KPI-RI-4	Usefulness (recommendations, findings)	11/2019	Delayed (12/2019), Complete
KPI-D-1	Peer reviewed publications	11/2019	Complete
KPI-D-2	Presentations and panels	11/2019	Complete

G.3.3.6. Performance Metrics Report

KPI-D-1. Peer Reviewed Publications

The paper "Blockchain in global supply chains and cross border trade: a critical synthesis of the state-of-the-art, challenges and opportunities" by Yangling Lu, Eleftherios Iakovou, and Weidong Shi was accepted by the *International Journal of Production Research* on 11 August 2019. https://www.tandfonline.com/doi/full/10.1080/00207543.2019.1651946

KPI-D-2. Presentations and Panels

The PI presented with the Project Champion at LogiChem in Houston on 9 – 10 September 2019. The presentation, *The Real Application of Blockchain Technology in Global Supply Chain and Logistics*, was a featured session on 9 September 2019.

G.4 Validating Deterrence Models for Scanning Technologies; George Thompson, Analytic Services Inc. (ANSER)

G.4.1. BTI Management Summary

This project reached all milestones, deliverables, and performance metrics during the reporting period. The project team held a final meeting on 5 May 2020 to discuss completed effort and transition next steps. Programmatic events during PY 5 included Quarterly Meetings in September 2019 and December 2019 and a Final Meeting 5 May 2020. In the December 2019 Quarterly Meeting, the PI stated that the milestones related to drug smuggling were behind schedule due to the increased time it took to complete the characterization of the nuclear environment. The PI requested a 90-day no cost extension (NCE) to prepare the final report and under the revised NCE schedule all remaining milestones and deliverables were achieved The Research Committee was not concerned with the delay due to the investigator having already completed all required research. The extension was only for the finalization of the report. The report, and all associated algorithms and data sources, were submitted to the BTI Institute on 30 April 2020. The report was reviewed by the BTI Institute management, Research Committee, and DHS Champion. The final report was released on 8 June 2020.

The final report: https://uh.edu/bti/research/deterrence-models/bti-deterrence-finalreport-released1.pdf
Project backgrounder: https://uh.edu/bti/research/deterrence-models/factsheet-deterrence-reduced.pdf

G.4.2. Executive Summary

Project PI: George Thompson
Lead Institution: ANSER, Inc.
Support Personnel: Dennis Wagner (Project Management), Lisa Pogue (Research Support), Damien Cobey (Technical Editing)
Project Champion: Namdoo Moon, Program Manager, CWMD
Reporting Period: Project Year 1 (project months 4 through 13)

Objectives: 1) categorize deterrence modeling constructs and parameters; 2) categorize smuggling populations with respect to these parameters; 3) define plausible ranges for parameter values; 4) identify and test external assumptions; refine parameter values

Baseline: Quantifying deterrence, in operationally meaningful terms, is notoriously difficult. Although there are many mathematical deterrence models in use, their inputs are usually treated as free-ranging parameters, or as subjects for informed guesstimate. As a result, policymakers (for example, officials in the U.S. Customs and Border Protection's (CBP's) Non-Intrusive Inspection (NII) program, credited with over 1,500 contraband seizures per year) must make decisions about scanning technologies, screening rates, and other deployment issues with less than a full understanding of the deterrence impacts.

Methodology: This project was designed to assist CBP measure the deterrence value of scanning technology to prevent the smuggling of illegal goods or instruments of terror. It takes a novel approach: namely, arriving at deterrence measures indirectly, through systematic face validation of extended deterrence models. Data collection included: a) literature review in the areas of deterrence modeling (to identify other modeling constructs for consideration) and behavioral aspects of smuggling (to develop extended model parameters and estimates); and b)

open-source research on documented incidents of cross-border smuggling, as well as the presumed effectiveness of various scanning technologies and other screening methods.

G.4.3. Milestones, Deliverables, and Performance Metrics

G.4.3.1. Milestones Table

ID	Milestone	Due Date	Status
M3	Model Parameters, Initial Values, and Cases	8/2019	Complete with delays (9/2019 for nuclear cases; 10/2019 for narcotics cases)
M4	Mismatches	10/2019	Complete (nuclear cases) with delays(11/2019 narcotics cases)
M5	Initial Parameter Bounds	11/2019	Complete with delays(12/2019)

G.4.3.2. Milestones Report

M3. Model Parameters, Initial Values, and Cases

Because nuclear smuggling cases are very diverse in terms of the checkpoint screening conditions in force, screening parameters had to be characterized separately for each case. The nature of screening operations varied widely over time across the various countries of the Former Soviet Union, Eastern Europe, and the Black Sea region. Accordingly, additional research was required to complete this milestone, which was reached in mid-September 2019 for nuclear cases and in October 2019 for drug smuggling cases.

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M4. Mismatches

Because of the additional research required to characterize equipment deployment, operations, and other factors for each individual nuclear smuggling case (see M3, above), this milestone was delayed. The set of mismatches / anomalies for nuclear smuggling was completed in October 2019, on schedule; however, the corresponding analysis for drug smuggling was completed in November 2019, approximately one month behind schedule.

M5. Initial Parameter Bounds

The cumulative delays described in Milestone 3 and 4 has resulted in a delay in Initial Parameter Bounds. This Milestone was completed in December 2019, approximately one month behind schedule.

G.4.3.3. Deliverables Table

ID	Deliverables Description	Due Date	Status
D2	Monthly Status Reports	Monthly	Complete
D3	Technical Report	4/2020	Complete
D4	Journal Article	4/2020	Complete
D5	Executive Briefing	4/2020	Complete
D6	Models and Algorithms	4/2020	Complete

G.4.3.4. Deliverables Report

D2. Monthly Status Reports

Monthly reports were submitted to the BTI Institute to track effort and progress on Tasks, Milestones, Deliverables, and Performance Metrics.

Because of the delays in milestones M3 through M5, the project schedule was extended by 90 days at no cost to the government. Due dates for the remaining deliverables (D3 through D6) were adjusted, with a complete draft of the final report and briefing re-scheduled from 31 January to 28 February 2020.

D3. Technical Report

The use of scanning systems (such as radiation portal monitors and X-ray imagers) at border checkpoints is said to act as a deterrent to the smuggling of radiological/nuclear materials, drugs, and other illicit items. The project examined several mathematical formulations of the deterrence function—the probability that a contemplated act of smuggling will be carried out, given that scanning occurs at a given rate and level of effectiveness. These formulations were further developed as “extended” models that incorporated the different motivations, perceptions, and decision-making behaviors of different smuggling populations. Extended model predictions regarding deterrence thresholds were compared to individual cases of radiological/nuclear smuggling and aggregated data on drug smuggling activity. These comparisons point to some tentative conclusions regarding the conditions under which scanning systems might or might not act as a deterrent. Such conclusions are necessarily limited by the study’s reliance on open-source information, the relatively small number of cross-border radiological/nuclear smuggling cases on record, the high level of aggregation in the drug smuggling data used, the need to make very rough estimates of some intermediate variables, and the fact that cognitive and behavioral models (including models of decision making under conditions of risk and uncertainty) have not been validated for the specific populations being studied.
The results from the analysis are provided in the following table for each type of smuggling activity.

	Radiological/Nuclear Smuggling	Drug Smuggling at SWB LPOEs
Level of activity (incidents / year)	• ~2	• ~150,000
Nature of activity	• Isolated incidents	• Ongoing enterprise with established supply chain
Smuggling populations	• Individuals / opportunists and small groups of criminals	• Large DTOs / TCOs • Smuggling cells • Individual mules
End users / demand	• Unknown	• Distributors, dealers, drug users
Type of scanning system	• Passive radiation detection (portal monitors, mobile vans)	• Active imaging (X-ray and gamma)
Role of scanning systems within checkpoint screening / detection architecture	• Primary phase	• Secondary phase (note: may expand to include primary phase in the future)
Key determinants of scanning system effectiveness	• Material type, mass, activity, and configuration • Source-detector geometry • Presence of benign emitters • Shielding / masking • Vehicle speed • Effectiveness of secondary inspection	• Size and density of package • Presence of other, similar objects • Duration of scan • Operator interpretation of image • Effectiveness of primary screen

The project highlighted one similarity related the individuals who actually carry the illicit material through a checkpoint. Both radiological/nuclear smugglers and drug mules tend to be impoverished individuals with few prospects for advancement—in other words, individuals for whom the potential gains of engaging in criminal activity represent a powerful inducement.

With respect to radiological/nuclear smuggling specifically, the study found:

- Potential gains from smuggling appear to be on the order of tens to hundreds of thousands of dollars for a single attempt
- Potential losses may involve sentences of roughly 2 to 4 years of imprisonment for an individual with a limited role, or 7 to 10 years for an individual with a larger role; these sentences are not always served in full
- In most areas where radiological/nuclear smuggling has been observed, average incomes are only a few thousand dollars per year; the ratio of perceived gains to losses is most likely quite large and deterrence is correspondingly difficult
- Before the mid-2000s, radiation portals were not widely prevalent and most apprehensions resulted from intelligence and law enforcement operations; smugglers believed (no doubt correctly, in most cases) that their chances of being detected at a border checkpoint were less than 10 percent
- The subsequent widespread deployment of portal monitors and vans increased the probability of detection at border checkpoints; however, smuggling attempts have continued
- It is possible that at least a few of these more recent incidents represent deliberate challenges (i.e., attempts in which the presence of scanning systems and the increased risk of detection were known

beforehand); alternative explanations include lack of prior knowledge, exploitation of specific gaps in coverage, or the ability to evade a functioning detector by bribing one or more border officials
- A full diagnosis of these incidents is not possible within the bounds of publicly available, open source data
- Considering all these factors, a tentative and very rough estimate from available information is that at least some radiological/nuclear smugglers may not be deterred unless the probability of detection is quite high—perhaps 50 percent or greater
- Depending on the effectiveness (and perceived effectiveness) of the secondary inspection process, achieving such a probability of detection may require a near certain probability that the material will be scanned in the primary phase and that the system will alarm; the latter stipulation is notoriously difficult in the case of shielded HEU
- The above estimate comes with several important caveats: in addition to the limitations imposed by the use of open-source information, these include the relatively small number of documented radiological/nuclear smuggling cases, the use of very rough estimates for certain intermediate variables, and the application of decision-making theories and models that have not been validated for this specific population of decisionmakers

With respect to drug smuggling at Mexico / U.S. LPOEs, the study found:

- Deterrence is difficult … not only because current detection rates (as a percentage of attempts) are low, but also because DTOs and smuggling cells employ organizational constructs that encourage risk taking, recruit risk-seeking individuals, and react to increased interdiction by adapting their methods and/or engaging in more risky behavior to recoup their losses
- Metrics for success, failure, gains, and losses depend on the level of organization being considered
- It is not possible to develop quantitative estimates of deterrent effects for large-scale DTOs/TCOs without a more complete picture of their business model(s), including current and minimum-acceptable levels of profitability, risk tolerance, and preferred strategies
- It is also difficult (on the basis of aggregated data) to quantify deterrent effects for individual smugglers; a more in-depth analysis would require detailed information on the pool of potential smugglers (by age, income, gang affiliation, etc.), their attitudes toward the risk of fine / imprisonment, their sources of information regarding detection risk, and many other factors
- Some existing evidence points to a deterrent effect for small-scale smuggling cells, provided that a vehicle's probability of being scanned is greater than approximately 30 percent—almost certainly much greater than what is experienced under current operations
- A large increase in the rate of referral to secondary inspection is not feasible under the existing screening/detection architecture due to the increased number of innocent vehicles that would be referred, along with the corresponding impacts on required resource levels and/or the flow of legitimate commerce

- New systems being developed by CBP may allow all vehicles to be scanned during the pre-primary phase; such systems could increase the probability that a smuggler is scanned in the secondary phase without increasing referral rates for innocent vehicles
- It is possible to predict the deterrent effect of these new systems in terms that are directly observable (i.e., the net impact on the number of seizures), provided that their effectiveness is known, they are deployed to all SWB LPOEs, and they are not susceptible to countermeasures such as changes in smuggling tactics
- Some of the intermediate variables used to develop these predictions are based on very rough estimates; moreover, much of the data on deterrent effects is derived from experience with Colombian smuggling organizations circa 2000, and may not be generalizable

The complete draft was delivered to BTI on 28 February 2020, on schedule in the revised NCE timeline. During March and April, the draft underwent internal ANSER review (quality audit and technical editing), as well as a review by BTI and the project champion. The revised, final version was delivered to BTI on April 30, 2020, on schedule.

D4. Journal Article
During March 2020, the PI drafted an article (based on technical report) for the "Homeland Security Affairs Journal" (HSAJ), an online journal published by the Center for Homeland Defense and Security (CHDS) at the Naval Postgraduate School. The draft was revised to reflect comments on the technical report, and was formally delivered to BTI on 30 April 2020, on schedule. ANSER submitted the article to HSAJ on 9 June 2020; it is currently undergoing peer review, which typically requires several months.

D5. Executive Briefing
The draft executive briefing was delivered to BTI on 28 February 2020, on schedule. It was subsequently revised to reflect comments received during the review process. The final version was delivered to BTI on 30 April 2020, on schedule. The project champion has arranged for the PI to brief DHS stakeholders; that briefing was scheduled for 13 July 2020 (outside of this reporting period) and invitees included DHS personnel from Countering Weapons of Mass Destruction Office, Transportation Security Administration and Office of Strategy, Policy and Plans. Additional briefings are planned for National Nuclear Security Administration (NNSA) and other DHS components pending interest & availability.

D6. Models and Algorithms
ANSER delivered a set of five spreadsheet files containing the algorithms and data developed during the course of the project. These files were delivered to BTI on 30 April 2020, on schedule.

G.4.3.5. Performance Metrics Table

ID	Description	Quantitative Performance Target	Due Date	Status

KPI-RI-1	Overall Project Success	Improved estimate of at least one deterrence parameter	4/2020	Complete
KPI-RI-4	Milestone M3	Characterization of at least two cases for each model/population	08/2019	Complete with Delay (9/2019)
KPI-RI-5	Milestone M4	Identification of at least one mismatch [or outlier]	10/2019	Complete with Delay(11/2019)
KPI-RI-6	Milestone M5	Estimated bounds for deterrence parameters	11/2019	In Progress with Delay (12/2019)
KPI-D-1	Deliverable D3	Report properly documents project goals, methods, results	1/2020	Complete
KPI-D-2	Deliverable D4	Article Accepted for review/publication	1/2020	Complete
KPI-D-3	Deliverable D5	Information benefits DHS screening ops/plans; and/or merits follow-on research	1/2020	Complete

G.4.3.6. Performance Metrics Report

KPR-RI-1. Overall Project Success

Within the limits of publicly available information, the researchers developed quantitative bounds for the effectiveness of checkpoint scanners in deterring nuclear smuggling (no such quantitative estimates are known to have existed previously). The researchers also demonstrated that estimated values for both technical and behavioral variables comport with observed patterns of drug smuggling (chiefly, the lack of deterrence associated with modest improvements in scanning).

KPI-RI-4. Milestone M3

The investigators completed the characterization of multiple cases for each population, drug smuggling and nuclear smuggling. Characterization of at least two cases for each model/population was achieved with a one-month delay (Sep 2019) from the proposed delivery schedule.

KPI-RI-5. Milestone M4

The research team identified multiple outliers in the radiological/nuclear case set. Identification of at least one mismatch [or outlier] was achieved with a one-month delay (November 2019) from the proposed delivery schedule.

KPI-RI-6. Milestone M5

The research team completed the analysis of both nuclear smuggling and drug smuggling data. For nuclear smuggling, the team identified quantitative bounds for deterrence thresholds; for drug smuggling, the team developed quantitative predictions of deterrence effects that might result from the introduction of new scanning technologies.

KPI-D-1. Deliverable D3

BTI notified the PI that the technical report was judged to be complete and accurate description of project goals, methods, and results and the Project Champion approved release of the report on 08 June 2020.

KPI-D-2. Deliverable D4
A journal article titled “Validating Deterrence Models for Scanning Technologies” based on the research conducted under this project has been accepted for review by the Homeland Security Affairs Journal on 09 June 2020.

KPI-D-3. Deliverable D5
The project champion indicates that the analysis framework developed for this project may warrant follow-on research by DHS/CWMD, to include data not in the public domain (such as intelligence or law enforcement sensitive data). Informal feedback also indicates that DHS/CBP believes the project results will be useful in developing performance thresholds for future scanning systems to be deployed along U.S. borders.

G.5 Exploring Homeland Security Applications for Unmanned Autonomous Systems at Maritime Ports. Benjamin Rohrbaugh, David Hansell, Lantern Unmanned Autonomous Systems, LLC (Lantern UAS)

G.5.1. BTI Management Summary

This project completed all milestones, deliverables and performance metrics during this reporting period.

On 18 February 2020 a briefing was given to CBP OFO personnel from the following components; CTPAT, NII, & CCS. On 20 February 2020, senior leaders from the Houston CBP Office of Field Operations (Director of Field Operations and Houston Seaport Director) were given a live demonstration of the platform capabilities at the University of Houston testing site.

CBP-OFO personnel indicated that a platform technology such as the one developed by the Project team could be applied to other projects of interest to DHS including:

- Drone-based thermal imaging to check freezer containers to identify narcotics smuggling
- Checking non-refrigerated containers for unusual temperatures to identify possible storage of biological weapons, which would need to be kept at a stable temperature which could be reflected in the surface temperature of the containers
- Neutron-detection on drone-based radiation detection systems
- Drone cameras to identify the presence of plant pests on hard to reach containers
- Container seal integrity verification against manifest for containers that are not scheduled for inspection
- UAS inspection of train cars in situations where stationary NII is not available
- RFID devices on drones to identify containers and confirm the manifests

- Application in break bulk area at the port of Houston to scan cargo
- Drone-based radiation detection in situations, like at the port of Philadelphia, where cargo moves through a populated area along a river channel before it arrives at the port and is scanned for radiation
- Drone-enabled collection of swipes from container handles or vents for analysis
- Scanning float planes for radiation - a particular pain-point they mentioned, as when a float plane arrives across the northern border a pair of officers has to drive out, often several hours, to scan it by hand, and have trouble scanning the side facing the water

The final meeting for the project was held on 6 May 2020. The BTI Management and Research Team were highly satisfied with the results of the project and believe there are transition opportunities across DHS.

The final report is available: https://uh.edu/bti/research/lantern-uas/uasbasedsensors-finaldeliverable-digital.pdf
The project background is available: https://uh.edu/bti/research/lantern-uas/factsheet-uas-basedsensors-reduced-28may2020.pdf

G.5.2. Executive Summary

Project PI: Benjamin Rohrbaugh
Lead Institution: Lantern UAS LLC
Co-PI: David Hansell
Project Champion: Namdoo Moon, Program Manager, Counter Weapons of Mass Destruction
Reporting Period: Project Year 1 (Project months 4 through 12)

Objectives: 1) determine the requirements for UAS-based detection and define configurations of sensor packages to be tested for this purpose; 2) establish a testing plan to evaluate the sensitivity and specificity of different sensor and camera configurations for onboard UAS operation; 3) determine requirements for controlled testing and conduct outreach to necessary partners to identify a location and facility for the testing; 4) testing in a controlled environment and gathering statistics based on multiple test sources, sensor configurations, and search patterns; 5) prepare for testing in a maritime port environment as part of Phase 2

Baseline: Currently, UAS are being used at maritime ports but primarily for site monitoring, public affairs, and maintenance functions. The Port of Long Beach, for example, uses drones for publicity footage, to monitor the port to identify potential intruders, and to check cranes or other hard to access machinery when there are malfunctions. The Project team is not aware of any efforts to use UAS at ports to detect potential contraband within cargo containers. Radiological and nuclear threat detection at ports, in particular, is currently conducted with large, fixed detector installations that require diversion of containers to fixed locations and provide relatively low threat specificity in detection, leading to many false positive alarms. Furthermore, the fixed nature of these systems has made them difficult to deploy in foreign ports, hindering compliance with the 9/11 Commission Act recommendations for container inspection.

Methodology: This project established a pilot program to test UAS against the above objectives in a maritime port of entry environment. The following steps comprised key components of the research methodology.

1) Determined the most viable sensor and imaging packages to be tested for UAS operations and obtained a combination of commercial off-the-shelf and bespoke systems and sensors for viable prototypes.
2) Development of the required software to use the determined sensor and imaging packages for the determined applications.
3) Accessed a controlled environment with cargo containers and radiation sources for field testing.
4) Conducted extensive testing and simulations of different sensor and imaging packages for various potential configurations of containers and cargo.
5) Developed and implemented a full research plan for testing in controlled environments.
6) Identified and approached potential port partners to reach agreement on the terms of a testing pilot program as part of Phase 2.
7) Developed and submitted a full report on the pilot program, including the results of the research, lessons learned, identified best practices, areas for further study, and input received from the port operators and CBP.

G.5.3. Milestones, Deliverables, and Performance Metrics

G.5.3.1. Milestones Table

ID	Milestone Description	Due Date	Status
M.1	Establish program of research for different UAS/sensor configuration and obtain necessary hardware. Determine the contraband types and cargo configurations to be prioritized.	7/2019	Complete
M.2	Completed CONOPS for UAS operations at port. Identify which sensor modalities will be most effective for this purpose based on stationary testing.	10/2019	Complete
M.3	Provide report and briefing on results of simulations of sensors being used on UAS and the most effective modalities for sensors used on UAS.	11/2019	Complete
M.4	Begin pilot program in controlled environment	7/2019-1/2020	Complete
M.5	Conduct interim review with BTI and project champion	10/2019-1/2020	Complete
M.6	Delivery of full report on operations and pilot program	4/2020	Complete

G.5.3.2. Milestones Report

M1. Establish program of research for different UAS/sensor configuration

The Project team determined a Kromek detector and Raspberry PI with data acquisition mounted on a drone was the most operationally viable configuration. Additionally, a router with wi-fi internet communicating with a Linux laptop with the data analysis tools software would facilitate real-time data collection and inflight analysis. The on-site testing plan was developed by Rustam Niyazov and provided to the BTI Institute team before onsite testing on 17 September 2019. The document is archived as

<Lantern_Tests_UH.docx>. Below is an image of the prototype and a table listing commercial off the shelf components used to create the prototype.

ITEM	NOTES
Kromek SIGMA50 detector	315 grams, Resolution (%@^{137}Cs)<7.2
Raspberry Pi with data acquisition	
Drone1 Drone 2	DJI M210 (for carrying the radiation system) Mavic (for testing thermal imaging capabilities)
Router with WiFi internet	Data is initially transmitted from Rasperry PI to laptop over Wi-Fi network
Linux laptop with data analysis tools	
Calibration sources 1 µCi	^{57}Co, ^{137}Cs, ^{60}Co (122,662,173,1332 keV)
Efficiency study sources (10µCi)	^{57}Co, ^{137}Cs, ^{22}Na
Container sources (10µCi)	^{137}Cs

M2. Completed CONOPS for UAS operations at port
An initial CONOPS for UAS operations in ports for radiation detection was developed. The CONOPS was refined throughout the life of the project as more data was gathered about the effectiveness of different types of operations. The CONOPS was presented as part of the Quarterly Meeting on 24 September 2019.

M3. Provide report and briefing on results of simulations of sensors
An initial report on the sensors was provided to the BTI Institute and Project Champion on 25 October 2019. A more developed report was drafted which incorporated all findings from the field testing, including on 10 and 11 December 2019. The complete report was submitted in advance of the Quarterly Meeting scheduled 19 December 2019.

M4. Begin pilot program in controlled environment
The project team, with support from the BTI Institute Research Committee chair and management team, identified a location at the University of Houston Technology Bridge in Houston, TX. Testing in the controlled location began 6 August 2019. Below is a picture of the field test site>

M5. Conduct interim review with BTI and project champion
Review was conducted with BTI and the project champion on 19 December 2019.

M6. Delivery of full report on operations and pilot program
Report was delivered to the DHS Project Champion on 4 May 2020 and the report was approved for release on 27 May 2020.

G.5.3.3. Deliverables Table

ID	Description	Due Date	Status
D.1	Determine the requirements for using UAS to detect contraband and/or tampering in cargo containers at a maritime port and define configurations of sensor and imaging packages to be tested for this purpose.	7/2019	Complete
D.2	Begin experiments to determine sensitivity and specificity of sensor and imaging packages and develop CONOPS for port operations and identify controlled environment for testing.	10/2019	Complete
D.3	Begin testing in controlled environment.	7/2019-1/2020	Complete
D.4	Review of simulation and testing in controlled environment and approach potential port partners about testing in the field.	10/2019-1/2020	Complete
D.5	Develop full report on research program.	4/2020	Complete

G.5.3.4. Deliverables Report
D1. Determine requirements for using UAS to detect contraband
The team evaluated the knowledge gaps and capabilities that UAS's can support at maritime ports.

D2. Begin experiments to determine sensitivity and specificity
Testing began in September and continued throughout this reporting period. Slight variations were made during each field test to adjust for different location of source and different configuration of sensors. In addition to radiological

detection, the UAS was able to capture visual images and infrared images to check for visual tampering of the cargo containers.

D3. Begin testing in controlled environment
Testing began 26 September 2019 at the University of Houston Technology Bridge.

D4. Review of simulation and testing in controlled environment
The Project team field tested in the months of September, October, and December. Each test provided additional data to review and refine the sensor process. Meetings with the BTI team, the Project Champion, and CBP experts have provided essential feedback and underlined the importance of continuing this research.

D5. Develop full report on pilot program

The overarching goal of this project was the development of a functioning prototype with subsequent field testing for proof of concept. The testing focused on the viability of radiation detection from a drone-based system, the ability of drones to capture detailed visual information about container surfaces and particularly door and seals, and the possibility of using thermal imaging to identify human smuggling and trafficking. The project team also developed plans to test other sensing capability including LIDAR for surface anomalies, neutron detection, develop radiation heat mapping, and to test drone-based solutions to the other capability gaps identified by CBP.

The project team was able to successfully complete the approved workplan on schedule, including establishing a fully operational controlled test environment, determining and obtaining commercially available drones and sensors that would meet testing requirements, and developing specialized software for these applications. Test results exceeded the project team's expectations for the capabilities of drone-based systems to detect radioactive material. The system consistently detected very small amounts of radioactive material through the exterior of a maritime shipping container and passenger vehicle. Testing and interactions with CBP field personnel indicated that this technology has the potential to be successfully transitioned to DHS operators.

Following the proof of concept, the project team developed (beyond original project scope and at no additional cost to the Sponsor) software to facilitate real-time visual display of the radiation detection results. The market-image application would provide a real time display of the radiation signal strength embedded in the drone control display with future features including audible operator alerts and construction of a heat map to be overlaid on the drone camera feed.

The Project team arranged meetings with the CBP OFO C-TPAT, NII, and CCS teams on Tuesday, 18 February 2020 to provide a briefing on the research. Additionally, on Thursday, 20 February 2020, Houston Director of Field Operations, Houston-Galveston Port Director and a cargo security specialist, were given a field demonstration at the test site located on the campus of the University of Houston.

The University of Houston media group featured the project on the UH Moment and the feature can be viewed using the following link.
https://www.youtube.com/watch?v=2DJijKbd6_E&feature=youtu.be

The Project report was submitted to the DHS Project Champion on 04 May 2020 and the report was approved for release by the DHS Project Champion on 27 May 2020.

Based on the success of the prototype development project and feedback from stakeholders, the project team developed a Phase II evaluation proposal to advance the data visualization features and to explore use cases proposed by stakeholders. The proposal was submitted to the Project Champion and the BTI OUP Program Manager on 20 March 2020.

G.5.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Establishing CONOPS for operations at ports including the key configurations of sensors and UAS, regulatory and requirements, and n identified location for controlled testing.	11/2019	Complete
KPI-RI-2	Conducting regular testing of UAS in controlled environment or at port through pilot program and identifying the areas where UAS provide the greatest potential benefit and where there are the largest challenges.	11/2019-4/2020	Complete
KPI-RI-3	Identifying the sensors and cameras that can most effectively be used by UAS to identify potential security threats and tampering on containers	11/2019-4/2020	Complete
KPI-D-1	Provide ongoing feedback on testing pilot program to CBP and other interested components of the homeland security enterprise	11/2019-4/2020	Complete
KPI-D-2	Provide final report on the potential merits of UAS operations that can be disseminated to DHS, the scientific community, and to the public.	4/2020	Complete

G.5.3.6. Performance Metrics Report

KPI-RI-1. Establishing CONOPS
CONOPS was established and communicated during the Quarterly Report.

KPI-RI-2. Conducting regular testing
The investigator team field-tested in September, October, and December during this reporting period.

KPI-RI-3. Identifying the sensors and cameras
During this reporting period, the team utilized a SIGMA50 Kromek detector and a Raspberry Pi-3B for data acquisition.

KPI-D-1. Provide ongoing feedback on testing pilot program to CBP and other interested components of the homeland security enterprise

The investigator team met with multiple CBP officials including the Director of Field Operations, Houston, and the Houston Port Director, who were extremely interested in the potential of this research.

KPI-D-2. Provide final report on the potential merits of UAS operations that can be disseminated to DHS, the scientific community, and to the public.
Report is complete, approved by DHS Project Champion on 27 May 2020, and available on the website via the following link: https://uh.edu/bti/research/lantern-uas/.

G.6 Border Management / Cross Border Trade Course Curriculum Development; Maria Burns, University of Houston

G.6.1. BTI Management Summary

During this program year, the Project team fully developed and offered two courses to University of Houston students. “Introduction to Homeland Security” was offered during the spring and summer 2020 semesters, and “Fundamentals of Border Management” was offered during summer 2020. A total of 31 students have cumulatively enrolled in one of these course offerings. These courses are additionally offered to DHS professionals as part of an online certificate program but as of the end of the reporting period no DHS personnel have yet to enroll.

The full development of all proposed courses to support two certificate programs, minors and majors in a bachelor’s degree program, has taken longer than anticipated and has resulted in delays in the originally proposed timeline found in the approved work plan. BTI Management acknowledges underestimating the difficult and time-consuming process inherent in the detailed review process including BTI, Department, College, State & DHS subject matter experts. The impact of the COVID-19 pandemic and associated disruptions to operations must also be mentioned as a contributing factor to the delay in delivery of approved courses. However, with the support from the Project Champion, the value of these courses and the importance of developing an educational pipeline for those interested in the Homeland Security Enterprise will ultimately be achieved.

As of the end of this reporting period, a three month no cost extension was requested and approved to finalize course development in PY6 as the course development was significantly delayed due to COVID-19. During PY5, programmatic milestones include Quarterly Meetings on 26 September 2019, 19 December 2019, and 28 April 2020.

Course development will continue into Program Year 6.

University of Houston Courses: https://uh.edu/bti/education/uh-courses/
Professional Courses: https://uh.edu/bti/education/certificates/

G.6.2. Executive Summary

Project PI: Maria Burns
Lead Institution: University of Houston

Support Personnel: Maura Pereira De Leon, (Senior Researcher); K. Porterfield (Instructional Designer); Y. Holton (Web Project Manager)
Project Champion: Paul Baker, Deputy Assistant Commissioner, CBP Office of Training & Development
Reporting Period: Project Year 1 (Project months 1 through 12)

Objectives:1) Develop the course curriculum of a Bachelor of Science degree, a minor, and a master's degree program in Border Management, Trade, and Transport Security; 2) Design two certificate programs, i.e., "Borders, Trade, and Transport Security" and "Border Operations Management and Security" that will be offered to homeland security professionals and industry personnel.

Baseline: An extensive analysis of academic programs offered by higher education institutions in the state of Texas and nationwide was conducted as a baseline data-review to develop the UH-BTI proposal. The programs analyzed offer degrees in several areas of Homeland Security, Border Studies, Security Studies, Trans-border Studies and Border Economic Studies among others. A list of universities, programs offered, and programmatic emphases was created. While most of the programs focused on areas related to borders security, they did not address management and/or field operations.

Methodology: At the University of Houston, the authorization and approval process of new academic programs including bachelor's degree and master's degree programs involves four steps.

First, the bachelor's degree and master's degree programs developed by the UH-Borders, Trade, and Immigration Institute and the UH College of Technology will be submitted to the Academic Programs Direction, Office of the Provost for review and approval. Second, following Provosts' Council approval, the full proposal of the new degrees will be presented by the Provost to the UH Board of Regents for approval and authorization. Third, once the UH Board of Regents approves the programs, the full proposals are submitted to the Texas Higher Education Coordinating Board (THECB) for final approval. Four, once the THECB grants approval, the full proposals are sent to the Department of Education for the programs to be deemed eligible for students to receive Title IV funding as financial aid.

It is important to mention that "full proposal" means full development of the programs including the following:

1. Program need justification
2. Review of existing programs in the state and nation
3. Student demand
4. Enrollment projections
5. Student recruitment strategies
6. Degree requirements
7. Curriculum
    a. Program objectives
    b. Course objectives
    c. Transfer policy
    d. Policy to grant credits for professional experience (plan and strategies)
    e. Tables of required, prescribed, and elective courses

f. Strategic plan and marketable skills alignment
g. Alignment with the state's *60x30TX* plan
h. List of core faculty, degrees, and courses to teach, % time assigned
i. List of support faculty, degrees, and courses to teach, % time assigned
j. Library resources
k. Facilities and equipment
l. Accreditation
m. Program evaluation plan
n. Cost and funding: funding for program development and implementation.

8. Appendices
   a. Course descriptions
   b. Prescribed sequence of courses
   c. Five-year faculty recruitment plan/hiring schedule
   d. Librarian's statement of adequate resources
   e. Articulation agreement with partner institutions
   f. *Curricula Vitae* for core faculty
   g. *Curricula Vitae* for support faculty
   h. List of support from area employers

The primary goal of this project is to develop the next generation of professionals and enhance the professional competencies of the DHS workforce, in the critical areas of Border Management and Cross-Border Trade and Transport Security. The methods utilized to meet these objectives entail the development of two certificate programs, a Bachelor of Science, (with minor and major tracks), and a master's degree program designed for homeland security enterprise (HSE) professionals that work remotely and who are unable to attend face-to-face professional development opportunities.

The outcome of this project will be a fully online course curriculum. This curriculum will provide new, timely and geographically broad understanding of the Border Security trends, challenges and opportunities. The learning outcomes offer a comprehensive and all-encompassing view of Border Management, preparing the HSE and DHS workforce to transfer their knowledge across Ports of Entry, and Borders and operation units.

The project is currently on track to reach all planned milestones by 30 September 2020.

The project comprises 11 Milestones. Among these, milestones 1, 2, 3, 5, 7, 9, and 11 are completed by 100%. Metrics 4, 6, 8, and 10 are in process. A considerable amount of effort was spent by the Project team focusing on developing, modifying, and uploading 20 undergraduates in one year.

G.6.3. Milestones, Deliverables, and Performance Metrics

G.6.3.1. Milestones Table

ID	Milestone	Due Date	Status
M.1	Needs analysis complete Undergraduate (2019); Graduate (2020)	 07/31/2019 04/30/2020	Complete

M.2	Curriculum Plan Development: Bachelor of Science and master's degree	08/31/2019	Complete
M.3	Course Content Development: eight modules	11/30/2019	Complete
M.4	Course Content Development 20 undergraduate courses and 10 graduate courses	11/30/2019	Ongoing
M.5	Instructional Strategies Development: eight modules	03/31/2020	Complete
M.6	Instructional Strategies Development: 20 undergraduate and 10 graduate courses.	03/31/2020	Ongoing
M.7	Technology-based instructional resources development: eight modules.	06/30/2020	Complete
M.8	Technology-based instructional resources development: 40 undergraduate courses and 10 graduate courses	09/30/2020	Ongoing
M.9	Interactive online course building into LMS (eight modules).	05/30/2020	Complete
M.10	Interactive online course building (40 undergraduate courses and 10 graduate courses).	09/30/2020	Ongoing
M.11	Pilot test online modules	09/30/2020	Complete

G.6.3.2. Milestones Report

M1. Needs Analysis

A needs analysis report for the undergraduate program was produced and submitted to DHS in July 2019. This report served as a baseline for the graduate program, and a graduate program needs analysis was developed and remains under review by the BTI Curriculum Committee.

M2. Curriculum Plan Development: Bachelor of Science and master's degree

A Curriculum Plan was developed for the Bachelor of Science degree in August 2019 and approved by DHS. A Curriculum Plan for the Master of Science degree was developed in April 2020 and is under review by the BTI Curriculum Committee.

M3. Course Content Development: eight modules

By 30 November 2019, the Project team developed course content for eight modules. The content for the first two courses was submitted to the DHS Project Champion on 25 September 2019 and 30 October 2019 .

M4. Course Content Development 20 undergraduate courses and 10 graduate courses

Course content development is an ongoing process.

Three undergraduate courses are fully developed (Introduction to Homeland Security and Fundamentals of Border Management) reviewed and approved by faculty researchers in the College of Technology and DHS Project Champion's team. Each course is comprised of five Thematic Areas (Modules) and 12 units. A third course "Tariff Classification, Export Control, and Free Trade Agreements", is under review by the DHS Project Champion's team. A fourth course "Border Security and Cross-Border Challenges", structured in

four Thematic Areas and 14 units has been developed, is under review the COT-BTI team, and will be submitted to our Project Champion for review in August 2020.

The remaining undergraduate courses are under development.

M5. Instructional Strategies Development: eight modules
The Instructional Strategies Development for eight modules was ready by March 2020.

M6. Instructional Strategies Development: 20 undergraduate and 10 graduate courses.
The Instructional Strategies Development for 16 undergraduate was completed as of the end of PY5 and is ongoing. Instructional Strategies Development for graduate courses will occur outside of this reporting period.

M7. Technology-based instructional resources development: eight modules.
The Technology-based instructional resources development for eight modules is complete.

The first 5 modules were tested in a pilot course in Spring 2020 (January through May), and 5 additional modules were tested in a second pilot course in June 2020. Both courses received excellent evaluations from the students.

M8. Technology-based instructional resources development: 40 undergraduate courses and 10 graduate courses
The development of technology-based instructional resources for the courses is an on-going process. Each course is built into two electronic Learning Management Systems (Blackboard and Canvas). Technology-based resources include communication tools (Microsoft Teams, Zoom, Skype, etc.), collaboration tools embedded in the LMS (discussion boards, forum, etc.), presentation tools (PowerPoint), and video making/editing software (Camtasia, YouTube, MS Stream, etc.).

M9. Interactive online course building into LMS (eight modules).
By May 2020, the course content for ten modules was uploaded into the two UH electronic Learning Management Systems. Namely, Blackboard for UH registered students and Canvas for participants who will take the courses as professional development opportunities. The Project Champion and his team have access to these modules and the new courses being developed.

M10. Interactive online course building (40 undergraduate courses and 10 graduate courses).
Building interactive online courses is an ongoing process. Each course is built into the two UH electronic Learning Management Systems. The courses are built into Blackboard for UH registered students and Canvas for participants who will take the courses as professional development opportunities. Three courses (Introduction to Homeland Security, Fundamentals of Border Management, and Tariff Classification, Export Control, and Trade Agreements) are built into Blackboard and Canvas. By the time of this reporting period, the

course “Border Security and Cross-Border Challenges” is being built into Blackboard and will be complete and transition to Canvas after feedback from the DHS Project Champion’s team is received.

M11. Pilot test online modules
The first 5 modules were tested in a pilot course in Spring 2020 (January through May), and 5 additional modules were tested in a second pilot course in June 2020. Both courses received excellent evaluations from the sixteen students who responded to the survey provided at the end of the courses.

G.6.3.3. Deliverables Table

ID	Deliverables	Due Date	Status
D.1	Needs Analysis report	9/2019	Complete
D.2	Report of Expert Reviewers on course content adequacy	9/2019	Complete
D.3	BS and MS courses content analysis report	12/2019	BS accomplished
D.4	Eight online modules developed	12/2019	Two courses developed
D.5	BS and MS 50 courses completely developed	6/2020	30 BS courses are developed

G.6.3.4. Deliverables Report
D1. Needs Analysis Report
A needs analysis report for the bachelor’s degree and certificate programs (D.1 above) was completed in September 2019. A needs analysis report for the Master’s degree program was completed in April 2020. The goals of the needs analysis were twofold, 1) to explore the existence and programmatic emphasis of academic programs related to critical areas of borders security and operations management offered by U.S. higher education institutions, and 2) to identify the competencies to be developed by the Bachelor of Science program. The needs analysis consisted of four components: 1) Search and review of academic programs offered by U.S. higher education institutions; 2) Review of existing programs offered by the University of Houston; 3) Information gathered at the Education Committee/DHS Workforce Panel held at the 2019 DHS-COE Summit; and 4) Review of DHS documents.

D2. Report of expert reviewers on course content adequacy
On 7 November 2019, the BTI team met with the DHS team to go over feedback on the Introduction to Homeland Security course content. A DHS Project Champion designee provided the team with an excellent detailed review of the course and suggested some minor changes and additions to the content. The course content developer (PI), made all the changes and incorporated some additions per Project Champion designee’s recommendations.

D3. BS and MS courses content analysis report
Through a review of the competencies that are required for a management position at the border (job announcements) and task analysis of professional competencies, content structure and course sequence for the Bachelor of

Science curriculum plan was developed. Once the BS curriculum plan is approved, we will develop the Master of Science curriculum plan.

D4. Eight online modules developed
By the time of this report writing, two courses have been developed (Introduction to Homeland Security and Fundamentals of Borders Management). Each course is comprised of 5 modules (thematic areas) and 12 units. A modified version of these courses will be transitioned into the certificate programs that BTI will offer as online professional development opportunities to current employees at DHS components.

G.6.3.5. Performance Metrics Table

ID	Performance Metrics	Due Date	Status
P.1	Needs analysis of the three academic components: certificate programs, Bachelor of Sciences, and master's degree. Completion rate: 100%	12/2019	Needs Analysis is complete
P.2	Report of Expert Reviewers on course content adequacy	12/2019	Complete
P.3	Complete development of eight online modules available through LMS. Completion rate: 100%	12/2019	Complete (courses 1, 2, 3)
P.4	Complete development of 40 undergraduate online courses available through LMS. Completion rate: 90%	9/2020	Outside of this reporting period
P.5	Complete development of 10 graduate online courses available through LMS. Completion rate 90%	9/2020	Outside of this reporting period

G.6.3.6. Performance Metrics Report
P1. Needs Analysis of the three academic components: certificate programs, Bachelor of Science, and Master's degree. Completion rate: 100%
The needs analysis report is complete.

P2. Report of Expert Reviewers on course content adequacy.
Expert Review of Courses 1 and 2 are complete. Review of course 3 (Tariff Classification and Free Trade Agreements) will be provided shortly after this report is submitted. The remaining Courses are under development and will be submitted for expert review in the next quarter.

P3. Complete development of eight online modules available through LMS
Two courses (10 modules or thematic areas) are completely developed and more than 15 modules are already built into the LMS.

G.7 Measuring Border Wait Times at Land Ports of Entry: Technology Assessment and Data Dissemination; Juan Villa, Texas A&M Transportation Institute

G.7.1. BTI Management Summary

During this reporting period, the "Wait Time" project team held their kick-off meeting on 1 August 2019 and Quarterly Meetings on 25 October 2019, 5 February 2020, and 12 May 2020.

At the end of this reporting period, the BTI Management, Research Committee, and Project Champion were satisfied with the progress of the project despite compiling delays in some milestones due to COVID-19 travel restrictions. The Research Committee was particularly satisfied with the ability of the PI team to find ways to continue installation despite COVID-19 restrictions in order to keep aspects of the project moving forward. Additionally, a four-month no cost extension was requested by the PI to utilize cost savings from travel restrictions to conduct a pilot study of automated license plate reader technology to enhance border wait time estimation. This request posed no impact to the timeline of the original deliverables and would provide DHS with data on an additional potential tool.

G.7.2. Executive Summary

Project PI: Juan Villa
Lead Institution: Texas A&M Transportation Institute
Support Personnel: Swapnil Samant (Senior Software Engineer), Carlos Silva Rivas (Research Specialist II), Daniel Escoto (Research Engineering Associate I), Jose Rivera (Assistant Transportation Researcher)
Project Champion: James Pattan, Program Manager, CBP Office of Field Operations
Reporting Period: Project Year 1 (Project months 1 through 11)

Objectives: 1) Analyze current system operation and maintenance practices; 2) Finalize Installation of RFID Equipment at Otay Mesa border crossings; 3) Identify improvements to POV border wait time measurement; 4) Research emerging technologies for dynamic vehicle wait time reporting; 5) Overhaul the current border wait time measurement system software

Baseline: Over five million vehicles drive across the United States-Mexico border every year. Border wait times at land ports of entry are an important measurement of port performance, trade, and regional competitiveness. A reliable and systematic method of measuring border wait times is needed in order to make better operations and staffing decisions at land ports of entry (POEs).

Methodology: The methodology includes a mix of theoretical and practical tasks that will lead to recommendations of the implementation of a more accurate, fast and reliable border crossing time measuring system.

The Project team met with the Project Champion three times throughout this performance period during the quarterly meetings in October 2019, February and May 2020. The majority of the proposed project milestones were completed. However due to COVID-19 restrictions, milestones 2, 3 and 4 have not been concluded. The research team needs to finalize field tests in order to complete milestones 3, 4 and 5.

Milestone 2 was delayed due to changes in the Mexican Administration and equipment installation was impacted due to COVID-19 travel restrictions.

The Project team has continued working on project activities that do not require travel or field tests since March 2020, when travel restrictions were implemented due to COVID-19. The plan is to finalize all milestones before the end of the calendar year, except for milestone 5 which will continue into next year. This assumes that travel restrictions are lifted in Q3 or Q4 of 2020. Based on feedback from the Project Champion, the work plan was modified to include an extensive data collection from GPS providers to determine the feasibility of implementing a GPS-based hybrid border wait time measuring system (Milestone 5). The proposed end date for the project is April 2021 when data will be collected and analyzed.

G.7.3. Milestones, Deliverables, and Performance Metrics

G.7.3.1. Milestones Table

ID	Milestone	Due Date	Status
M.1	System Operation (continuous)	10th day of the month	Ongoing
M.2	Otay-Mesa System reporting Crossing Time	2/2020	Delayed, 80 % complete
M.3	POV research prototype	3/2020	Delayed, 95 % complete
M.4	POV research test	5/2020	Delayed, 95 % complete
M.5	Bluetooth analysis report	6/2020	Delayed, 95 % complete
M.6	Emerging technologies white paper	9/2020	Outside of this reporting period
M.7	Border wait time measuring system	9/2020	Outside of this reporting period

G.7.3.2. Milestones Report

M.1 System Operation

The Project team has continued the operation of the Santa Teresa, NM and the Nogales, AZ wait time measurement systems and performed maintenance during the reporting period. Monthly reports are produced and wait time information is shared with CBP for those crossing in operation. The COVID-19 travel restrictions have prevented the research team to travel to perform maintenance at these two sites. As soon as it is safe to travel, the two sites will be visited to perform maintenance.

M.2 Otay-Mesa System reporting Crossing Time

The Project team coordinated with the California Department of Transportation (Caltrans) to develop a design for the RFID equipment at the California Highway Patrol Vehicle Inspection Facility. The design was approved by Caltrans and the equipment was installed at the facility.

The Project team obtained authorization from Mexican federal authorities and coordinated with local contractor to install RFID equipment at the Mexican side of the border. The equipment installation was partially completed, and

installation of readers/antennas are required to finalize and test the system. The research team is working with Mexican authorities to obtain authorization to deliver the equipment into Mexico.

M.3 Privately-owned vehicle (POV) research prototype
The Project team performed a literature review and technology assessment to identify improvements to the current POV wait time measurement system. The analysis identified automatic license plate readers (ALPR) as a technology that could improve border wait time measurement accuracy. The Project team developed a prototype system that includes the existing Bluetooth readers and the ALPR to measure POV wait time by vehicle type (Secure Electronic Network for Travelers Rapid Inspection [SENTRI], Ready, and regular).

M.4 POV research test
The Project team developed a test plan to analyze system functionality and the performance of the technologies in a controlled environment while simulating real-life border crossing situations at the Texas A&M University RELLIS campus. The objective of the specific test was to prove ALPR capabilities of detecting a vehicle by the plate number and re-identify it when passing by another point using the plate number.

The technology assessment results showed that by using a combination of Bluetooth/Wi-Fi, and ALPR technologies, sufficient information can be obtained to estimate travel times at land ports of entry by POV travel type. COVID-19 restrictions interrupted the last part of the tests, that will be finalized as soon as restrictions are lifted.

M.5 Bluetooth analysis report
The Project team prepared a preliminary report entitled “Identify Improvements to Privately Owned Vehicle Border Wait Time Measurement” that included results of the activities performed under Milestones 3, 4 and 5. The report is 95% complete and requires results from the final ALPR tests to be concluded.

M.6 Emerging technologies white paper
The Project team submitted a paper to the Transportation Research Board (TRB) for publication. The paper presents results from Milestones 3, 4 and 5 describing the proposed hybrid technology system to measure POV border wait time by lane type.

M.7 Border wait time measuring system
The Project team evaluated options for migrating Border Crossing Information System (BCIS) to a cloud provider. The system would include moving the database server, application server and web server to an Infrastructure as a Service (IaaS) or Platform as a Service (PaaS) model offered by cloud service providers. After evaluating options, the research team decided to use the Azure cloud platform offered by Microsoft. The new system will include options for monitoring of field devices and create a preliminary System Architecture for integration of all services required for BCIS using services offered on Microsoft Azure platform. The cost of running BCIS could be narrowed down to each crossing and high uptime can be achieved with cloud architecture.

As of the end of June 2020, the new system is being tested with information from the Zaragoza-Ysleta border crossing in El Paso. The data transfer and analysis will be tested for a month to identify any potential issues and the system will be migrated after this test period.

G.7.3.3. Deliverables Table

ID	Deliverables	Due Date	Status
D.1	Monthly system operation report	Recurring	Ongoing
D.2	Penetration test report	01/2020	Delayed, report will be prepared after RFID equipment is installed at the Mexican side of the border.
D.3	Final installation report	1/2020	Delayed, report will be prepared after RFID equipment is installed at the Mexican side of the border.
D.4	Bluetooth analysis report	6/2020	Draft report was prepared and will be finalized as soon as travel restrictions are lifted.
D.5	Innovative technologies white paper	9/2020	Outside of this reporting period
D.6	New border wait time measurement system software	9/2020	Outside of this reporting period

G.7.3.4. Deliverables Report

D.1 Monthly system operation report

The Project team has prepared monthly reports that include the Santa Teresa, NM and Nogales, AZ border crossing wait and crossing times, as well as a system reliability reports for these two border crossings.

D.2 Penetration test report

The report will be prepared as soon as the system is operational at the Otay Mesa border crossing.

D.3 Final installation report

The report will be prepared as soon as the RFID systems are installed at the Mexican side of the border at the Otay Mesa border crossing.

D.4 Bluetooth analysis report

A draft report was prepared and will be finalized as soon as the research team can conclude the ALPR tests at the Texas A&M University RELLIS campus.

D.5 Innovative technologies white paper
An article was submitted to the Transportation Research Board.

D.6 New border wait time measurement system software
New cloud-based system is being tested.

G.7.3.5. Performance Metrics Table

ID	Performance Metrics	Due Date	Status
KPI-RI-1	Bluetooth system functionality to measure border wait time by lane	5/2020	Draft functionality report finalized. Requires final field test to conclude
KPI-RI-2	Improved software to measure and report border wait times	9/2020	Outside of this reporting period
KPI-D-1	Innovative Technologies Paper	9/2020	Paper submitted for publication
KPI-D-2	Data delivered in a timely manner	Throughout the project in a regular basis	CBP receives border wait time data for two truck border crossings

G.7.3.6. Performance Metrics Report

KPI-RI-1 Bluetooth system functionality to measure border wait time by lane
The POV border wait time measurement system by lane was developed and designed by the research team and partial field tests conducted to verify functionality. Based on partial tests, the selected technology is capable of measuring border wait times by lane.

KPI-RI-2 Improved software to measure and report border wait times
Performance measure scheduled to complete outside of this reporting period. The new cloud-based system is being tested with real data coming from the Zaragoza-Ysleta border crossing.

KPI-D-1 Innovative Technologies Paper
Performance measure scheduled to complete outside of this reporting period. An article is being prepared to be presented for consideration to the Transportation Research Board.

KPI-D-2 Data delivered in a timely manner
The research team has been providing truck border wait time information to CBP during the reporting period.

G.8. Tactical Mapping of Border Security Impacts: El Paso Sector; Mayra Maldonado, Hunt Institute for Global Competitiveness, University of Texas at El Paso

G.8.1. BTI Management Summary

This project kicked off on 15 November 2019 and held Quarterly Meetings on 27 February 2020 and 30 April 2020.

As a follow up to a request by the Project Champion during the Kick-Off meeting, the research team submitted the data that was being collected to the BTI Institute on 12 December 2019. The data was forwarded to the project Champion for review on 13 December 2019.

At the end of this reporting period, the project has achieved Milestone 1 and presented potential output shells of the tactical mapping website based on the collected data. The Project Champion, representatives from the El Paso Sector, BTI Management, and Research Committee believe the project to be on time and on budget. The same believe the tool, once complete will be of immense value to the U.S. Border Patrol in the El Paso sector and has the potential to be utilized across all sectors.

G.8.2. Executive Summary

Project PI: Mayra Maldonado
Lead Institution: Hunt Institute for Global Competitiveness, University of Texas at El Paso
Co-PI: Jose Angel Moreno, Hunt Institute
Support Personnel: Roberto Ransom (Operations Director), Rafael Perez (Research Economist), Lilian Acosta (Graduate Research Assistant), Eric Peters (Graduate Research Assistant), Leonardo Orea (Graduate Research Assistant), Juan Corona (Graduate Research Assistant)
Project Champion: Assistant Chief Melissa Herrera, USBP Headquarters Reporting Period: Project Year 1 (Project months 1 through 8)

Objectives: 1) Create a tactical mapping of historical social, demographic, and economic indicators against historical border security deployments, namely physical and technological infrastructure, personnel deployments, and regulatory changes in the El Paso Sector border counties, for all years where data is available; 2) Conduct a forward-looking economic impact analysis for future potential border security measures based on historical CBP resource deployments for the El Paso Sector border counties.

Baseline: The tactical mapping of the impacts in the El Paso Sector was achieved by comparing historical social, demographic, and economic indicators against a baseline of data that depict changes in border security infrastructure, personnel deployments, and regulatory changes from 1986 to present.

Methodology: The Project Team generated the tactical mapping by using data visualization software (e.g., Tableau) to display a series of historical social and economic data against past border security deployments. The social and economic data was collected from U.S. government databases, such as the Department of Homeland Security, the U.S. Census Bureau, the Bureau of Economic Analysis, the

Bureau of Labor Statistics, the Federal Deposit Insurance Corporation, the Financial Crimes Enforcement Network, the U.S. Department of Health, the Federal Bureau of Investigation, the U.S. Department of Health, and the Centers for Disease Control, as well as from state government databases in New Mexico and Texas. This federal and state data was mapped against the border security deployments to generate a historical visualization of how U.S. border communities in the El Paso Sector have been impacted by past border security deployments and regulatory changes concerning immigration and customs enforcement.

The economic impact model utilized IMPLAN, an Input-Output (I-O), multiplier-based, static system. I-O analysis models how industries are linked by the intermediate inputs they provide one another to produce the final output in a regional economy. IMPLAN gathers data from a large variety of sources to generate I-O multipliers, a measure of how dollars interjected into a region are re-spent, thereby leading to additional economic activity. Given an input, for example CBP's or USBP's expenditures within a region, IMPLAN applies I-O multipliers to estimate the total economic activity generated from CBP's expenditures. IMPLAN is a static system and the software assumes the estimates are for the same year of the expenditures. IMPLAN cannot forecast economic activity.

The economic impact model provided three indicators of economic activity across employment, labor income, and output:

(1) Employment – the average annual full-time jobs within industry sectors. Seasonal jobs are not included.
(2) Labor Income – the sum value of compensation paid to workers and business proprietors. The value includes wages, salaries, employer paid benefits, and payroll taxes.
(3) Output – the value of all goods and services produced within the region's economy.

The goal of the Tactical Mapping of Border Security Impacts in El Paso Sector is the creation of a comprehensive map of impacts that border security deployments and regulatory changes have had and could have on the social and economic conditions of communities in the El Paso Sector.

This mapping will serve a tactical purpose as a decision support tool in optimizing the policy and resource deployment for U.S. Customs and Border Protection (CBP), particularly the U.S. Border Patrol (USBP), to assist with the safeguarding of the southern U.S. border around and between ports of entry.

In developing the tactical mapping tool, the Project team collected and graphed a diverse range of historical socio-economic data against a timeline of significant changes in border security infrastructure, personnel deployments, and relevant regulatory changes that have directly affected the communities in the El Paso Sector of the U.S.-Mexico border.

With this information and analysis, the tactical mapping will demonstrate through data visualization software the ways in which impacts from border security deployments and policy changes have affected the communities which can be used for intelligence

and resource deployment purposes. Additionally, upon completion and deployment of the mapping tool, it can be used to estimate the economic impact of future border security deployments using the IMPLAN economic impact model.

G.8.3. Milestones, Deliverables, and Performance Metrics

G.8.3.1. Milestones Table

ID	Description	Due Date	Status
M.1	Review of Previous Mappings	2/2020	Complete
M.2	Tactical Mapping of Baseline and Socio-Economic Data (Full use of data visualization tool)	8/2020	In Progress
M.3	Economic Impact Analysis	10/2020	In Progress
M.4	Project Manual	(projected) 11/2020	Outside of this reporting period

G.8.3.2. Milestones Report

M1. Review of Previous Mappings of Social and Economic Impact of Border Security Deployments

Various federal and state governmental databases were searched to collect the totality of data to create the comprehensive and historical view of the impacts in the El Paso Sector.

M2. Tactical Mapping of Baseline and Social Economic Data

The Data Visualization Tool is under development. The tool has been presented to the Project Champion and other members of Border Patrol during the Quarterly Meetings. The tool is an interactive website that displays social and economic data by sector by overlay on a map.

M3. Economic Impact Analysis

This milestone is in progress and is projected to complete on time.

M4. Project Manual

This milestone is outside of this reporting period.

G.8.3.3. Deliverables Table

ID	Description	Due Date	Status
D.1	Review of Previous Mappings of Social and Economic Impact of Border Security Deployments	2/2020	Complete
D.2	Collection and Consolidation of Historical Baseline Border Security Data	3/2020	Complete
D.3	Collection of Historical Social, Demographic, and Economic Data Mapping	8/2020	In Progress
D.4	Economic Impact Analysis Final Report	(projected) 9/2020	Outside of this reporting period

G.8.3.4. Deliverables Report

D1. Review of Previous Mappings of Social and Economic Impact of Border Security Deployments

The project team successfully submitted deliverable 1.

D2. Collection and Consolidation of Historical Baseline Border Security Data
The project team successfully submitted deliverable 2.

D3. Collection of Historical Social, Demographic, and Economic Data Mapping
Due to various challenges, including those by the global pandemic, the due date for deliverable 3 has been changed from July 2020 to September 2020.

G.8.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Collection and mapping of border security deployments for at least 15 years	6/2020	Accomplished
KPI-RI-2	Collection and mapping of border infrastructure for at least 25 years	6/2020	Accomplished
KPI-RI-3	Collection of regulatory changes regarding border security infrastructure for at least 15 years	6/2020	Accomplished
KPI-RI-4	Data visualization and/or tactical mapping of at least 80% of baseline indicators on the outline using the data visualization software	6/2020	Accomplished
KPI-RI-5	Harmonization of data indicators and regulatory changes across states, counties, and/or cities in at least 85% of these data points/regulations	6/2020	Accomplished
KPI-D-1	Conduct Quarterly Meetings	3/2020; 6/2020	Accomplished

G.8.3.6. Performance Metrics Report
KPI-RI-1.
Collection and mapping of border security deployments for at least 15 years was accomplished in the written report submitted with deliverable 1 in February 2020.

KPI-RI-2.
Collection and mapping of border infrastructure for at least 25 years was accomplished in the written report submitted with deliverable 1 in February 2020.

KPI-RI-3.
Collection of regulatory changes regarding border security infrastructure for at least 15 years was accomplished in the written report submitted with deliverable 1 in February 2020.

KPI-RI-4.
Data visualization and/or tactical mapping of at least 80% of baseline indicators on the outline using the data visualization software was accomplished in the written reports submitted with deliverable 1 and deliverable 2 in February and March 2020, respectively.

KPI-RI-5.

Harmonization of data indicators and regulatory changes across states, counties, and/or cities in at least 85% of these data points/regulations was accomplished in the written reports submitted with deliverable 1 and deliverable 2 in February and March 2020, respectively.

G.9. The Road Less Traveled: Bolstering the Absorptive Capacity of Southern Central American States to Northern Triangle Migrants; Marcus Boyd, University of Maryland

G.9.1. BTI Management Summary

This project held the Kick-Off meeting on 23 January 2020 and a Quarterly Meeting on 7 May 2020. At the end of PY5, the project had reached Milestone 1 (Collect Data Sources) and 2 (Institutional Review Board). The BTI Management, Research Committee, and Project Champion acknowledge the increased constraints that COVID-19 restrictions have placed on conducting in-person field work. Engaging in a virtual capacity would raise data privacy concerns and potential require IRB protocols that need to be addressed. Depending on how long the travel restrictions linger, the project team acknowledges the need for a no cost extension. The BTI Management and Research Team understand the potential requirement and will continue to support the project. Interviews will take place outside of this reporting period.

G.9.2. Executive Summary

Project PI: Marcus Boyd
Lead Institution: University of Maryland
Support Personnel: Barnett Koven (Co-PI); Kathryn Lindquist (Co-PI); Max Erdemandi (Researcher); Amira Giadala (Researcher), Julie M Carris (Director of Administrative Services).
Project Champion: Michael Huston, Principal Director, Department of Homeland Security - Office of Policy; and David Cloe, Deputy Assistant Secretary for the Western Hemisphere at U.S. Department of Homeland Security.
Period: Project Year 1 (Project months 1 through 4)

Objectives: 1) To determine whether or not Northern Triangle migrants are selecting to migrate south, and how these figures relate to migration to Mexico and the United States; 2) Determine Panama and Costa Rica's capacity for supporting Northern Triangle versus non-Northern Triangle migrants; 3) Provide an analysis of possible short- and long-term investments that could help Panama, Nicaragua, and Costa Rica support labor and humanitarian immigration flows.

Baseline: Economic instability and rampant organized crime and violence in Honduras, Guatemala, and El Salvador (collectively known as the Northern Triangle countries) is a powerful push factor for emigration. The Northern Triangle countries have experienced varying levels of systemic violence since the 1960s. The peoples of Guatemala and El Salvador endured long civil wars that only ended within the last 30 years. Both countries have strong organized criminal elements that use extortion and threats of violence as a primary means of securing capital. The governments of Guatemala and El Salvador lack the ability to appropriately govern and enforce the rule of law. While Honduras lacks the severe organized violence that plagues Guatemala and El Salvador, Honduras, like its neighbors, lacks a strong economic base. Honduras and Guatemala also have the dubious distinction of being ranked near

the top of femicide rankings globally. The combination of a persistent threat of violence, especially against women, lack of economic opportunity, and government instability are the main drivers causing people to emigrate.

Methodology: The first step in understanding the migration dynamics of Northern Triangle versus non-Northern Triangle migrants is to collect empirical evidence about the scope and density of those migrants in neighboring Panama and Costa Rica. Using official statistics from both Panama and Costa Rica the Project team used a nested model of analysis, with each step building on the previous in both complexity and granularity. The team generated descriptive statistics – including distributions and measures of central tendency – to outline the size and scope of the Northern Triangle versus non-Northern Triangle immigrant populations in Panama and Costa Rica. Subsequently, a simple comparative analysis followed by a bivariate analysis – including statistical significance testing using t-tests, Chi-Square, and ANOVA/ANCOVA where appropriate – was conducted to find meaningful differences between the Northern Triangle and non-Northern Triangle migrant populations in these four countries (Mexico, United States, Panama, and Costa Rica). Using this approach, the Project team will be able to identify possible push and pull factors affecting migration streams to Panama and Costa Rica.
The project has proceeded with data collection, analysis, and reporting on time during the period of performance (POP), including the current fiscal year thus far. The Project team has submitted all deliverables and monthly technical reports on time to date and presented its research plan to BTI at the May quarterly meeting. Initial delays in contracting led to a later-than-anticipated start date for the POP, and, due to the on-going COVID-19 pandemic, Severe Research Restrictions were placed on the University of Maryland System during the first months of the project. However, the Project team successfully transitioned to remote work. Quantitative data collection is completed, and analysis is underway, and the research team is on-track for a 31 July 2020 submission of the quantitative report deliverable. The project has also met all milestones during the POP thus far, with the exception of finalizing travel arrangements for qualitative data collections. Given the restrictions on travel due to COVID-19, the team has been considering alternative qualitative data collection plans since March and is working closely with BTI to adapt to travel restrictions and shift key informant interviews to an online platform.

G.9.3. Milestones, Deliverables, and Performance Metrics

G.9.3.1. Milestones Table

ID	Description	Due Date	Status
M1	Collect Data Sources	06/01/2020	Complete
M2	Institutional Review Board	03/14/2020	Complete
M3	Make contact with interviewees, lodging, and safety plan	07/02/2020	N/A

G.9.3.2. Milestones Report

M1. Collect Data Sources

This milestone was scheduled to be completed by the beginning of June; a provisional data dictionary was delivered on time. However, newly released open-source public opinion data from the latest round of Americas Barometer surveys prompted additional data collection during June for incorporation into the final quantitative deliverable report.

M2. Institutional Review Board
IRB permission from the University of Maryland's Institutional Review Board to conduct the research was obtained on 9 December 2019.

M3. Make Contact with Interviewees, lodging, and safety plan.
This milestone is scheduled to be achieved after the reporting period. The research team has sought guidance from BTI regarding the interview process for qualitative data collection. The coronavirus pandemic and University of Maryland travel restrictions impeded the ability of the Project team to travel to Panama or Costa Rica.

G.9.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Meeting Notes	01/23/2020	Complete
D2	Data Dictionary	06/01/2020	Complete
D3	Safety Plan	07/31/2020	Outside of this reporting period
D4	Data Analysis Report	07/31/2020	Ongoing
D5	Field Work Briefing	09/15/2020	Outside of this reporting period
D6	Field Work Findings	11/20/2020	Outside of this reporting period
D7	Final Report	02/16/2021	Outside of this reporting period
D8	Academic Publication(s)	03/14/2021	Outside of this reporting period

G.9.3.4. Deliverables Report
D1. Meeting Notes with IRB
The Project team met with the Project Champion and BTI on 23 January 2020 for the kickoff meeting and discussed the project's goals and objectives, our qualitative and quantitative sources and the intention of hiring a Research Assistant to support data discovery, documentation and analysis. Notes taken throughout the meeting were subsequently submitted to BTI.

D2. Data Dictionary
Data dictionary was submitted to BTI by the 1 June 2020 deadline and returned to the team with no feedback or comments from the BTI Research Committee.

D3. Safety Plan
This report is scheduled to be submitted after the reporting period.

D4. Data Analysis Report
The Data Analysis Report is scheduled to be submitted after the reporting period. Analysis is currently ongoing, and the team will continue compiling information and performing data analysis for the Quantitative Report and submit the report by the 31 July 2020 deadline. The Project team explored national and subnational data to produce a holistic picture of the environments that have or potentially could house migrant populations. The team has proven

to be resourceful in identifying and leveraging open-source data from governments, IGOs, and NGOs.

G.9.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Descriptive and analytical statistical modeling of publicly available data to understand the dynamics of the Northern Triangle and non-Northern Triangle countries across Costa Rica and Panama	07/10/2020	Complete
KPI-RI-2	Identifying the totality of immigrants as well as immigration patterns out of the Northern Triangle and beyond	07/31/2020	Ongoing
KPI-RI-3	Higher order statistical analysis looking into the push and pull factors (i.e. the relationship between the levels of violence and economic indicators vs. receiving countries) that impact the migration streams in the region	07/31/2020	Ongoing
KPI-RI-4	Qualitative data collected from informants local to target areas in Costa Rica and Panama through focus groups and interviews	11/20/2020	Ongoing

G.9.3.6. Performance Metrics Report

KPI-RI-1.

Statistical modeling was ongoing during the reporting period and results will be included in the final quantitative report. In addition to statistical analyses, we have compiled publicly available data to produce charts, graphs and maps for incorporation into the report.

KPI-RI-2.

Identifying the totality of migrants and immigration patterns is scheduled to be completed outside the reporting period. The team has examined national, regional and international data to understand migration flows and population trends in the region.

KPI-RI-3.

Outlining the push-pull factors is scheduled to be completed after the reporting period. The team has analyzed survey data, in addition to economic indicators to understand the causes of migration in the region and potential areas for improvement.

KPI-RI-4.

The interviews will take place after the reporting period, and the research team working with sponsors to finalize the qualitative data collection plan.

G.10. Mexican and Northern Triangle Perspectives on Mass Migration: Identifying and Assessing Strategic Narrative Alignment; Skye Cooley, Oklahoma State University

G.10.1. BTI Management Summary

This project kicked off on 14 February 2020 and held a Quarterly Meeting on 7 May 2020. The project has completed Milestone 1 (News Articles Collected) and are in progress for Milestone 2 (Focus Groups and Interview Sessions). The findings of these efforts were consolidated in an Interim Report that was reviewed on 31 May 2020. The project team has reviewed 45,000 news articles, 50 policy briefs, and conducted 13 interviews. The project team also held a deliverable format discussion on 18 June 2020 with the Project Champion. The team discussed instead of utilizing a standalone application that may have issues on a DHS computer, they would develop a web-based system that could provide the same information.

The BTI Management, Research Committee, and Project Champion acknowledge the difficultly with scheduling interviews virtually in light of COVID-19 restrictions. The Project Champion is particularly interested in the results of the project, even if there are a limited number of interviews in comparison to what was originally planned.

G.10.2. Executive Summary

Project PI: Skye Cooley; Robert Hinck
Lead Institution: Oklahoma State University; Monmouth College
Co-PI: Asya Cooley (Oklahoma State University); Sara Kitsch (Monmouth College)
Support Personnel: Jared Johnson (Technical Expert); Robert Utterback (Technical Expert)
Project Champion: Michael Huston, DHS
Period: Project Year 1 (Project months 1 through 6)
Objectives: 1) Provide Northern Triangle and Mexican national perspectives on what the humanitarian, economic, and political crises associated with migration are as well as perspectives on how to best address those crises through policy; 2) Compile and evaluate academic literature, as well as government and NGO program proposals concerning effective comprehensive approaches to migration management; 3) Provide local perspectives from the Mexico-Guatemala and US-Mexico border areas on what the humanitarian, resource and legal crises associated with migration are, as well as perspectives on how to best address those crises; 4) Provide a cogent narrative framework explaining US policies and actions aimed at addressing migration in ways that Mexican and Central Americans would understand as being in pursuit of a shared, mutually beneficial action.

Baseline: Migration from Northern Triangle into the US has increasingly accelerated humanitarian and political crises that require urgent attention from US decision-makers. However, viewing these crises from solely a US perspective, with researchers and policymakers attempting to discern tactical policies aimed to deter migration into the US, is short-sighted and ignores migration's transnational nature and causes. In many instances, these problems stem from perceptual gaps in US and Central American societies' understandings of what their governments should be doing to address perceived challenges. These differences are often more perceived than real and require analysis regarding how language from both sides may aid or inhibit common concerns and mutually beneficial solutions.

Methodology: The Project Team utilized a mixed-method research design examining how Northern Triangle countries (Guatemala, Honduras, and El Salvador), Mexico, and the US describe the issue of migration within their own political communities through narrative. Narratives, and the stories comprising them, are how human beings make sense of themselves in relation to their environment. Narratives provide human life purpose, direction, and a sense of just action. The NPF tool created via this project will be utilized to analyze the uncovered narratives in relation to policy development.

The project is currently on track to reach all planned milestones no later than 31 December 2020. The project completed milestone 1 and milestone 2 is in progress. Given the COVID-19 travel restrictions, researchers are unable to conduct site visits at this moment. Instead, they are focusing on conducting telephone interviews to complete milestone 2. Milestones 3 and 4 are to be completed once all data is collected.

The Project team met with BTI and Project Champion two times throughout this performance period. The first meeting occurred via telephone on 14 February 2020 to kick off the project. During this meeting, we discussed project objectives, data collection, student involvement, tasks, deliverables, milestones, performance metrics, transition plan, programmatic risks and mitigation plans, and next steps. The second meeting took place via telephone on 7 May 2020. The purpose of the meeting was to provide a quarterly update, including COVID-19 adjustments, policy briefs update, interviews update, and media analysis update. The Project team also discussed with BTI and DHS what a final Human-in-the-Loop AI product should look like in order to make future adjustments to the AI deliverable. The interim report was submitted on 30 May 2020 detailing the project progress.

G.10.3. Milestones, Deliverables, and Performance Metrics

G.10.3.1. Milestones Table

ID	Description	Due Date	Status
M1	All news article data is collected.	January – June 2020	Complete
M2	All focus group and interview sessions data are collected.	March – June 2020	20 interviews completed (33%); remaining interviews are scheduled to complete outside of this reporting period
M3	All data are analyzed and summarized.	January – June 2020	Scheduled to complete outside of this reporting period
M4	Final report is submitted.	January – June 2020	Scheduled to complete outside of this reporting period

G.10.3.2. Milestones Report

M1. All news article data is collected across time periods 3 & 4.
The project has collected and analyzed over 45,000 articles from US, Mexico, and Northern Triangle media. Researchers conducted an initial pilot analysis of US and Mexico articles across all four time periods, as well as Northern Triangle media during time period 4. The data was processed through three different topic modeling algorithms to determine which provided the most accurate results. Then, researchers qualitatively analyzed the topic categories to assess key themes, terms, and emergent narratives used to discuss migration. These results were then synthesized in an initial summary of the overarching narrative contexts discussing migration.

M2. All focus group and interview sessions data are collected.
The project has completed 20 in-depth interviews (policy experts, migrant shelter workers, migrants, academics, and vocational center workers). Given the COVID-19 travel restrictions preventing site-visit field work, researchers are currently in discussions with a network of shelters to aid in conducting interviews with shelter volunteers in both the US and Mexico, as well as interview migrants. Researchers have reached out to DHS personnel for interviews in order to add an agency layer of perspective to the project. The project is also in initial discussions with migrant vocational training centers for potential interview candidates. Researchers are considering other relevant perspectives to add to the project that can more readily be contact via telephone, this includes legal networks that offer free services to migrants. The project is intentionally trying to over-sample a diverse audience via phone interviews. The expectation of final total interviews conducted at this point, given COVID-19 is roughly 40 interviews among stakeholders.

M3. All data are analyzed and summarized.
Milestone to be completed outside of this reporting period.

M4. Final report is submitted.
Milestone to be completed outside of this reporting period.

G.10.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Interim report	January – May 2020	Completed
D2	Final report	January – June 2020	Deliverable scheduled to complete outside of this reporting period
D3	Conference(s) submissions completed (e.g. Global Ties; Global Studies; International Studies Association Conference)	January – June 2020	Deliverable scheduled to complete outside of this reporting period
D4	Publication(s) manuscripts completed (academic and news media)	January – June 2020	Deliverable scheduled to complete outside

			of this reporting period

G.10.3.4. Deliverables Report

D1. Interim report

The interim report was submitted on 30 May 2020 detailing the project progress, including initial policy analysis findings, initial interview findings, initial media findings, and human-in-the-loop AI status.

D2. Final report

Deliverable scheduled to complete outside of this reporting period.

D3. Conference(s) submissions.

Deliverable scheduled to complete outside of this reporting period.
The researcher team submitted a conference presentation titled “The Human Impact: Lessons Learned on Reducing Illegal and Irregular Migration Through Policies” to the International Studies Association (ISA) Midwest Annual Conference to be held on 20-22 November 2020 in St. Louis, Missouri.

D4. Publication(s) manuscripts.

Deliverable scheduled to complete outside of this reporting period.

G.10.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Interviews	January – June 2020	20 interviews completed
KPI-RI-2	Deliberation-based focus groups	January – June 2020	To be completed
KPI-RI-3	News media articles	January – June 2020	To be completed
KPI-D-1	National academic conference(s)	January – June 2020	To be completed
KPI-D-2	Academic publication(s)	January – June 2020	To be completed
KPI-D-3	News media publication(s)	January – June 2020	To be completed

G.10.3.6. Performance Metrics Report

KPI-RI-1. Interviews

The project has completed 20 in-depth interviews (policy experts, migrant shelter workers, migrants, academics, and vocational center workers). The remaining interviews will be completed before December 2020.

KPI-RI-2. Deliberation-based focus groups

Given the COVID-19 related travel restrictions continuing to prevent site-visit field work, researchers are currently unable to conduct deliberation-based focus groups on the ground.

KPI-RI-3. News media articles

Researchers collected and analyzed over 45,000 articles from US, Mexico, and Northern Triangle media. An initial pilot analysis of US and Mexico articles across all four time periods, as well as Northern Triangle media during time period 4 was performed.

G.11. Economic Motivations of Migrants from the Northern Triangle; Detlof von Winterfeldt, University of Southern California

G.11.1. BTI Management Summary

This project was kicked off on 17 January 2020 and held a Quarterly meeting on 7 May 2020.

The Project team merged the LAPOP and EMIF-SUR datasets with economic data to conduct analysis on the motivations behind migration. Initial analysis produced results that were of keen interest to the Project Champion.. Additionally, the team has completed case studies on Puerto Rican migration around 1950 and Mexican migration around 2010. They are utilizing these cases studies to tie significant economic events to changes in migration patterns.

The Project team acknowledged the difficultly with coordinating in person engagement and stakeholder discussion due to COVID-19 travel restrictions. The project is currently on schedule to meet all milestones and deliverables.

G.11.2. Executive Summary

Project PI: Detlof von Winterfeldt
Lead Institution: University of Southern California
Support Personnel: Bryan Roberts (Consultant)
Project Champion: Michael Huston, Principal Director, Department of Homeland Security - Office of Policy; and David Cloe, Deputy Assistant Secretary for the Western Hemisphere at U.S. Department of Homeland Security.
Period: Project Year 1 (Project months 1 through 6)

Objectives: 1) Conduct a systematic review of the populations from the Northern Triangle that migrate or attempt to migrate to provide an understanding of which groups will be responsive to changes in economic policies; 2) Estimate the economic and individual characteristics of people in the Northern Triangle that are most associated with attempted or intended illegal entry into the United States; 3) Develop a methodology for projecting changes in attempted migration from the Northern Triangle in response to changes in U.S. economic development policies; 4) Conduct case studies of historic experiences with economically-motivated migration using experiences from Mexico and Puerto Rico.

Baseline: Economic development has been a key focal point for understanding how to reduce migration from the Northern Triangle. The U.S. government has engaged for decades with Northern Triangle societies and governments to assist them in building better quality institutions and achieve more rapid economic development; this effort is now of central importance given its nexus with migration to the U.S. Without understanding what segments of the Northern Triangle population are at the highest risk of emigrating to the U.S., the U.S. government is unlikely to enact development policies that are most effective at reducing migration.

Methodology: This Project consists of three core components. First, analysis of the characteristics of actual and potential migrants in terms of where they live, what their economic situation is, and the degree to which economic motivations cause them to want to emigrate. Those who have emigrated or intend to emigrate were compared to those who did not want to emigrate in order to understand the key systematic differences between these populations. Second, the Project Team developed a graphical-interface tool that will allow users to project changes in migrations from the Northern Triangle based on assumptions about the impact of U.S. policies on local economic and security conditions in the Northern Triangle. Third, the Project Team assessed historical evidence on policies that may have affected emigration flows from the Northern Triangle, Puerto Rico, and Mexico to the U.S.

G.11.3. Milestones, Deliverables, and Performance Metrics

G.8.3.1. Milestones Table

ID	Description	Due Date	Status
M.1	Kick-off meeting with DHS stakeholders	1/15/2020	Complete
M.2	Interim briefing of project results to DHS stakeholders	7/29/2020	Complete
M.3	Final briefing of project results to DHS stakeholders	12/15/2020	Outside of this reporting period

G.8.3.2. Milestones Report

M1. Kick-Off meeting with DHS stakeholders

The Kick-Off meeting with DHS stakeholders was held on 17 January 2020. Representatives from DHS Office of Strategy, Policy, and Plans were present telephonically to discuss the objectives and methodologies of the work plan. The meeting was used to describe the data sources, the unique survey Latin American Population Opinion Poll, and discuss the case studies that were going to be briefed.

M2. Interim Briefing of Project Results to DHS Stakeholders

This milestone is in progress but will include results from running a series of discrete choice models to estimate the factors that are most important in determining the intention to migrate using the LAPOP and EMIF-Sur datasets related to migration from Central America. The interim brief will also contain the initial results of the case studies (Puerto Rico and Mexico).

M3. Final Briefing of Project Results to DHS Stakeholders

This milestone is outside of this reporting period.

G.8.3.3. Deliverables Table

ID	Description	Due Date	Status
D.1	Interim briefing to DHS stakeholders	7/2020	Completed
D.2	Final briefing to DHS stakeholders	12/2020	Outside of this reporting period
D.3	Simulation Analysis Tool	12/2020	Outside of this reporting period
D.4	Regression results	12/2020	Outside of this reporting period

D.5	Final project report	12/2020	Outside of this reporting period
D.6	Regression results	12/2020	Outside of this reporting period

G.8.3.4. Deliverables Report

D1. Interim Briefing to DHS Stakeholders

The Interim Brief is in progress and will be delivered outside of this reporting period.

D2-D6.

All other deliverables are based on project completion and outside of this reporting period.

G.8.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Fitted econometric model (Regression results submitted to DHS)	2020	IComplete
KPI-RI-2	Simulation of development scenario impacts (Scenario modeling tool presented to DHS using regression results)	2020	Complete
KPI-RI-3	Case studies (Presented at interim briefing)	2020	Complete
KPI-D-1	Preparation of presentation of project results at an academic conference (Conference abstracts provided)	2020	Outside of this reporting period
KPI-D-2	Draft publication of paper to be published in an academic journal (Draft Journal article provided)	2020	Outside of this reporting period

G.8.3.6. Performance Metrics Report

All performance metrics are tied to the interim or final deliverable and will be assessed outside of this reporting period.

G.12. Developing a Regional Approach to Managing Migration Flows from the Northern Triangle through Mexico to the United States; Andrew Selee, Migration Policy Institute

G.12.1. BTI Management Summary

This project kicked off on 27 January 2020 and held a Quarterly Meeting on 7 May 2020. At the end of this reporting period, the project reached Milestone 2 (Interim brief published) and is in progress for M1 (Legal Frameworks Memo) and Task 4 (Field Research). The PI stated that the COVID-19 travel restrictions are causing difficulty with completing the field research. This will potentially impact timelines and the feasibility of holding an in-person roundtable in the next reporting period. The Project team, based on input from the Project Champion, is emphasizing the legal frameworks in Mexico and Central American countries. The Project team is focusing the legal research (virtual and desk) at this stage and will extend the in-person travel towards the back end of the project in order to mitigate loss of time due to COVID-19 restrictions.

G.12.2. Executive Summary

Project PI: Andrew Selee
Lead Institution: Migration Policy Institute
Support Personnel: Ariel Ruiz Soto (Policy Analyst); Andrew Tanco (Associate Policy Analyst and Special Assistant to the President); Jessica Bolter (Associate Policy Analyst); Randy Capps (Director of Research for U.S. Programs)
Project Champion: Michael Huston, Director, Mexican Affairs, Office of Policy, DHS
Reporting Period: Project Year 1 (Project months 1 through 6)

Objectives: 1) Assess Mexico's capacity to manage migration flows, cooperate with the United States in combatting smuggling, provide protection for migrants where warranted, settle and integrate a portion of the new migration flow, and continue removing migrants to El Salvador, Guatemala, and Honduras (and other countries) to provide deterrence; 2) Assess the institutional and policy capacity of the Salvadoran, Guatemalan, and Honduran governments to manage migration flows, especially through efforts to degrade smuggling networks, address root migration causes, accommodate their repatriated nationals, and enhance their asylum systems to potentially settle some third-country nationals; 3) Understand how Costa Rica and Panama can work with the U.S. and Mexican governments and other regional actors to move beyond monitoring to potentially controlling migration flows through their territory more effectively; 4) Understand trends and push factors driving current migration flows so as to better predict their future intensity and potential impact on the capacity of the Mexican and Central American governments to implement cooperative migration control strategies; 5) Recommend policy options to manage flows from El Salvador, Guatemala, and Honduras through Mexico to the United States, as well as flows from other source countries through Central America.

Baseline: Near-record apprehensions along the U.S.-Mexico border have made it urgent to address the new flows from Central America and other world regions. Families traveling together, children traveling alone, and adult asylum seekers comprise a majority of the new flows, thereby reducing the effectiveness of traditional U.S. border security strategies that were designed to address flows of largely Mexican men seeking work in the United States. At times during the past year, the sheer volume of arrivals has challenged CBP's ability to carry out basic border enforcement activities such as migrant detection, processing, custody, and transportation.

Methodology: Through extensive interviewing of government and non-governmental leaders, the Project Team assessed the institutional and policy capacity of these governments to implement current agreements; their ability to strengthen their institutional structures to deal with migration flows, potentially provide asylum, and reintegrate repatriated migrants; and other potential options for regional cooperation in managing migration effectively. The Project Team also mapped in detail migration flows from Central America and from countries outside the region (including from Asia and Africa). Using publicly available datasets, supplemented by qualitative interviews in Central American countries, the Project Team constructed a more detailed map of primary sending regions and how these have shifted between 2014 and 2019.

The project is on track to reach milestones M.1 and M.2, as reflected in the revised work plan, on time. Because field work has had to proceed at a slower pace due to the COVID-19 pandemic, milestones M.3-M.6 may be delayed. The Project team published an interim brief analyzing the policy changes and regional cooperation that ensued from the June 2019 U.S.-Mexico agreement (M.2) on 8 June 2020. The Project team will submit a memo on Central American legal frameworks governing migration (M.1) by the end of July/early August. At the same time, virtual field work is ongoing to inform the final report on capacity and options for greater engagement by the Mexican and Central American governments to manage migration. Approximately 30 percent of the proposed field work was completed in this reporting period. The team has conducted 7 interviews of members of international organizations, government, and academia in Mexico; 20 interviews of members of international organizations, government, academia, and civil society in Guatemala; and 8 interviews in the United States and other countries (Ethiopia, Ghana, Italy, Somalia) of experts on extra-continental migration and members of NGOs working with extra-continental migrants, for a total of 35 interviews thus far. The team will be conducting initial interviews in El Salvador, Honduras, Costa Rica, and Panama in July and August.

The project status reflects several changes to the original work plan. First, the Project team is conducting field work virtually due to COVID-19 travel restrictions and safety precautions, with virtual fieldwork necessarily taking substantially longer than on-the-ground fieldwork would have taken, due to the complexities of scheduling multiple calls and video meetings. As a result, milestones M.3-M.6 may be delayed as field work must be completed before the draft report based on the field work can be written, the roundtable to discuss findings can be held, and the final project report can be published and disseminated.

Second, the Project team added the publication of an interim brief on U.S.-Mexico migration management, with the approval of the DHS project champion. During review of Mexican immigration policies and upon conducting interviews with key informants over the phone, the Project team determined that such a publication would be timely and relevant to policymaking as cooperation on migration management between the United States and Mexico continues to evolve following the one-year anniversary of the agreement between the two countries. And finally, the project champion requested that the Project team shift the proposed deliverable on quantitative data on migration flows to a review of the legal frameworks for immigration policies in Mexico and certain Central American countries, and how such legal frameworks could facilitate or hinder migration-management cooperation with the United States.

Timeline of Key Events

- 1/27/20: Kickoff presentation
- 2/6/20: January monthly report submitted
- March 2020: Began conducting virtual interviews
- 3/6/20: February monthly report submitted
- 4/3/20: March monthly report submitted

- 4/24/20: Project PY5 carryover estimates submitted
- 5/7/20: Quarterly meeting
- 5/7/20: April monthly report submitted
- 6/8/20: Interim brief, “One Year after the U.S.-Mexico Agreement: Reshaping Mexico’s Migration Policies,” published in English and Spanish
- 6/8/20: Webinar held, “Beyond the Border: U.S.-Mexican Migration Accord Has Ushered in Sweeping Change in Mexico in Its First Year,” with 402 participants
- 6/9/20: May monthly report submitted

G.12.3. Milestones, Deliverables, and Performance Metrics

G.8.3.1. Milestones Table

ID	Description	Due Date	Status
M.1	Legal frameworks memo submitted to DHS	Jul 20	Outside reporting period
M.2	Interim brief published	Jun 20	Complete
M.3	Draft report for roundtable	Nov 20	Outside reporting period
M.4	Roundtable discussion on findings and policy options	Nov 20	Outside reporting period
M.5	Final project report published	Dec 20/Jan 21	Outside reporting period
M.6	Launch of final report (in-person release event, media outreach, and social media)	Dec 20/Jan 21	Outside reporting period

G.8.3.2. Milestones Report

M1. Legal frameworks memo submitted to DHS
Milestone scheduled to complete outside of this reporting period. By 30 June 2020, we had begun reviewing legal frameworks and drafting memos on our findings, with anticipated completion of the memo in late July or early August.

M2. Interim brief published
Milestone completed on 8 June 2020. In order to complete this milestone, Ariel Ruiz Soto carried out desk research, analyzed U.S. and Mexican data sources, and he and Andrew Selee conducted three virtual interviews to understand the policy changes that resulted from the 7 June 2019 U.S.-Mexico agreement.

M3. Draft report for roundtable
Milestone scheduled to complete outside of this reporting period. By 30 June 2020, the team had conducted desk research and had conducted 40 percent of planned interviews to gather evidence for the report.

M4. Roundtable discussion on findings and policy options
Milestone scheduled to complete outside of this reporting period.

M5. Final project report published
Milestone scheduled to complete outside of this reporting period.

M6. Launch of final report
Milestone scheduled to complete outside of this reporting period.

G.8.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Memo to DHS on findings of legal frameworks review	Jul 20	Outside reporting period
D2	Interim brief on U.S.-Mexico migration management	Jun 20	Complete
D3	Draft report for roundtable	Nov 20	Outside reporting period
D4	Roundtable on findings and policy options	Nov 20	Outside reporting period
D5	Final project report	Dec 20/Jan 21	Outside reporting period
D6	Launch of final report (in-person release event, media outreach, and social media)	Dec 20/Jan 21	Outside reporting period

G.8.3.4. Deliverables Report

D1. Memo to DHS on findings of legal frameworks review
Deliverable scheduled to complete outside of this reporting period. By 30 June 2020, we had partially completed legal framework reviews for Guatemala, Costa Rica, and Panama and begun drafting the memo on our findings. The anticipated delivery date for the memo to DHS is late July/early August.

D2. Interim brief on U.S.-Mexico migration management
Deliverable completed on 8 June 2020. In order to complete this deliverable, Ariel Ruiz Soto carried out desk research, analyzed U.S. and Mexican data, and he and Andrew Selee conducted three virtual interviews to understand the policy changes that resulted from the 7 June 2019 U.S.-Mexico agreement.

D3. Draft report for roundtable
Deliverable scheduled to complete outside of this reporting period. By 30 June 2020, the team had conducted desk research and had conducted 40 percent of planned interviews to gather evidence for the report.

D4. Roundtable on findings and policy options
Deliverable scheduled to complete outside of this reporting period.

D5. Final project report published
Deliverable scheduled to complete outside of this reporting period.

D6. Launch of final report
Deliverable scheduled to complete outside of this reporting period.

G.8.3.5. Performance Metrics Table

ID	Description	Due Date	Status

KPI-RI-1	Legal frameworks memo useful to the project champion and DHS	Jul 20	Outside reporting period
KPI-RI-2	Interim brief useful to the project champion and broader public	Jun 20	Completed
KPI-RI-3	Roundtable to review research findings and discuss policy options successful	Nov 20	Outside reporting period
KPI-RI-4	Project report useful to the project champion and broader public	Dec 20/Jan 21	Outside reporting period
KPI-D-1	Webinar held for launch of interim brief	Jun 20	Completed
KPI-D-2	Event held for launch of final report	Dec 20/Jan 21	Outside reporting period
KPI-D-3	Media and social media outreach	Dec 20/Jan 21	Outside reporting period

G.8.3.6. Performance Metrics Report

KPI-RI-1. Legal frameworks memo useful to the project champion and DHS

Performance measure scheduled to complete outside of this reporting period. We took feedback from the project champion, provided during the 7 May 2020 quarterly meeting, into account and adjusted our work plan to research more deeply the legal frameworks for migration policies in Costa Rica, El Salvador, Guatemala, Honduras, and Panama and focus the analysis on questions raised by the project champion.

KPI-RI-2. Interim brief useful to the project champion and broader public

Performance measure completed in June 2020. The brief was cited in several English and Spanish media outlets. It has contributed to the understanding that Mexican immigration enforcement has been crucial to U.S. border security efforts in the past year and will continue to be so.

KPI-RI-3. Roundtable to review research findings and discuss policy options successful.

Performance measure scheduled to complete outside of this reporting period.

KPI-RI-4. Project report useful to the project champion and broader public.

Performance measure scheduled to complete outside of this reporting period. By 30 June 2020, the team had conducted desk research and had conducted 49 virtual interviews to gather evidence for the report.

KPI-D-1. Webinar held for launch of interim brief.

Performance measure completed on 8 June 2020. Former U.S. Ambassador to Mexico Roberta Jacobson and former Mexican Ambassador to the U.S. Gerónimo Gutiérrez spoke on the webinar, as well as border reporter Angela Kocherga. A total of 402 people participated in the webinar, and the audio/video posted on the MPI website afterwards has received 498 views.

KPI-D-2. Event held for launch of final report.

Performance measure scheduled to complete outside of this reporting period.

KPI-D-3. Media and social media outreach.

Performance measure scheduled to complete outside of this reporting period.

G.13. Addressing Cross Border E-Commerce Challenges with Emerging Technologies; Weidong Shi, University of Houston

G.13.1. BTI Management Summary

This project held a Kickoff meeting on 14 April 2020 and a Quarterly meeting on 29 June 2020. During the Quarterly Meeting, the Project team presented the results of efforts in mapping e-commerce data flow and an initial report outline. For the map of E-Commerce Data Flow, the Project team gathered data items based on data communication specifications defined by selected carriers, fulfillment service providers, and marketplaces/platforms. The team also extended the WCO e-commerce data flow model by adding seller, fulfillment, and broker stakeholders. The team also mapped the physical flow of data in order to better understand the complexity of data sharing across multiple stakeholders with different logistics strategies.

The Project team also laid out the initial report outline to include proposed chapter subjects. The final report will align with the objectives of the project.

There was a discussion initiated by the project champion related to the logistics strategies (direct mail, goods collection, and bonded import) and how these strategies integrate E-Commerce. As it stands, a seller can use any of the current strategies to fulfill an E-Commerce request. This shows that any new policy on data collection or sharing would have to take in to account all three strategies to have the greatest impact and least disruption.

The project is currently on track. The Project team is working now to secure stakeholder meetings.

G.13.2. Executive Summary

Project PI: Weidong (Larry) Shi
Lead Institution: University of Houston
Support Personnel: Christine McDaniel The MacroDyn Group, Washington, DC; Vincent Iacopella, licensed Customs broker, Trade co-chair of the 14th COAC Committee
Project Champion: Vincent Annunziato Director of Trade Transformation, Office of Trade, U.S. Customs and Border Protection
Period: Project Year 1 (Project months 1 through 3)

Objectives: 1) Conducting research, and developing models to integrate support for Customs procedures (e.g., unique product identifiers, product classification, COO certificates, certificates required for review by PGAs – for instance FDA), with e-commerce ecosystem to automate and facilitate legitimate flow of e-commerce goods; 2) Developing and evaluating data cooperation among e-commerce operators, sellers/buyers, and Customs for automation and simplification of e-commerce Customs declaration, assurance of data quality of e-commerce imports within the e-commerce value chain, in particular closing e-commerce data gaps of low valued shipment (e.g., product identifiers), and increased capability for Customs control on cross border e-commerce and risk based assessment; 3) Developing approaches to harmonize flow of information among e-commerce platforms,

Customs, and cross border postal services for improving efficiency; 4) Engaging with stakeholders and evaluating the developed models along key dimensions such as trade facilitation, Customs control, risk management, and automation of Customs declaration process; 5) Identifying and analyzing potential barriers to e-commerce data cooperation; 6) Economic analysis of the benefits, costs, potential opportunities, and potential threats of integrating emerging technologies into Customs procedures and data cooperation among e-commerce operators, sellers, buyers, and Customs.

Baseline: The e-commerce marketplace has spurred increased competition, lower prices, and more variety. By offering ease of access and more ways by which transactions can be completed, e-commerce is fast becoming the platform that consumers and businesses use to access global markets. The process stands in great contrast with traditional, mainly containerized, trade where most of the volumes are shipped in large quantities between a limited number of sellers and buyers.

Methodology: The Project Team worked closely with CBP and government side stakeholders/subject matter experts (including USPS), as well as commercial e-commerce stakeholders to draft recommendations based on well-established information systems research framework. Other methods employed included literature survey, in depth analysis, economic analysis, brainstorming sessions, teleconference meetings and discussions with private industry stakeholders, COAC consultants, and government side subject matter experts. Further application of After/Before analysis facilitated objective assessment of the e-commerce data cooperation and revenue collection models.

The project is currently on track to reach planned milestones. The project completed milestones 1 (survey of map e-commerce data flow and business process). The team had quarterly project meeting at the end of June.

In addition, project activities of the team so far included: conducted multiple brainstorming sessions regarding e-commerce information sharing and lessons from CBP e-commerce pilots; developed tools for collecting e-commerce data from public sources; engaged with stakeholders such as COAC e-commerce workgroup.

G.13.3. Milestones, Deliverables, and Performance Metrics

G.13.3.1. Milestones Table

ID	Description	Due Date	Status
M.1	Completion of e-commerce survey study.	06/2020	Completed
M.2	Completion of model development (e-commerce integration of Customs support, postal network).	08/2020	In Progress
M.3	Completion of data cooperation model development.	12/2020	Outside reporting period
M.4	Completion of evaluation and assessment with stakeholders.	12/2020	Outside Reporting Period

G.13.3.2. Milestones Report

M1. Completion of e-commerce survey study

The team conducted a comprehensive e-commerce survey covering efforts of CBP type 86 and section 321 pilots, map of e-commerce data flow and business process, WCO-UPU data standards regarding e-commerce shipping,

data definitions and flow among e-commerce stakeholders including marketplaces/platforms, WCO e-commerce standards, e-commerce business models and logistics strategies, etc.

M2. Completion of model development
The team had multiple teleconference meetings in June. Currently it is on track to complete M2.

M3. Completion of data cooperation model development
The team had teleconference meetings in June. Currently it is on track to complete M3.

M4. Completion of evaluation and assessment with stakeholders.
This activity is scheduled outside the reporting period.

G.13.3.3. Deliverables Table

ID	Description	Due Date	Status
D.1	Survey of e-commerce support for Customs and map of information flow.	06/2020	Completed
D.2	Models for e-commerce support of Customs procedures and declaration.	08/2020	In Progress
D.3	Models for harmonizing information flow among e-commerce, Customs, and postal network.	08/2020	In Progress
D.4	Models for data cooperation among e-commerce operators and stakeholders.	12/2020	Outside Reporting Period
D.5	Evaluation from stakeholders.	12/2020	Outside Reporting Period
D.6	Final project report.	12/2020	Outside Reporting Period

G.13.3.4. Deliverables Report
D1. Survey of e-commerce support for Customs and map of information flow
The team finished the survey. Data (excel files) and flow diagrams were shared within the team and included in project meeting handouts. They will be included as attachment in project report.

D2. Models for e-commerce support of Customs procedures and declaration
Effort has begun on this deliverable.

D3. Models for harmonizing information flow among e-commerce, Customs, and postal network
Effort has begun on this deliverable.

G.13.3.5. Performance Metrics Table

ID	Description	Due Date	Status

KPI-RI-1	Improving trade facilitation.	12/2020	Outside Reporting Period
KPI-RI-2	Improving risk management.	12/2020	Outside Reporting Period
KPI-RI-3	Facilitating data exchange/cooperation with e-commerce operators.	12/2020	Outside Reporting Period
KPI-RI-4	Strengthening Customs control and enforcement.	12/2020	Outside Reporting Period

G.13.3.6. Performance Metrics Report

All key performance indicators are outside of this reporting period.

G.14. DNA Assays for Determining Honey Origins; Richard Willson, University of Houston

G.14.1. BTI Management Summary

This project kicked off on 21 February 2020 and held a Quarterly meeting on 21 May 2020. Due to COVID-19 travel restrictions, Milestone 1 (Collection of 300 samples) is delayed. However, the PI team has been able to begin Tasks 3 (Honey pollen DNA sequencing), Task 5 (Honey plant DNA sequence clustering informatics analysis), Task 6 (Purification and analysis of soluble DNA from filtered honey), and Task 7 (curation and detection of country-specific plant barcodes) with the samples they already have.

The BTI Management, Research Committee, and Project Champion believe that despite the delay in sample collection, the overall project remains on track to complete on time and on budget.

G.14.2. Executive Summary

Project PI: Richard Willson
Lead Institution: University of Houston
Support Personnel: Aniko Sabo (Bioinformatics Expert); Katerina Kourentzi (Assay Development Expert); Dimple Chavan (Graduate Student); Suman Nady (Graduate Student)
Project Champion: Patricia (Hawes) Coleman, Deputy Executive Director, Customs and Border Protection, Laboratories and Scientific Services
Period: Project Year 1 (Project months 1 through 5)

Objectives: 1) Establish DNA sequencing and sample clustering analysis pipeline; 2) Develop DNA amplification-based RPA analysis methods; 3) Demonstration of purification, PCR amplification and sequencing of soluble DNA

Baseline: There is considerable miss-identification of sources of honey imported into the United States and identifying the true origin of imported honey is of considerable interest to Customs and Border Protection. The current methods for determining country of origin are based on pollen identification.

Methodology: The methods to be employed include: 1) Pollen DNA barcode sequencing-based identification of plant and geographical origins of honey; 2)

Analysis by clustering based upon metagenomic, barcoding data and publicly available databases; 3) demonstration of methods to resist attempts to evade detection by manipulating pollen content/profile. The methods and Standard Operating Procedures have been transferred to CBP-LSS for DHS use.

The project is currently on track to reach all planned milestones, as mentioned in the workplan. The Project Champion and research committee members were updated with the research progress during the Project Quarterly Meeting held on 21 May 2020. The change has caused no delay in overall milestone, deliverable, or performance metric timelines, except for milestone 1 involving the acquisition of 300 samples, which is slightly delayed by the COVID-19 pandemic. Necessary steps are taken to overcome the delay in milestone 1 including expanding the pool of individuals who are collecting the samples, supplementing with domestic samples.

G.14.3. Milestones, Deliverables, and Performance Metrics

G.14.3.1. Milestones Table

ID	Description	Due Date	Status
M1	Accumulation of 300 honey samples	July 2020	Outside the reporting period
M2	Sequencing of 300 honey samples	October 2020	Outside the reporting period
M3	RPA assay development	October 2020; January 2021	Outside the reporting period

G.14.3.2. Milestones Report

M1. Accumulation of 300 honey samples

As of the end of this reporting period the Project team had accumulated 181 honey samples from 30 countries. As described in the workplan milestone M1 was supposed to be completed by the end of six months (July 2020). However, due to COVID-19, the milestone M1 is now scheduled to be completed outside of this reporting period. The Project team could simply purchase the remaining samples online in a short time, but authenticity and provenance are important in the acquisition of these standard materials. Extensive efforts have been invested by honey team members to procure additional honey samples through legitimate online websites, retail shops, and via trusted friends and colleagues. The Project team expects to achieve milestone M1 by September 2020.

M2. Sequencing of 300 honey samples

The Project team's laboratories were entirely shut down by COVID-19 and are now operating at reduced capacity with extensive social distancing. The Project team has obtained next-generation sequencing data for a total of 17 samples. The next four samples are with Genewiz, with results expected to be received by July 27, 2020. Considering the necessary precautionary measures taken by UH to allow reopening research labs, we will achieve milestone M2 by the end of October 2020, as stated in the workplan.

M3. RPA assay development

The Project team is working towards milestone M3, which is on track and will be achieved by October 2020 as stated in the workplan.

G.14.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Kickoff meeting minutes	Feb 21 2020	Completed
D2	Accumulation of honey samples	April 2020, July 2020	Ongoing
D3	Pollen DNA purification and prep protocols	March 07 2020	Completed
D4	Pollen DNA sequencing	July 2020, Oct 2020	Ongoing
D5	Pollen DNA clustering methods and data	July 2020, Oct 2020, Jan 2021	Ongoing
D6	Purification and analysis of soluble DNA from filtered honey	April 2020, July 2020, Jan 2021	Ongoing
D7	Country-specific plant DNA barcode archive and informatics	April 2020, July 2020, Nov 2020	Ongoing
D8	RPA amplification assays	July 2020, Oct 2020, Jan 2021	Ongoing
D9	Testing and validation to determine origins of CBP-provided or blinded honey samples	Jan 2021	Not yet started
D10	Overall Report	Jan 2021	Not yet started
D11	Project Debriefing	Jan 2021	Not yet started

G.14.3.4. Deliverables Report

The Project team is on schedule to complete all deliverables as committed in the workplan except for deliverable D2 (accumulation of 300 honey samples) which will be somewhat delayed due to unexpected COVID-19 issues. As discussed previously, substantial efforts are being made to acquire the remaining 125 honey samples from trusted sources.

D1. Kick-off Meeting Minutes

The kick-off meeting minutes were completed on 21 February 2020.

D2. Accumulation of Honey Samples

As of the close of the reporting period the project team had accumulated 181 unique samples.

D3. Pollen DNA Purification and Prep Protocols

Pollen DNA purification and prep protocols were delivered to the Project Champion on 10 March 2020.

G.14.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Honey sample acquisition	July 2020	Delayed; Outside the reporting period
KPI-RI-2	Honey sequencing reads per sample	April 2020	Ongoing

KPI-RI-3	Filtered honey PCR success rate	July 2020	Ongoing
KPI-D-1	Presentation at technical conference accepted	January 2021	Ongoing
KPI-D-2	Paper submissions to peer-reviewed journals	October 2020; January 2021	Ongoing
KPI-D-3	Sequencing & analysis SOPs	January 2021	Ongoing

G.14.3.6. Performance Metrics Report
Research and Innovations KPIs

KPI-RI-1 (300 honey sample acquisition) will be slightly delayed.

KPI-RI-2 has met the criteria of at least 30,000 reads per sample, mentioned in the workplan, for all 17 samples sequenced so far. We have successfully shown PCR and NGS analysis of plant DNA isolated from filtered honey using three different methods for KPI-RI-3.

Dissemination KPIs (HSE, Scientific Community, Public)

KPI-D-1 Two abstracts have been accepted for presentation at the American Chemical Society Fall 2020 Meeting & Expo, 17-20 August 2020 (now virtual).

- ✓ Targeted next-generation sequencing using plant ITS2 for authenticating honey origins, the Division of Agricultural and Food Chemistry (Oral)
- ✓ Enrichment of trace pollen-free DNA for next-generation sequencing to determine honey origins, the Division of Biochemical Technology (Poster)

G.15. Assessment of Customs-Trade Partnership Against Terrorism (CTPAT) Program; Andrew Farrelly, CT-Strategies

G.15.1. BTI Management Summary

This project kicked off on 19 March 2020. The project is overall on time, with a delay to Milestone 2 (Complete Gathering of Raw Data) due to OMB approval of the survey taking longer than planned. Despite these delays, the BTI Management, Research Team and Project Champion expect that the project will be completed on-time.

G.15.2. Executive Summary

Project PI: Andrew Farrelly
Lead Institution: CT Strategies
Support Personnel: Ronald May (CTPAT Subject Matter Expert); Allen Gina (CBP/CTPAT Subject Matter Expert); Brett Laduzinsky (Project Manager)
Project Champion: Manuel Garza, Director, Customs Trade Partnership Against Terrorism
Period: Project Year 1 (Project months 1 through 4)

Objectives: 1) Obtain informational assessment of perceptions of CTPAT Program; 2) Provide practical recommendations for CTPAT Program improvement

Baseline: The Customs-Trade Partnership Against Terrorism (CTPAT) Program Customs Trade Partnership Against Terrorism (CTPAT) was established in November 2001 to enhance United States border security via strengthening international supply chains. As part of a multi-layered cargo enforcement program, CTPAT has evolved into an effective public-private partnership to facilitate flows of cargo through ports of entry while maintaining the rigorous security standards inherent in CBP field operations. This voluntary program involves principle stakeholders of the international supply chain such as importers, carriers, consolidators, licensed customs brokers, and manufacturers. The statutory framework for the CTPAT program was provided by the Security and Accountability for Every Port Act of 2006. A report from the Government Accounting Office published in February 2017 (GAO-17-84) highlighted deficiency in the program's ability to demonstrate member benefits.

Methodology: The Project Team has collected data from both CBP and participating member companies through remote interviews and a survey. Data includes crossing and examination rates as well as ease of access to other listed benefits. Data were gathered across various geographic areas, port sizes, timeframes, and modes of transport so as to represent the national scale of the program.

For metrics that cannot be quantified through a measure of time, money, or other quantifiable benefit, a standardized qualification scale was utilized to measure benefits. To measure benefits to CBP, appropriate data was gathered quantifying CBP resources expended in trade processing.

The value of these data sets will be measured against a comparable sample of non-CTPAT participants' data. Where applicable, CTPAT members' data will be compared to like data sets taken from prior to their membership. This will provide a 'before and after' comparison, where appropriate.

The project is largely on track, plans for data-gathering are in place and discussions with key stakeholders have occurred. The online survey has been created with the help of a survey designer and is pending approval by the U.S. OMB to distribute to approximately 11,000 stakeholders. Because the OMB approval process is taking longer than expected, M2 is projected to be delayed 1-2 months. Milestones 3, 4, and 5 are all on track. Framework for those milestones is being prepared and specific data will be incorporated as it is obtained.

All deliverables due to date (1-3 of 16 total) have been submitted. The Project team anticipates that future deliverables will be provided on targeted due dates, with the exception of deliverables 4-5 (gathering and refining raw data) due to the delays with the OMB survey approval. Subsequent deliverables 6-16, should not be delayed in any significant way.

G.15.3. Milestones, Deliverables, and Performance Metrics

G.15.3.1. Milestones Table

ID	Description	Due Date	Status
M1	Complete plan for data-gathering to include scheduled elicitation sessions with stakeholders in the field,	Initiation + 3 months	Delayed without great difficulty

	identified accessible documents and data from CTPAT HQ, and other identified outside data sources	(June 2020)	
M2	Complete gathering of raw data from: stakeholders in field; accessible data sources from CTPAT HQ, and outside documents	Initiation + 6 months (Sept. 2020)	In progress: (50%) Preliminary stakeholder interviews conducted ; raw data requested, online survey created and pending approval from the Office of Management & Budget (OMB)
M3	Complete set of further data analysis reports; including additional literature review, enrollment patterns, and differences in modes	Initiation + 10 months (December 2020)	In progress (25%) Literature Review near completion, Framework being prepared on enrollment patterns and differences in modes. Additional stakeholder data will be plugged in as received.
M. 4	Complete set of Performance Metrics for CTPAT Program (updated and new metrics)	Initiation + 11 months (January 2021)	In progress (20%) early analysis of metrics is underway.
M.5	Final Report Submitted – including final data analyses and set of best performance measures	Initiation + 12 months (February 2021)	In progress (10%). Various final report components being worked simultaneously. Framework for key themes being prepared, pending stakeholder data returns.

G.15.3.2. Milestones Report

M1 Status: Complete Plan for Data Gathering

The plan for data-gathering is delayed but as of the end of the reporting period was nearing finalization. Discussions have been held with key government and industry stakeholders. Documents and data sets have been requested for review. Ideally, the Project Team would like to firm up elicitation/interview dates after survey data begins to be returned (as part of M2). However, should the survey return data be significantly delayed further, elicitations can be scheduled independently so as not to delay M1 any further.

M2. Status: Complete Gathering of Raw Data

Milestone 2 is underway but with delays. The online survey, which will yield a significant quantity of stakeholder data return, has been created with the assistance of professional survey designer. The survey is pending approval by

the U.S. OMB prior to distribution to over 11,000 stakeholders. Additionally, discussions have been had with private sector transportation groups regarding establishing elicitations. Ideally, this would happen after the online survey is distributed. Private stakeholder groups seem eager to participate and provide data. Government stakeholders are also being lined up to provide feedback and key data. Milestone 2 may be delayed by 1-2 months due to the OMB review delay. The project team is confident it can mitigate negative impact of the delay by preparing portions of subsequent deliverables earlier on, so that the overall project stays on track.

M3. Complete Set of further data analysis reports
The CTPAT Literature Review is near completion. A framework is being prepared regarding reports on trends in CTPAT enrollment patterns and differences in modes. This framework will allow the Project Team to add in data and draw key conclusions as it is obtained through stakeholder surveys, elicitations, and document reviews. Milestone 3 is on track for December 2020.

M4. Complete Set of Performance Metrics
Early data requests and documents reviewed have begun to provide an idea of performance metrics. The Project Team will continue to review existing and incoming data to build out a set of Performance Metrics. M4 is on track for January 2021.

M5. Final Report
The Project Team is beginning to identify key themes for the Study. As further data is gathered and analyzed these themes will be built out along with a set of performance metrics. M5 is on track for on time completion in February 2021.

G.15.3.3. Deliverables Table

ID	Description	Due Date	Status
D1	Updated Project Plan	Apr 2020	Complete
D2	Summary of problems to prioritize existing data sources	May 2020	Complete
D3	List of stakeholders and plan for specific data requests	June 2020	Complete
D.4	Raw data gathered and documented from the CBP CTPAT Office and stakeholder groups at CTPAT field offices	Sept 2020	Survey created, pending USG approval
D.5	Refined data set with quality, reliability, and integrity	Oct. 2020	Pending data-gathering
D.6	Summary of benefits and, when available, quantifiable impacts of CTPAT	Nov. 2020	Benefit data in early stages of gathering
D.8	Literature review on CTPAT and/or similar programs	Nov. 2020	Near completion
D.9	Analysis of enrollment patterns, benefits, and tradeoffs	Dec. 2020	In progress
D.10	Summary of the difference in benefits realized across different modes	Nov. 2020	In progress
D.11	Set of performance metrics appropriate for CTPAT program	Dec. 2020	In progress
D1	Updated Project Plan	Apr 2020	Complete

G.15.3.4. Deliverables Report
D1. Updated Project Plan
Submitted April of 2020

D2. Summary of problems to prioritize existing data sources
Submitted May 2020

D3. List of stakeholders and plan for specific data requests
Submitted June 2020

D4. Raw data gathered and documented from the CBP CTPAT Office and stakeholder groups at CTPAT field offices
Currently in progress. Per Milestone 2 status: The online survey, which will yield a significant quantity of stakeholder data return, has been created with the assistance of professional survey designer. The survey is pending approval by the U.S. OMB prior to distribution to over 11,000 stakeholders.

Additionally, discussions have been had with private sector transportation groups regarding establishing elicitations. Private stakeholder groups seem eager to participate and provide data. Government stakeholders are also being lined up to provide feedback and key data. D4 was slightly delayed due to the OMB review delay. The project team is confident it can mitigate negative impact of the delay by preparing portions of subsequent deliverables earlier on, so that the overall project stays on track.

Review of existing documents and other data is also being conducted while waiting for the online survey to launch.

D5. Refined data set with quality, reliability, and integrity
This will be completed pending the completion of D4, which may face a 1-2-month delay. Survey data will be refined with the assistance of Survey Design Specialist.

D6. Summary of benefits and, when available, quantifiable impacts of CTPAT
Benefit data has begun to be reviewed and discussed with key stakeholders, along with analysis of impacts on CTPAT. Benefits are regarded as a key component of the study. D6. Is on track for on time completion.

D8. Literature review on CTPAT and/or similar programs
D8 is near completion. The Project Team has reviewed past studies, government reports, and articles on CTPAT. The Literature Review shows how the program has evolved, but where progress can still be made. The Project Team comments on how its Study addresses critiques raised in past articles and reports. D8. Is on track for on-time completion.

D9. Analysis of enrollment patterns, benefits, and tradeoffs
The Project Team is creating a framework for this deliverable based on initial data gathered and past program experience. Additional data gathered through the survey and stakeholder interviews will then populate the framework as it is acquired. D9 is on track for on-time completion.

D10. Summary of the difference in benefits realized across different modes

Similarly, to D9, a deliverable framework has been developed. Additional data gathered in the coming weeks will populate the framework. D10 is on track for on-time completion.

D.11 Set of performance metrics appropriate for CTPAT program
Initial data has been gathered related to performance metrics. This area will be further studied as additional documents are reviewed and stakeholder interviews are held. D.11 is scheduled for on-time completion.

D.12 Evaluation guideline for CTPAT members
D.13 Analysis of potential roadblocks and tradeoffs in adopting CTPAT
D.14 List of best performance measures for CTPAT program
D.15 Analysis of factors influencing sustained enrollment

Regarding deliverables D12-D15, some data has been gathered through initial stakeholder interactions and document reviews, but the majority of the work on these deliverables has not yet begun. The Project Team is confident that these deliverables will be completed on schedule.

D.16. CTPAT Final Program Assessment Report
Key themes are being identified for the Final Report regarding benefits, metrics, Program marketing, and Member communications. Findings related to these key themes will be validated and adjusted accordingly as additional data is gathered. On-time delivery is expected.

G.15.3.5. Performance Metrics Table

ID	Description	Due Date	Status
KPI-RI-1	Data sources identified with CTPAT Office. Metrics/measures: number/percentage of needed data sets located/identified; number obtained; effort/time in cleaning/processing for use in the models, number of data sets not available, etc.	Initiation +3 months (March-June 2020)	Incomplete
KPI-RI-2	Stakeholders engaged in elicitation sessions at CTPAT field offices. To include subsets of company size, modes, and other divisions that become apparent during the process. Additional KPIs will be included to measure quality and completeness of responses; e.g. number of questions answered and a standard measure of thoroughness of response.	Initiation + 6 months (Sep 2020)	In progress (50% complete)
KPI-RI-3	Quantifiable and qualifiable CTPAT performance metrics identified. Additional KPIs will be incorporated to reflect the number of existing models as well as new models to be developed; and effort expended to implement them. KPIs will also be developed to measure schedule modifications and extensions.	12 months (Feb. 2021)	In progress (25% complete)
KPI-D-1	Presentation at technical conference accepted	During/After Completion	Planned
KPI-D-2	Paper submissions to peer-reviewed journals	After completion	Planned

KPI-D-3	Data shared with CTPAT Members and Trade Community	During/After Completion	Project objectives shared with CTPAT Members and Trade community
KPI-D-4	Number of notifications sent out	After completion	Planned
KPI-D-5	Response rates	After completion	Planned
KPI-D-6	Event attendance	After completion	Planned
KPI-D-7	Measurable quality of discussions	After completion	Planned

G.15.3.6. Performance Metrics Report

KPI-RI-1.

Available data sources have been identified, as well as unavailable data sources. These include existing documents and initial discussions with government and industry stakeholders. The Project Team will continue working with CBP and the CTPAT Office, and Field Offices, to identify data sources and exploit them beyond the current reporting period.

KPI-RI-2.

The online survey is scheduled to be issued later this summer, as are the elicitation sessions to be scheduled. Based on initial discussions with trade association representatives and sample CTPAT Members, the Project Team is confident in a sufficient response rate and sufficient quality of data.

KPI-RI-3.

Performance metric data has been examined. Utilizing additional data gathered beyond the performance period will help quantify and qualify the data further.

KPI-D-1-7.

Working in coordination with the CTPAT Office, the CBP Commercial Operations Advisory Committee (COAC), and with other trade associations, the Project Team has begun disseminating information on the Study's objectives and key milestones so that these stakeholders may engage at key points and stay informed throughout the process as much as is appropriately possible.

After completing the project, the Project Team plans to coordinate with CBP, the CTPAT Office, BTI, and DHS to appropriately share results of the study through conferences, publications, and other forums.

H. DHS Related Activity Not Specified in PY5 Work Plan

H.1. CBP Trade Innovation Summit

At the invitation of the Director of Trade Transformation for U.S. Customs and Border Protection, Vincent Annunziato, the Executive Director and Mark Clarke, Associate Provost

at the University of Houston, presented during the 2019 Innovation Summit in Washington, DC, on 7 August 2019. The summit was hosted by U.S. Customs and Border Protection, Office of Trade, Trade Transformation Office, Business Transformation and Innovation Division. The Associate Provost's presentation centered on the Innovation Economy at the University of Houston and the success derived from student-compromised "E-Teams" regarding the successful transition of intellectual property and as an experiential learning opportunity.

H.2. Office of Trade Leadership Training Offsite

The BTI Institute coordinated and hosted a panel centered on China and its impact on trade, at the request of Cynthia Whittenburg, Deputy Executive Assistant Commissioner, at the DHS St. Elizabeth's Campus in Washington, DC, on 13 August 2019.

Richard Willson, BTI Institute Research Committee member and Professor at the University of Houston, moderated a panel that included Steven Lewis, Fellow at the Baker Institute at Rice University, Todd Ratcliffe, President and CEO of the Pharmaceutical Security Institute, Patrick Schaefer, Executive Director of the Hunt Institute, and Peter Li, Assistant Professor at the University of Houston. Kurt Berens, Executive Director of BTI Institute, gave introductory remarks and a brief overview of the mission and efforts of the BTI Institute.

Lewis presented a "Survey of China," including a discussion on consumer tendencies. Ratcliffe presented on the impact of counterfeit pharmaceuticals and online pharmacies. Schaefer presented on trends in maritime shipping data to and from China. Li presented "China & Global Wildlife Trafficking," including a discussion of the amount of international wildlife trafficking that passes through China.

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