Headquarters U.S. Air Force

Integrity - Service - Excellence

Air Force Human Systems Integration – Capabilities and Requirements Tool (HSI-CRT)

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711 HPW/HP
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Overview

- Background
- Validation / Verification of Question Sets
- HSI-CRT Usability Study
- Software Demonstration
- Summary
- Discussion

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Background

- **Mission**
  - The mission of the 711th Human Systems Integration Directorate (711 HPW/HP) and purpose of Human Systems Integration (HSI) is to optimize warfighter performance through a human-centric approach to system development, acquisition, and sustainment.
- **Problem Statement**
  - 711 HPW/HP lacked a comprehensive approach for inclusion of HSI in early systems engineering processes and documents such as the Capabilities-Based Assessment (CBA), Analysis of Alternatives (AoA) and Concept Development (CD)
- **Solution**
  - Develop an effective tool, for addressing human performance related issues in the CBA, AoA, and CD processes and documents, to ensure HSI best practices are included in DoD / affiliated acquisition processes

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Background

- Completed a literature review of documents related to the CBA, AoA, and CD.
- Leveraged DoD and AF requirement guides to develop comprehensive question sets
  - Developed questions that inherently highlight a best practice in an area
    - Questions were formulated in such a manner that a positive response indicates that the “best practice” is being followed
- Reviewed the *Risk Management Guide for DoD Acquisition* in order to develop a strategy for risk assessment
- Leveraged Risk Identification: Integration & Ilities (RI3) application as a framework/guide in developing the interactive tool

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Question Sets and Risk Assessment Strategy

HSI-CRT Reports

Capabilities-Based Assessment (CBA)

- 109 Questions
- 12 Risk Matrices
  - 1 Overall Roll-up Risk Matrix
  - 9 HSI Domains
  - 1 Tradeoff
  - 1 General
- 1 Roll-up Bar Chart

Analysis of Alternatives (AoA)

- 140 Questions
- 12 Risk Matrices
  - 1 Overall Roll-up Risk Matrix
  - 9 HSI Domains
  - 1 General
  - 1 Tradeoff
- 1 Roll-up Bar Chart

Concept Development (CD)

- 86 Questions
- 12 Risk Matrices
  - 1 Overall Roll-up Risk Matrix
  - 9 HSI Domains
  - 1 General
  - 1 Tradeoff
- 1 Roll-up Bar Chart

HSI-CRT Design and Development

Questions and Risk Assessment Strategy

Sample Questions

AoA	CBA	CD
Have manpower requirements been identified for each alternative?	Was a Manpower-Expert part of the CBA Analysis Team?	Have specific Manpower concepts been identified and documented with respect to capability gaps, mission tasks, MOEs, MOPs, MOSs, operational concepts, and support concepts?

Yes

- Provide evidence of best practice occurring
- Next Question (Do not include in the Risk Matrix)

No

- Provide rationale for negative response
- Assess Likelihood (the likelihood of best practice not occurring)
- Assess Consequence (the impact on the program if the best practice does not occur)

Not Applicable

- Provide rationale for why the question is not applicable

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HSI-CRT Design and Development

Questions and Risk Assessment Strategy

- **Likelihood:** The probability of the best practice (stated in the question) **NOT** occurring *(Assigned by the user)*

Level	Likelihood	Probability of Occurrence
1	Not Likely	0% - 20%
2	Low Likelihood	21% - 40%
3	Likely	41% - 60%
4	Highly Likely	61% - 80%
5	Near Certainty	81% - 100%

- **Consequence:** The impact (consequence) on the program if the best practice does **NOT** occur *(Assigned by the user)*

Level	Consequence
1	Minimal or no consequence to human effectiveness and performance with minimal or no impact on program success
2	Minor reduction in human effectiveness and performance with little or no impact on program success
3	Moderate reduction in human effectiveness and performance with limited impact on program success
4	Significant degradation in human effectiveness and performance; may jeopardize program success
5	Severe degradation in human effectiveness and performance; will jeopardize program success

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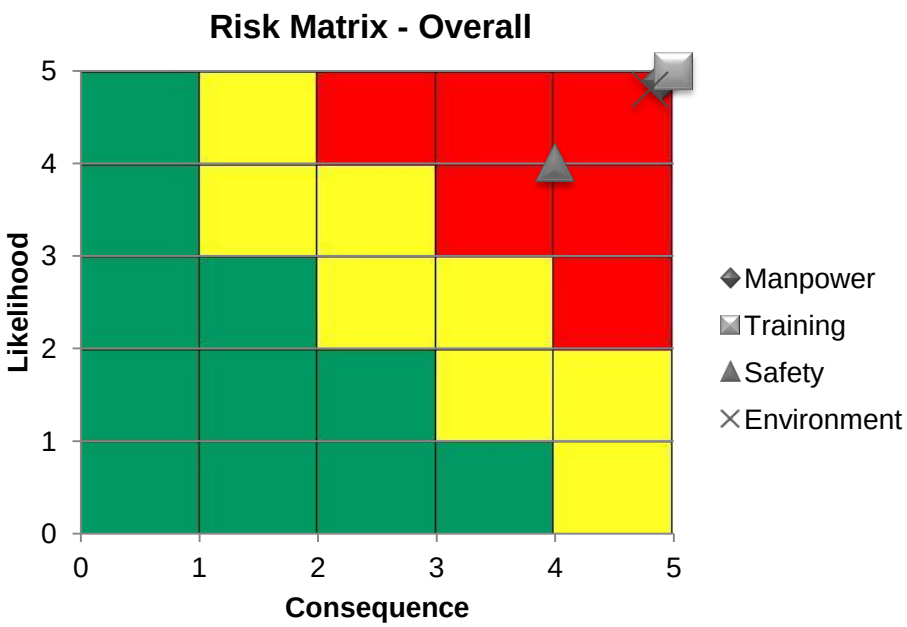
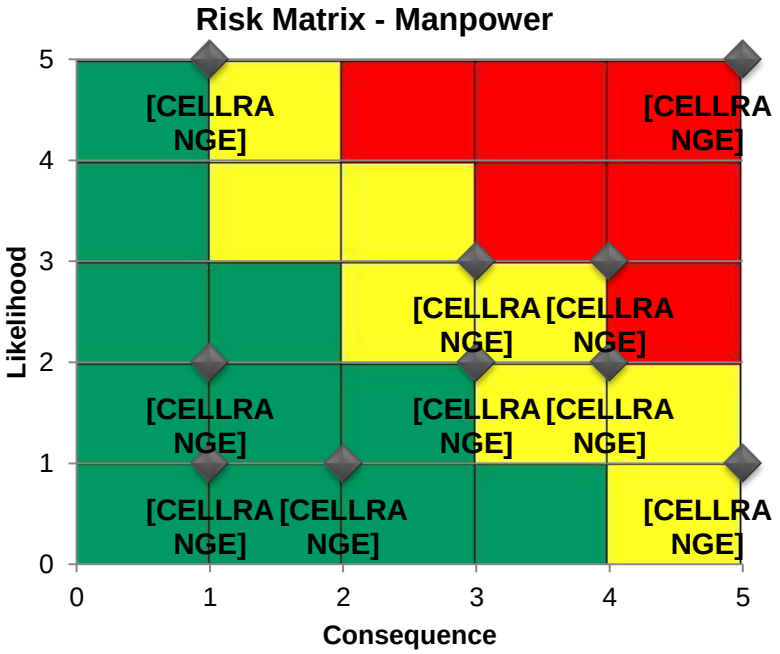
HSI-CRT Design and Development

Questions and Risk Assessment Strategy

Overall



Domain- Specific



Verification & Validation of Question Sets

Overview

- **Purpose**
  - Review and evaluate the domain-based question sets associated with CBA, AoA, and CD for accuracy, comprehensiveness, completeness, and applicability.
- **Process**
  - Collected Subject Matter Experts (SMEs) background information
  - Interviewed SMEs
  - Solicited written feedback from SMEs

Verification & Validation of Question Sets

SME Information Form

- **SME Information Form**
  - Contact Information
  - HSI/HSI Domain Experience
  - Air Force Acquisition Experience
  - CBA , AoA, and CD participation experience

Contact Information

Full Name: _____
Title *First* *Last*

Office Phone: _____

Email _____

Human Systems Integration (HSI) and Domain Experience

How knowledgeable are you in the following?

	Not Knowledgeable	Somewhat Knowledgeable	Knowledgeable	Very Knowledgeable	Years of Experience
Human Systems Integration	☐	☐	☐	☐	
Manpower	☐	☐	☐	☐	
Personnel	☐	☐	☐	☐	
Training	☐	☐	☐	☐	
Human Factors Engineering	☐	☐	☐	☐	
Environment	☐	☐	☐	☐	
Safety	☐	☐	☐	☐	
Occupational Health	☐	☐	☐	☐	
Survivability	☐	☐	☐	☐	
Habitability	☐	☐	☐	☐	

Acquisition Experience

How knowledgeable are you about the following?

	Not Knowledgeable	Somewhat Knowledgeable	Knowledgeable	Very Knowledgeable	Years of Experience
Air Force Acquisition	☐	☐	☐	☐	
Capabilities – Based Assessment	☐	☐	☐	☐	
Analysis of Alternatives	☐	☐	☐	☐	
Concept Characterization and Technical Description	☐	☐	☐	☐	

How many Capabilities – Based Assessments (CBA) have you participated in? _____

How many Analysis of Alternatives (AoA) have you participated in? _____

How many Concept Characterization and Technical Descriptions (CCTD) have you participated in? _____

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Verification & Validation of Question Sets

Revised Question Sets

- **Revised question sets for the CBA, AoA, and CD aligned to each HSI domain**
  - CBA – 109 questions (down from 122)
  - AoA – 140 questions (down from168)
  - Concept Development – 86 questions (up from 78)
- **Developed an approach to ensure that HSI Tradeoffs are being considered as part of the analysis**
  - HSI Tradeoff Considerations – 9 Questions

HSI-CRT Usability Study
Overview

- **Objectives**
  - Exercise the application under controlled test conditions with representative users
  - Establish baseline user performance and user satisfaction levels of the interface for future usability evaluations
  - Determine design inconsistencies and usability problem areas within the user interface
  - Determine what, if any, features are missing from the tool
- **Participants**
  - 16 personnel
  - Included both HSI practitioners and non-HSI practitioners
  - Participant Requirement: PC Proficiency

HSI-CRT Usability Study
Usability Study Plan

Task	Task Description	Time
Complete User Information Form	The user will be required to complete a User Information Form. The form solicits pertinent contact information such as e-mail and phone number from the user.	5 minutes
HSI-CRT Overview/Training	A member of the research team will provide a brief background of the HSI-CRT as well as outline the basic features of the tool. Additionally, the user will be given a 1-page quick reference sheet that highlights the basic features of the tool.	10 minutes
Scenario 1	The user will be required to complete the following tasks in Scenario 1. • Open the HSI-CRT application • Start a new analysis • Enter Program Information • Enter HSI Practitioner Information • Answer 3 Manpower questions in the Analysis of Alternatives • Answer 3 Personnel questions in the Analysis of Alternatives • Answer 3 Training questions in the Analysis of Alternatives • Select and answer 3 Tradeoff questions in the Analysis of Alternatives • Save current progress • Exit the HSI-CRT application	15 minutes
Scenario 2	The user will be required to complete the following tasks in Scenario 2. • Open the HSI-CRT application • Open an existing CBA analysis from USS2.xlsx from the Desktop • Answer 3 Safety questions in the CBA • Answer 3 Occupational Health questions in the CBA • Select and answer 3 Tradeoff questions in the CBA • Save current progress • Generate HSI-CRT Report • View HSI-CRT Report • Exit the HSI-CRT application	15 minutes
PSSUQ Survey	The user will be required to evaluate the software capabilities of the tool in a quantitative manner by completing the PSSUQ survey.	10 minutes
Wrap-up	A member of the research team will debrief the user.	5 minutes
Total		**60 minutes**

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HSI-CRT Usability Study
Outline (General Approach)

- **Overview / Walkthrough of the Tool**
- **Two (2) Scenarios**

Scenario 1
- Open Tool
- Start Analysis
- Answer 9 AoA questions
- Answer 3 tradeoff questions
- Save and Exit

Scenario 2
- Open Tool
- Open Existing Analysis
- Answer 9 CBA questions
- Save Progress

- **Questionnaire and Interview Session**

- **Observation**
  - Participant's interaction with the application was monitored by the facilitator/observer seated in the same room.
- **Post-Study System Usability Questionnaire (PSSUQ)**
  - 19 Questions
    - Overall
    - System Usefulness
    - Informational Quality
    - Interface Quality
  - 7-point scale
    - 1: Strongly Agree
    - 7: Strongly Disagree
- **Open-ended Questions**

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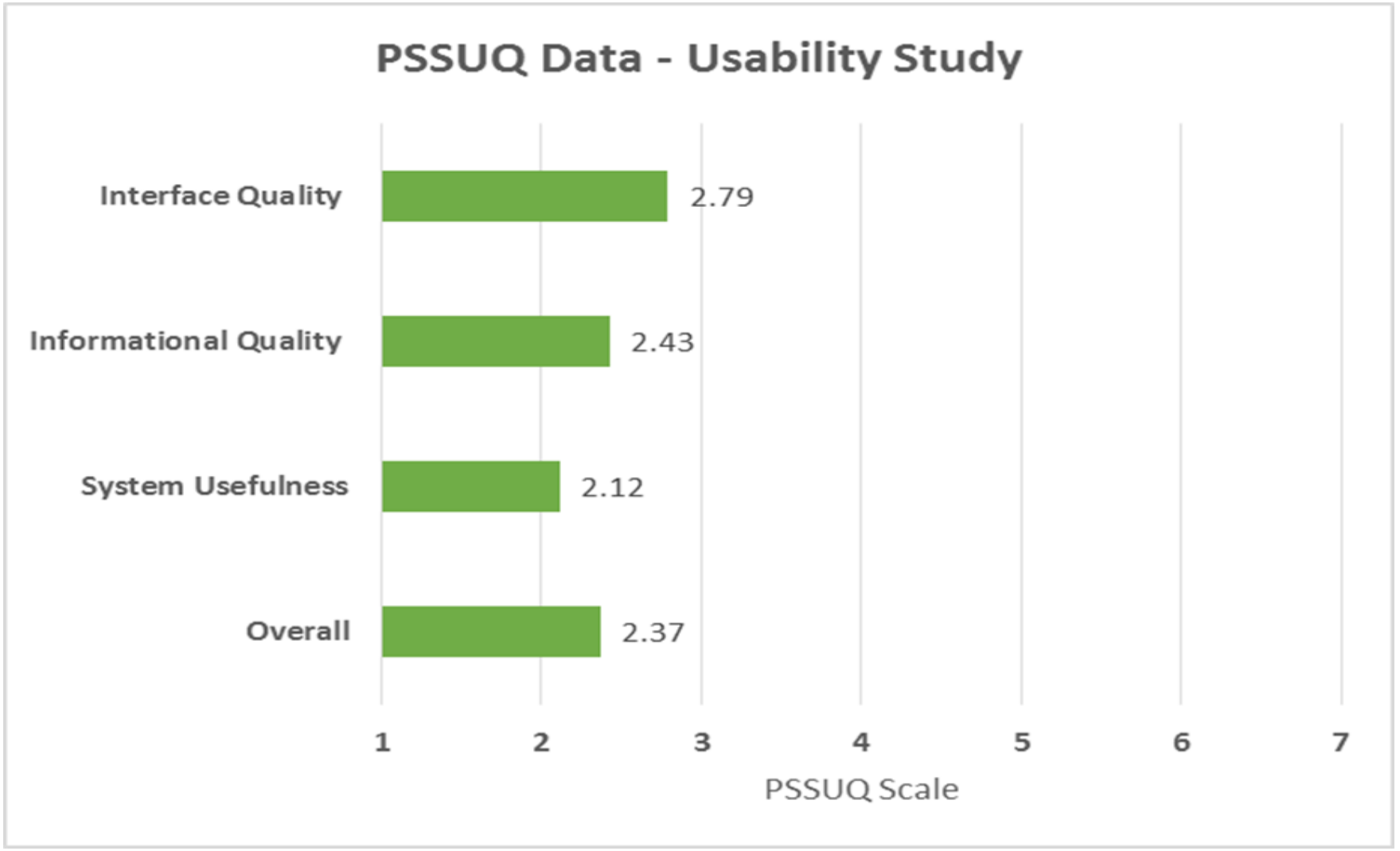
HSI-CRT Usability Study
Results



HSI-CRT Usability Study
Results

- **Some of changes made as a result of usability study:**
  - Larger font
  - Larger response box
  - More functions
    - Save As
    - Sort
  - Separate workflows for each document
  - Increased tool responsiveness
  - Change in the location of the tabs
  - Fixed the location of the navigation buttons

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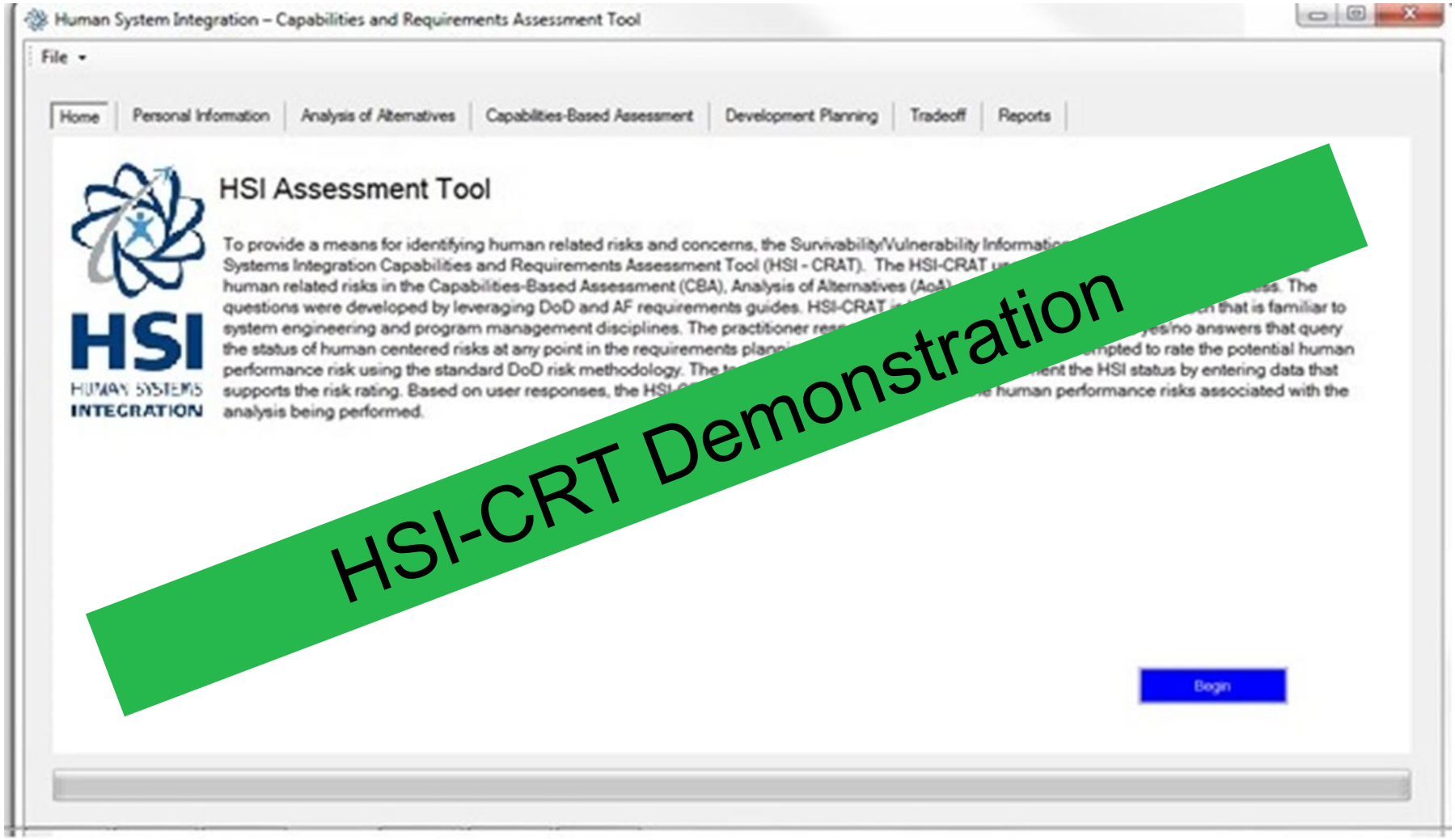
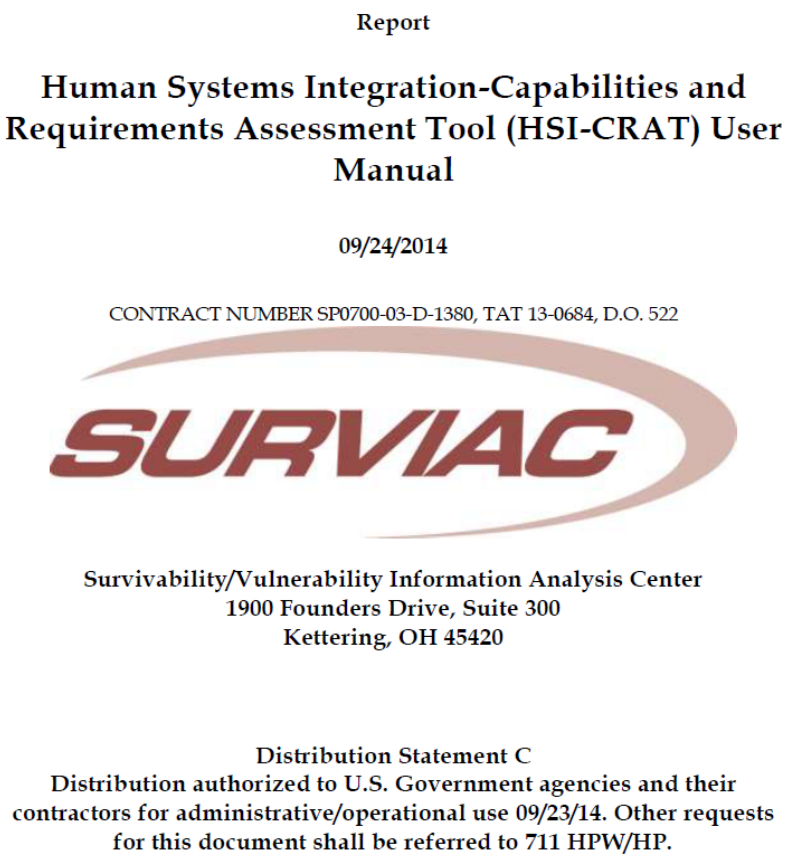
HSI-CRT Operations



HSI-CRT User Manual

- **Concise, step-by-step instructions on how to navigate the tool**
  - Home
  - Personal Information
  - Capabilities – Based Assessment
  - Analysis of Alternatives
  - Concept Development
  - HSI Tradeoff Considerations
  - HSI-CRT Report



Report

Human Systems Integration-Capabilities and Requirements Assessment Tool (HSI-CRAT) User Manual

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SURVIAC

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Summary

- **Purpose**
  - Develop an comprehensive tool for addressing human performance related issues in the CBA, AoA, and Concept Development activities and documents >>> incorporating HSI best practices within DoD / affiliated acquisition processes.

- **HSI-CRT Capabilities**
  - Comprehensive question sets for requirements documents / processes
  - Integrated approach to assess human-related program risks
  - Effective and engaging user interface

Discussion