

Human-Centered Design in Systems Engineering: Human View Methodology

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NDIA Systems Engineering Conference 29 October 2009





- Examine dynamic aspects of Human View as an effective methodology for Human Systems Integration (HSI) practitioners coordinating and collaborating with systems engineers.
- ▼ Use data from system development effort to build Human Views.
- Use modeling and simulation to analyze dynamic operator elements of the system to augment Human View process.

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- Design, development, and production of large complex systems requires the HSI practitioner to ensure that HSI results, e.g., the task analysis, are communicated in a language that the systems engineer understands.
- An architecture framework provides that communication medium.





Defines common approach for development, presentation, and integration of architecture descriptions.

Architecture frameworks are used by systems engineers to provide a common set of products and product descriptions for representing systems.

Current frameworks fail to capture the human-centered design aspects needed to ensure the effectiveness of human operated systems, such as users requirements, capabilities and limitations.





Department of Defense Architecture Framework (DODAF)

- DoDAF defines different views that breakdown a complex system into specific categories:
 - All View Describes the Scope and Context (Vocabulary) of the Architecture
 - Operational View Identifies What Needs to be Accomplished
 - Systems and Services View Relates Systems, Services, and Characteristics to Operational Needs
 - Technical Views Prescribes Standards and Conventions
- Each of the four views depicts certain architecture attributes -some attributes bridge two views and provide integrity, coherence, and consistency to architecture descriptions.

However, none of these conventions focus explicitly on the human element - by adding a Human View to the architecture framework, an understanding of the human role in systems/enterprise architectures is included.



- ▼ Early efforts to represent humans in architecture products focused on human role and activities.
 - Hildebrand and Adams, 2002
 - Handley, 2006
- Additional analytical efforts in both Canada (DNDAF) and United Kingdom (MoDAF) have been concerned with how to include human activities in architecture framework.
 - Baker et al, 2006
 - Bruseberg, 2008
- Human View methodology provides HSI practitioner a mechanism to convey an understanding of human role in systems/enterprise architectures to systems engineers.

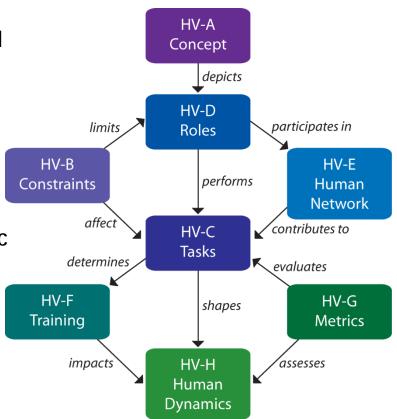


- Purpose is to organize information into a framework about how the human functions in the system in order to model the impacts of human performance from tasks, personnel, and system resources.
- Provides a set of products which captures information on Capabilities, Constraints, Tasks, Roles, Networks, Training, and Metrics, which are integrated with a dynamic model used to determine human risk.
- **v** By using the Human View
 - It ensures that the human is fully considered in the architecture by structurally incorporating them into engineering planning.
 - It provides human-system parameters that can be used to minimize human risk with the overall system.



Human View Product Descriptions

- <u>HV-A</u>: Concept A conceptual, high-level representation of the human component of the enterprise architecture framework.
- ▼ <u>*HV-B*</u>: Contraints Sets of characteristics that are used to adjust the expected roles and tasks based on the capabilities and limitations of the human in the system.
- ▼ <u>*HV-C*</u>: Tasks Descriptions of the human-specific activities in the system.
- ▼ <u>*HV-D*</u>: Roles Descriptions of the roles that have been defined for the humans interacting with the system.
- <u>HV-E</u>: Human Network The human to human communication patterns that occur as a result of ad hoc or deliberate team formation, especially teams distributed across space and time.
- ▼ <u>*HV-F*</u>: Training A detailed accounting of how training requirements, strategy, and implementation will impact the human.
- ▼ <u>HV-G</u>: Metrics A repository for human-related values, priorities and performance criteria, and maps human factors metrics to any other Human View elements.
- ▼ <u>*HV-H*</u>: Human Dynamics Dynamic aspects of human system components defined in other views.



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Example: HV-A

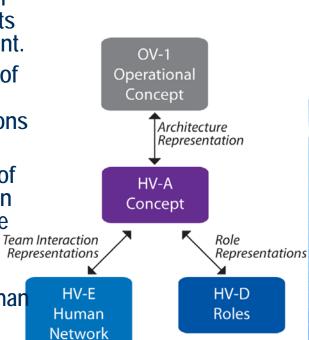
HV-A is a conceptual, high-level representation of the human component of the enterprise architecture framework. Its purpose is to visualize and facilitate understanding of the human dimension in relation to operational demands and system components.

Pictorial depictions of the system and its human component.

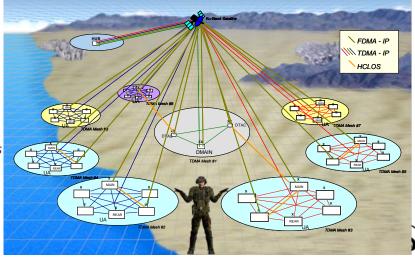
High level indicators of where human system interactions may occur.

Textual descriptions of the overall human component of the

System. Team Represent Use cases which describe the human process.



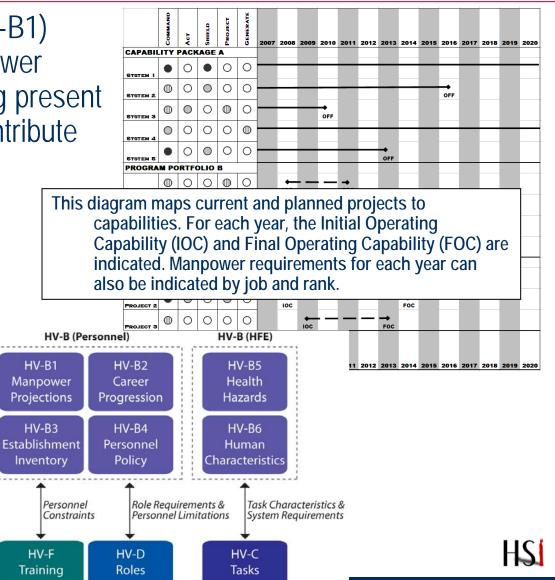






Example: HV-B

- Manpower Projections (HV-B1) illustrates predicted manpower requirements for supporting present and future projects that contribute to larger capabilities.
- Manpower forecasting to allow initial adjustments in training, recruiting, professional development, assignment and personnel management.
- Impacts (and timeframe) related to numbers of personnel, personnel mix, Military Occupational Structure Identification (MOSIDs), Rank/level distribution, and, postings/relocations of personnel.
- Number of personnel with necessary Knowledge, Skills, and Abilities (KSAs) 'ready and able' to support fielding of future program.





Example: HV-E

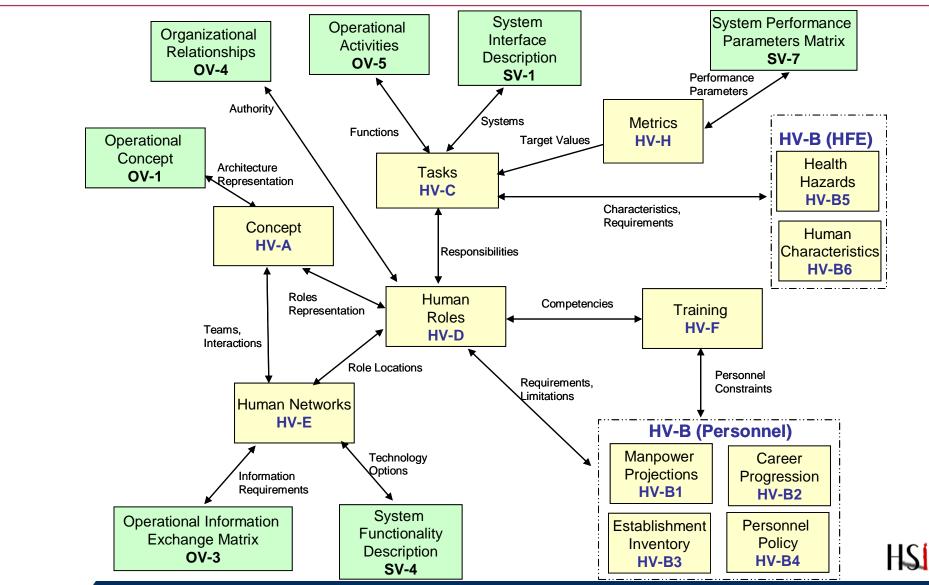
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The HV-E captures the human to HV-D HV-C HV-A Roles Tasks Concept human communication patterns that occur as a result of ad hoc or Teams & **Roles & Locations** Objectives Interactions deliberate team formation, HV-E especially teams distributed across Human Network space and time. Role groupings or teams formed, Information Requirements Technology Options including the physical proximity of the roles and virtual roles OV-3 SV-4 **Operational Information** System Functionality included for specific team tasks. **Exchange Matrix** Description Type of interaction – i.e., collaborate, **RBK/ASHORE** FWD/ AFLOAT coordinate, supervise, etc. MOC Command El ement COMMANDER Team cohesiveness indicators - i.e., Communication and Information Systems Center trust, sharing, etc. Information Manage Future Plans Center Plan Develope Team performance impacts - i.e., COA Planner Lead COA Planner Surface synchronization (battle rhythm), level of engagement (command Intelligenc This diagram indicates the interactions across teams involved directed). in the Commander's Update Brief process. It also Maritime Team dependencies - i.e., Develop specifies the communication types and team locations. frequency/degree of interaction Legend between roles. ⇒ Within Center Oper at ions Center Across Centers Current Operations Center 11/4/2009



Human View Interaction with DoDAF





- Used Improved Performance Research Integration Tool (IMPRINT).
 - Stochastic task-network modelling tool to help assess interaction of people and system performance from concept and design through field-testing and system upgrades. (Mitchell et al, 2008)
 - Helps researchers and designers evaluate operator mental workload while testing alternate system-operator function allocations. (Wickens, 1991)

Purpose of the dynamic Human View is to capture the interaction of the human system components.

 An effective modeling and simulation tool can assess the static Human View data under dynamic situations and provide the system engineer designers with a robust set of HSI criteria.



Dynamic Model Elements

| Human View Product | Data Required by Simulation Model | |
|--------------------|--|-----|
| HV-A Concept | Hypothesis to be tested by the model. | |
| HV-B Constraints | Selection of the Moderator settings of Personnel and Stressors. | |
| HV-C Tasks | Generation of the Network Diagram composed of Tasks and Subtasks; Assignment of System Interfaces to Tasks. | |
| HV-D Roles | Creation of Operator list; Assignment of Operators to Tasks. | |
| HV-E Human Network | Identification of Team Functions and Operator Teams. | |
| HV-F Training | Selection of the Moderator setting of Training. | |
| HV-G Metrics | Identification of Mission Level Time & Accuracy criterion and selection of Task Level Time & Accuracy standards. | HSI |



Method

- ▼ Used U.S. Army's Future Combat System.
- ▼ Created experimental model in IMPRINT.
 - Operators were defined by the Human View roles.
 - Task descriptions were used to create a network diagram for a specified mission.
 - Task-role combination provided the operator assignments.
 - Performance standards/measures were used to define the expected task times, accuracy, and outcomes.
 - Constraints determine moderators that impact performance (e.g., heat, etc.).
 - IMPRINT outputs provide data that describe overall success/failure of the mission, task performance completion and potential errors, and operator workload.
- Results used to support systems engineering process to ensure human/operator requirements are met.

HC.



Dynamic Model Inputs

| Z IMPRINT Pro - Analysis: Tactical Road March Version: 111 Mission: Tactica Re. Ed. Yew Moderators Exponds Tools Unlikes Help | | | | | Int | terfaces (HV-E) | |
|--|--|--|--|--|---|---|--|
| Image: Second | et to Ambush | Properti • × | | | | HV-C2 System Interfaces | |
| Analyses | | 21 III | | | Role | System | |
| Analysis Tree 8 2 FCSHV Version: 1 2 Final Analysis Version: 111 3 Depart Control Manual | res 4 Maintain March Security | | | | Platoon Leader | 1 LCU Centralized Controller; 2 Centralized Tactical (UGS-T) | Controller, |
| Event Queue Residence Read March | Conduct Scheduled Halts | tical Road March | MPRINT . | | Platoon Sergeant | Multifunction Utility/Logistics and Equipment (MULE-T) | Transport |
| Network Diagram | | Network Diagram / W Operators | | Properties: Infantry + # × | Vehicle Commander | | |
| * 🖬 Variables | Parronnel from BEV1 | Name Specially Anti Tank 00A-PlaceHolder | Automated Crew Maintainer | 21 21 III A. Warfighter | Squad Leader | 3 Centralized Controllers; Small Unmanned (SUGV) | Ground Vehicle |
| Output | te Cesuities | Common Close 118-Infantryman Driver 118-Infantryman Gunner 118-Infantryman Health Care 66W-Health Care Specialist | | a) Automated False | Robotic | Armed Rconnaissance Vehicle (ARV-A); Cla Aircraft System (UAS) | ss 1 unmanned |
| Properties - I Installed Plugins | Aniter An Tark | Infantry 11B-Infantryman Platoon Leader OFF-Officer | | a) Specially D. Workload Management | Team Leader | 6 sets Intelligent Ground Sensors (UGS-U) | |
| earch and Replac | nce Operations 1 + 20 Cond Network Dagram | Platoon Sergea 11B-Infantryman Robotic 11B-Infantryman | | a) Default Strat A | Health Care | | |
| Variable Watches 21 Destroy Unit Veh | icles and Equipment2 | Squad Leader 11B-Infantryman Team Leader 11B-Infantryman | | c) Accurrcy Pe 0.00 d) Threshold 60 | Driver | Infantry Carrier Vehicle | |
| | 22 Resume Output P Robotic Squad Leader Team Leader | Vehicle Comma 11B-Infantryman Vehicle Comma 11B-Infantryman | | | Infantry | MK 44 30MM; MK240 7.62MM; | |
| Task Netw Task Netw Task Netw Tasks (HV-C) | Popular Massie Mas | | Autyvest Scapestal Reset March Version 111 Social Reset March Version 111 Social Reset March Version 111 Social Reset March Version 11 Social Reset March Version 1 Soci | A Dagran - 1943 Back to Arobush - indexto - | W Ans Tank W Operators 23_1Drv_Ambush | m Tettfall Read Barry | |
| Platoon Arrives at Designated Coordinates Platoon Initiates Screen Operation | Roles (HV-D) | | _ | Elle Edit 1 Ed M En Windo | Ørev Moderators Execution Reports Tools LBillies Heil 2 2 2 3 3 4 2 3 4 3 3 3 3 3 3 3 | T 23_101v. Ambushi 1 RIPATS T 2 Hove h Route T 3 Report Messures T 20 Condu noze | on |
| Enemy Initiates | | | | Analysia Tree | Analyses Analysis Version: 111 Eurotion Root Function Root | March | B A Task Id A |
| React to Ambush Near | 10/ 5.5 | | | 2 | * 2 Final Analyzis Version: 111 * 2 From KI Version: 1 | erth Route ID 2 etts Failure Crew Taxons Paths Workload Destand | |
| Driver Reacts to Ambush | HV-D Roles Abbreviation Role Name MOS | | | Asimator | R Z Tactical Hoad March Version | Ectis Failure Crew Taxons Paths Workload Demand Ection PetMM/SS m | B. Time at a) Tr 00.20 b) Ac 95.00 |
| Vehicle Gunner Reacts to Ambush | PL 02 Platoon Leader 11A | | | Event Queue | * IIi Maintainers Accuracy Require 96 | 00 Accuracy Measu Percent Steps Correct | c) Ac Perco d) Cri 95.00 e) Tri Distri |
| Vehicle Commander Reacts to Ambush | PSG/VC E7 Platoon Sergeant 11B40 | | < | Network Diagram | Eli Missions Estimated Task Time Estimated Task Time | | e) Tr Destr () Tin zetan g) De Nom |
| intantry squad Reacts to Ambush | VC E6 Vehicle Commander 11B30 SL E6 Squad Leader 11B30 | 7 |) Output | Output | T START | C Use Expression (evaluates to seconds) | () Por 00:15 |
| Platoon Leader Reacts to Ambush | VC E5 Vehicle Commander 11B20 | | | Variable Watches D Ev Palette | R Initiate David Ma Distributioning | | k) Pa 00.00 |
| Evacuate Injured Personnel from BFV | RBTIC E5 Robotic 11B20 | | | 5 | T Maintain March 5 Parameter 2: tanda | and Deviation 00:00:30:00 HH1MMLSS.m | n) Ac 95.00 |
| Disengage From An Enemy Force Treat and Evacuate Casulties | TL E5 Team Leader 11B20 | start | 🖉 🗗 🚨 📴 🚯 🛛 🔯 Inbox - Micros | INT. INPRINT | - T Platon Arves a - T Platon Initiates | | n) Ac 95.00 o) Ac 2.50 p) Pn 95.00 III C. Effects |
| Conduct Resupply Operations | HC E4 Health Care 68W10 DVR E4 Driver 11B10 | | | earch and Repla | C T Evacuate Injurec T Disengage from | | a) Ta 3 b) Int Ress |
| Conduct Maintenance Operations | INF E4 Infantry 11B10 | | | Variable Watcher | T Treat and Evacu | | c) Re return d) 8e |
| Conduct Consolidation and Reorganization | CCSW E4 Common Close Support Weapon 11B10 | Motrico | | \rightarrow | Dorform | ance Standards | d) Be e) En B D. Failure n) % 5.00 |
| Destroy Unit Vehicles and Equipment | A/GNR E4 Gunner 11B10 | INIELIICS | (HV-G) | - | L CHOIIIG | ance Stanualus | b) No 3 Rej c) % 1.00 |
| Resume Original Mission | A-Tank E4 Anti Tank 11B10 | | · / | | e 🐂 Resources | | d) % 1.00 e) % 0.00 |
| | | | HV-G Standa | ards | Macros Variables | | g) % 5.00 h) % 75.00 i) % 1.6.00 |
| | | Taal Darfarmaar | | | Snapshots External Events Cultural Templates | | 0.515.00 0.No Vehi |
| | | Task Performance: | - | | * A Equipment Estimated Task Accu | racy | j) No Vehi k) No 3 Re I) % 1 10.00 |
| | | 95% Reliability | | | Ker Stressors Mean Accura s Ker Forces Installed Plugins Probability of Suc S | 25 00 Accuracy Standard Deviat [2:50 35 00 % | B E. Crew at Doi Drive |
| | | •95% Accuracy | | | | | by to |
| | | | | | Contraction of Contraction | | -17 |
| 11/4/2009 | | | | | 🕱 Analysis Tree 🧠 Palette 🛛 😔 Output 🐠 Variable W | atches 🕲 Event Queue 🏷 Search and Replace Time Format HH1MMSS Total Runs 25 Run Number Rando | m Seed. 7 Clock |
| 1111/2007 | | | | 🐉 start | 🖉 🖉 🗳 🖉 🖏 🚯 📑 Indox - Marosol 🍉 | | 0 |



Approach

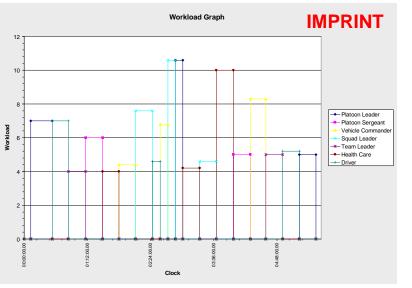
- Baseline simulation was executed to provide expected levels of mission performance parameters of time and accuracy.
 - IMPRINT provides for the overall development of a network task model that accounts for the tasks and the types and numbers of operators performing those tasks.
 - It also provides the opportunity to examine the effects of unexpected outcomes.
- Simulation was run multiple times, the outcome measures were analyzed in terms of performance and workload.





Dynamic Model Outputs

Operator Workload



Impact of Constraints

| Assion M | teintenance | | | | _ | | | | | | | | | | PKII | |
|-----------|-----------------|---------|---|--------------|-----------|--------|----------|----------|-------|-------------|-------------|-------------|----------|-------------|-------|--------------------------|
| | | | | | ASV. | AB | A | loculacy | | | Time | | | Probability | | Personnel Characteria |
| Specialty | Walighter | Task II | Task | Distribution | Composite | Cutolf | Previous | Adjusted | Delta | Previous | Adjusted | Delta | Previous | Adjusted | Delta | |
| 118 | Driver | 11 | Driver Heacts to Ambush1 | Nomal | C0 | 70 | 95.00 | 94.55 | 0.44 | 00.09.00.00 | 00.09.00.21 | 00.00.00.21 | 84.13 | 87.92 | 2.21 | Training |
| 118 | Driver | 2 | Move Along March Route | Nomel | 00 | 70 | 95.00 | 94.57 | 0.43 | 00.19.00.00 | 00 19 00 16 | 00.00.00.16 | 84.13 | B1.97 | -2.16 | C Stressors |
| 118 | Driver | 21 | Destroy Unit Vehicles and Equipment2 | Normal | 00 | 70 | 95.00 | 94.55 | 0.45 | 00.19.00.00 | 00.19:00.07 | 00.00.00.08 | 84.13 | 81.96 | -2.27 | 1 |
| 110 | Platoon Sergean | 18 | Conduct Resupply Operations1 | Nomal | CO | 70 | 95.00 | 94.65 | -0.35 | 00.19.00.00 | 00.19.00.00 | 00.00.00.00 | 84.13 | 82.36 | -1.77 | |
| 118 | Platoon Sergean | 4 | Maintain March Security | Nomal | C0 | 70 | 95.00 | 94.55 | -0.45 | 00.19.00.00 | 00.19.00.00 | 00.00.00.00 | 84.13 | 81.86 | -2.27 | Apply |
| 118 | Squad Leader | 13 | Intentry Squad Reacts to Ambush1 | Normal | 00 | 70 | 95.00 | 94.55 | 0.45 | 00.09.00.00 | 00.09.00.16 | 00:00:00.17 | 84.13 | 81.86 | -2.27 | |
| 118 | Squad Leader | 16 | Disengage from an Energy Force1 | Nomel | 00 | 70 | 95.00 | 94,60 | 0.40 | 00.19.00.00 | 00.19.00.21 | 00.00.00.21 | 84,13 | B2.10 | -2.03 | |
| 118 | Squad Leader | 7 | Platoon Initiates Screen Operation | Normal | C0 | 70 | 95.00 | 94.58 | -0.42 | 00.19:00.00 | 00 19 00 14 | 00.00.00.14 | 84.13 | 82.02 | -2.11 | |
| 118 | Team Leader | 20 | Conduct Consolidation and Reorganization1 | Nomal | CO | 70 | 95.00 | 94.61 | -0.39 | 00.19.00.00 | 00.19:00.00 | 00.00.00.00 | 84.13 | 82.17 | -1.96 | |
| 118 | Team Leader | 3 | Report Control Measures | Nomal | C0 | 70 | 95.00 | 94.70 | -0.30 | 00.19.00.00 | 00.19.00.00 | 00.00.00.00 | 84.13 | 82.64 | -1.49 | |
| 118 | Vehicle Comman | 12 | Vehicle Commander Reacts to Ambush1 | Nomal | 00 | 70 | 95.00 | 94.55 | 0.44 | 00.09.00.00 | 00.09.00.23 | 00:00:00.23 | 84.13 | 81.91 | 2.22 | |
| 118 | Vehicle Common | 19 | Conduct Maintenance Operations1 | Nomal | CO | 70 | 95.00 | 94.66 | 0.34 | 00.19.00.00 | 00.19.00.09 | 00 00 00 10 | 84.13 | 82.46 | -1.67 | |
| 118 | Vehicle Comman | 6 | Platoon Arives at Designated Coordinates | Nomal | C0 | .70 | 95.00 | 94.60 | -0.40 | 00 19 00 00 | 00 19 00 00 | 00.00.00.00 | 84.13 | 82.11 | -2.02 | |
| 68% | Health Care | 15 | Evacuate Injured Personnel from BFV1 | Nomal | ST | 70 | 95.00 | 93.33 | -1.67 | 00.19:00.00 | 00.19:00.43 | 00.00.00.43 | 84.13 | 74.72 | -9.41 | |
| 60w | Health Care | 17 | Treat and Evacuate Casulties1 | Nomal | 51 | 70 | 35.00 | 93.59 | -1.41 | 00.19.00.00 | 00.19:00.29 | 00:00:00:30 | 04.13 | 76.39 | 7.74 | |
| 69W | Health Care | 5 | Conduct Scheduled Halts | Nomal | ST | 70 | 95.00 | 93.40 | 1.60 | 00.19.00.00 | 00.19:00.00 | 00.00.00.00 | 84.13 | 75.17 | -8.96 | |

Mission Success Rates

| Run | Mission Performance Time | RNS | Accuracy Result |
|-----|--------------------------|-----|-----------------|
| 1 | 05:38:13.78 | 4 | |
| 2 | 05:38:11.31 | 3 | No failure |
| 3 | 05:36:48.93 | 4 | No failure |
| 4 | 05:39:56.18 | 5 | No failure |
| 5 | 05:40:36.60 | 6 | No failure |
| 6 | 05:41:00.88 | 7 | No failure |
| 7 | 05:39:12.05 | 8 | No failure |
| 8 | 05:36:08.66 | 9 | No failure |
| 9 | 05:40:42.82 | 10 | No failure |
| 10 | 05:39:38.28 | 11 | No failure |
| 11 | 05:39:10.11 | 12 | No failure |
| 12 | 05:34:43.11 | 13 | No failure |
| 13 | 05:38:48.06 | 14 | No failure |
| 14 | 05:39:44.32 | 15 | No failure |
| 15 | 05:35:47.95 | 16 | No failure |
| 16 | 05:55:01.82 | 17 | No failure |
| 17 | 05:37:18.57 | 18 | No failure |
| 18 | 05:38:39.54 | 19 | No failure |
| 19 | 05:40:10.08 | 20 | No failure |
| 20 | 05:38:52.16 | 21 | No failure |
| 21 | 05:35:53.98 | 22 | No failure |
| 22 | 06:00:09.75 | 23 | No failure |
| 23 | 05:36:05.52 | 24 | No failure |
| 24 | 05:38:45.16 | 25 | No failure |
| 25 | 05:37:21.77 | 26 | No failure |

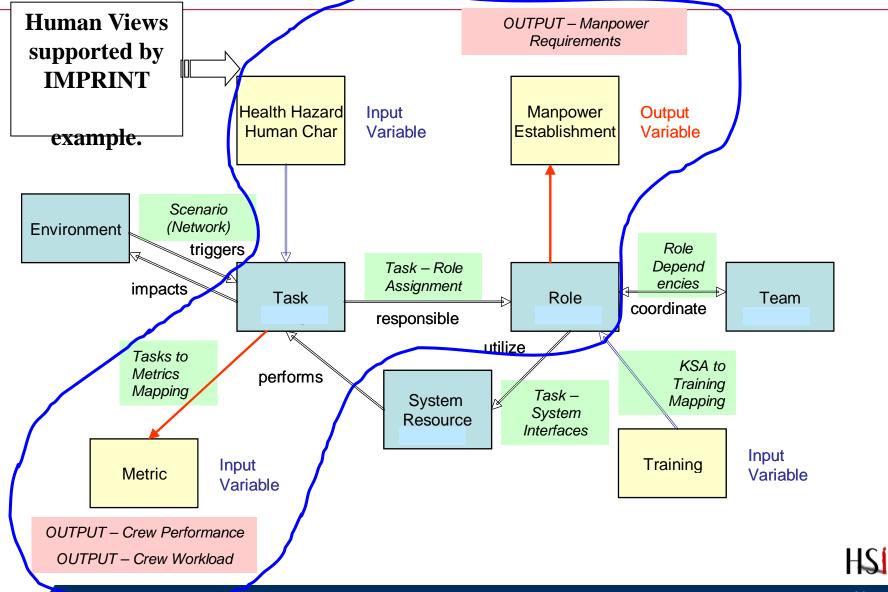
Individual Task Performance

| [| | | | | | | | | | | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|--------|-------------------|-----------------------|--------|----------------|---|--|--|--|--|--|
| Test | Or and and | | | | 0.1 0 | | Accuracy | | | | % Met Both Time AND Accuracy | | | | | |
| Task | Standard | | Maximum | Mean | Std. Dev. | | Accuracy Standard | | | Mission Aborts | % Met Both Time AND Accuracy | | | | | |
| START | | | | 00:06:52.21 | | | | Percent Steps Correct | 100.00 | 0 | 100.00 This DOES meet the performance criterion of 90% | | | | | |
| Initiate Road March | | | | 00:24:08.51 | | | | Percent Steps Correct | 92.00 | 0 | 88.00 This does NOT meet the performance criterion of 90% | | | | | |
| Move Along March Route | | | | 00:19:02.03 | | | | Percent Steps Correct | 100.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| Report Control Measures | | | | 00:18:55.64 | | | | Percent Steps Correct | 92.00 | 0 | 88.00 This does NOT meet the performance criterion of 90% | | | | | |
| Maintain March Security | 00:20:00.00 | | | | | | | Percent Steps Correct | 100.00 | 0 | 100.00 This DOES meet the performance criterion of 90% | | | | | |
| Conduct Scheduled Halts | 00:20:00.00 | | | | | | 90.00 | Percent Steps Correct | 100.00 | 0 | 100.00 This DOES meet the performance criterion of 90% | | | | | |
| Platoon Arives at Designated Coordinates | 00:20:00.00 | | | | | | 90.00 | Percent Steps Correct | 96.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| Platoon Initiates Screen Operation | 00:20:00.00 | | | | | 92.00 | 90.00 | Percent Steps Correct | 96.00 | 0 | 88.00 This does NOT meet the performance criterion of 90% | | | | | |
| Driver Reacts to Ambush1 | 00:10:00.00 | 00:08:19.06 | 00:10:09.37 | 00:09:11.21 | 00:00:30.59 | 96.00 | 90.00 | Percent Steps Correct | 92.00 | 0 | 88.00 This does NOT meet the performance criterion of 90% | | | | | |
| Vehicle Commander Reacts to Ambush1 | 00:10:00.00 | 00:07:56.72 | 00:09:52.43 | 00:09:00.04 | 00:00:24.85 | 100.00 | 90.00 | Percent Steps Correct | 96.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| Infantry Squad Reacts to Ambush1 | | | | 00:08:50.08 | | | 90.00 | Percent Steps Correct | 92.00 | 0 | 92.00 This DOES meet the performance criterion of 90% | | | | | |
| Platoon Leader Reacts to Ambush1 | 00:10:00.00 | 00:08:02.94 | 00:09:32.83 | 00:08:52.93 | 00:00:24.06 | 100.00 | 90.00 | Percent Steps Correct | 100.00 | 0 | 100.00 This DOES meet the performance criterion of 90% | | | | | |
| Evacuate Injured Personnel from BFV1 | 00:20:00.00 | 00:17:34.35 | 00:19:54.06 | 00:18:50.51 | 00:00:31.65 | 100.00 | 90.00 | Percent Steps Correct | 92.00 | 0 | 92.00 This DOES meet the performance criterion of 90% | | | | | |
| Disengage from an Enemy Force1 | 00:20:00.00 | 00:17:57.22 | 00:20:03.71 | 00:19:00.60 | 00:00:36.99 | 92.00 | 90.00 | Percent Steps Correct | 76.00 | 0 | 68.00 This does NOT meet the performance criterion of 90% | | | | | |
| Treat and Evacuate Casulties1 | 00:20:00.00 | 00:17:36.50 | 00:19:50.97 | 00:19:05.12 | 00:00:33.61 | 100.00 | 90.00 | Percent Steps Correct | 92.00 | 0 | 92.00 This DOES meet the performance criterion of 90% | | | | | |
| Conduct Resupply Operations1 | 00:20:00.00 | 00:18:23.12 | 00:19:57.86 | 00:19:03.19 | 00:00:28.29 | 100.00 | 90.00 | Percent Steps Correct | 92.00 | 0 | 92.00 This DOES meet the performance criterion of 90% | | | | | |
| Conduct Maintenance Operations1 | 00:20:00.00 | 00:17:37.41 | 00:19:45.42 | 00:18:54.63 | 00:00:27.62 | 100.00 | 90.00 | Percent Steps Correct | 96.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| Conduct Consolidation and Reorganization1 | 00:20:00.00 | 00:17:47.45 | 00:20:06.05 | 00:19:01.20 | 00:00:32.18 | 92.59 | 90.00 | Percent Steps Correct | 92.59 | 0 | 85.19 This does NOT meet the performance criterion of 90% | | | | | |
| Destroy Unit Vehicles and Equipment2 | 00:20:00.00 | 00:17:55.55 | 00:19:38.60 | 00:18:52.68 | 00:00:24.30 | 100.00 | 90.00 | Percent Steps Correct | 96.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| Resume Original Mission2 | 00:20:00.00 | 00:18:10.37 | 00:20:05.01 | 00:18:59.88 | 00:00:30.03 | 96.00 | 90.00 | Percent Steps Correct | 100.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |
| END | 00:07:00.00 | 00:04:51.16 | 00:06:36.74 | 00:05:54.19 | 00:00:26.88 | 100.00 | 90.00 | Percent Steps Correct | 96.00 | 0 | 96.00 This DOES meet the performance criterion of 90% | | | | | |



- Simulation output identified tasks that did not meet the Future Combat System accuracy standard.
- IMPRINT outputs of operator workload and resource conflicts were further investigated to determine if an overloaded condition or a resource shortage contributed to the accuracy detriment of the tasks.
- Analysis verified that the Human View static products can be used to structure the input data to a simulation tool, such as IMPRINT, to provide the simulation environment for the dynamic Human View.
- The dynamic Human View is critical in the architecture framework approach because it captures the dynamic aspects of the human system components defined in other views.





SPAWAR



- Several efforts in various countries are underway to define and structure Human View as viable methodology for HSI practitioners to coordinate and collaborate with the system engineers.
 [Example: UK MODAF Human View]
- While the ergonomists always had a set of tools and processes to support system development (e.g., task analysis, function allocation, etc.), the Human View products facilitate a more structured language for communicating with the other engineering disciplines during system development.





- The Human View products are derived using an ergonomic approach, namely, a top down method analyzing human gaps in existing architecture frameworks, or based on specific needs that evolved during the course of the architecture development to capture specific human view data.
- HSI practitioners can use Human View methodology to provide a fully integrated set of products that ensure an effective and efficient design, development, and production process.





Conclusions

- Human View products facilitate a more structured language for communicating with other disciplines during system development.
- Verify HSI practitioners can use Human View methodology to provide a fully integrated set of products that ensure an effective and efficient design, development, and production process.
- Analysis results demonstrated that Human View data for a complex system, such as the Future Combat System, can be used to assess design impacts when combined with a simulation tool, such as, IMPRINT.
- Variable View is critical in the architecture framework because it captures the dynamic aspects of the human system components defined in other views.