2018

Chapter 7: Human View

Holly A.H. Handley
Old Dominion University

Original Publication Citation
Handley, H. (2018). Chapter 7: Human View. In *Guide for Human Systems Integration in the System Acquisition Process: Soldier Materiel Systems, DA PAM 602-2.* Department of the Army. Handley, H. (2018). Chapter 7: Human View. In *Guide for Human Systems Integration in the System Acquisition Process: Soldier-Materiel Systems* (pp. 34-42). Department of the Army. https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN7935_DAPam602-2_FINAL.pdf#page=40

Chapter 7
Human View

Section I

Process

7–1. Overview
The human viewpoint was developed by a panel of system engineering and HSI practitioners in 2007. The goal was to develop an integrated set of models, similar to existing architecture viewpoints, that included and organized human data as part of the architecture description (RTO–TR–HFM–155). HSI practitioners have long argued that without a viewpoint that focuses on the human component of the system, there is no basis in the architecture for analysis of human issues that may impact multiple aspects of the system (for example, performance analyses that consider the human impact to system performance, cost-benefit analyses that consider the impact of MPT on total costs, and requirement analyses that include the human specifications to adequately operate and maintain the system). With a viewpoint that captures human considerations, these factors can be assessed and addressed early in the acquisition process, along with their technical counterparts. The consideration of human issues early in the acquisition phase can enhance overall systems performance by ensuring efficient and effective use of human resources within the system, ultimately reducing overall system costs. Utilizing the human viewpoint supports HSI's goals of optimizing total system performance, reducing life cycle costs, and minimizing risk of Soldier loss or injury by ensuring a systematic consideration of the impact of the materiel design on Soldiers throughout the acquisition process.

7–2. Building a human viewpoint
a. Human viewpoint models. The human viewpoint contains seven models that include different aspects of the human element, such as roles, tasks, constraints, training, and metrics (see table 7–1, below). It also includes a human dynamics component to capture information pertinent to the behavior of the human system under design (see RTO–TR–HFM–155 for an explanation of human viewpoint models).

Table 7–1
Human viewpoint models

Product	Name	Description
HV–A	Concept	A conceptual, high-level representation of the human component of the enterprise architecture framework.
HV–B	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.
HV–C	Tasks	Descriptions of the human-specific activities in the system.
HV–D	Roles	Descriptions of the roles that have been defined for the humans interacting with the system.
HV–E	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.
HV–F	Training	A detailed accounting of how training requirements, strategy, and implementation will impact the human.
HV–G	Metrics	A repository for human-related values, priorities, and performance criteria, and maps human factors metrics to any other Human View elements.
HV–H	Human Dynamics	Dynamic aspects of human system components defined in other views.

b. Relationship. The relationship between the data captured in each Human View product is shown in figure 7–1, below. These relationships can be used to develop a simulation model to evaluate the impact of the human on the system performance. The Improved Performance Research Integration Tool (IMPRINT) is a human performance modeling tool developed by the U.S. ARL to help system developers predict the impact of operator attributes on system performance. In order to use IMPRINT as the model for the Human View Dynamics, a mapping was created between the Human View products and the IMPRINT Model as shown in table 7–2, below (Handley & Broznak, 2011). This mapping indicates how the information captured in the Human View static products can be applied as input data to the IMPRINT Model.

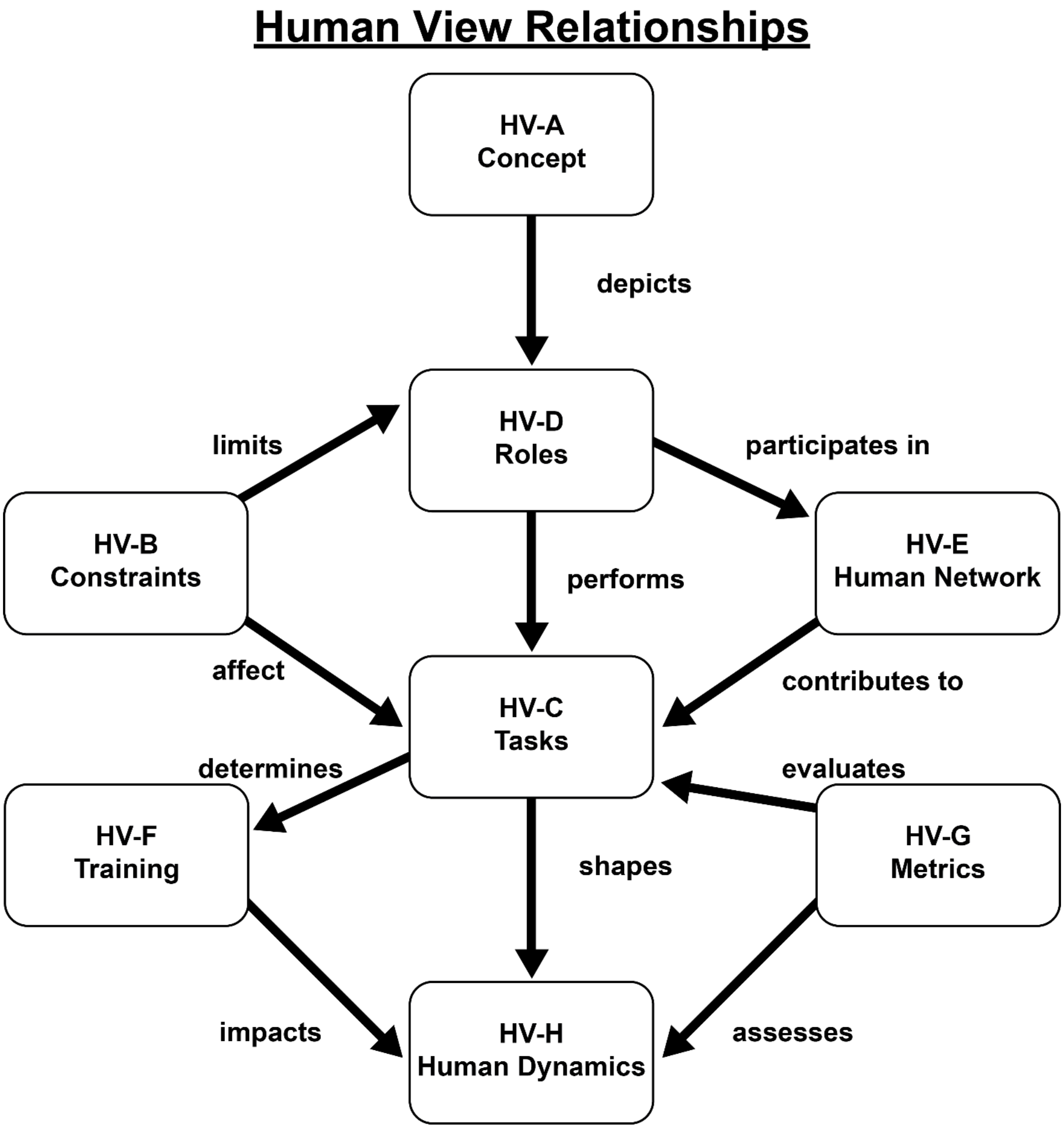

Figure 7–1. Human view relationships

Table 7–2
Mapping of human view products to improved performance research integration tool data

Information captured in human view		Data required by IMPRINT model
HV–A Concept	A high-level representation of the human component of the system.	Hypothesis to be tested by the model.
HV–B Human Factors Constraints	Operator capabilities and limitations under various conditions.	Selection of the moderator settings of personnel and stressors.
HV–C Tasks	Task decomposition and interdependencies; systems available for task completion.	Generation of the network diagram composed of tasks and subtasks; assignment of system interfaces to tasks.
HV–D Roles	List of roles and assigned task responsibilities.	Creation of operator list; assignment of operators to tasks.
HV–E Human Network	Role groupings or teams formed; interaction types between roles and teams.	Identification of team functions and operator teams.
HV–F Training	Training required to obtain necessary knowledge, skills, and abilities to perform assigned tasks.	Selection of the moderator setting of training.
HV–G Metrics	Performance parameters and standards.	Identification of mission-level time and accuracy criterion and selection of task-level time and accuracy standards.

c. Stages to develop the human viewpoint. The human viewpoint models can be compiled by going through a series of steps, broken into stages (Handley & Kandemir, 2013). The first stage is initiated by the concept of operations for the overall system concept. From this use cases (HV–A) are developed that describe the interaction of humans with the operational environment and system components. The second stage develops the human roles (HV–D) and tasks (HV–C), often in tandem. Tasks describe the human activities, usually by more fully decomposing higher-level functions. Roles represent job functions or task groupings. The mapping between the two is a key product of the development as it drives manning and training requirements. The first two stages are shown in figure 7–2, below.

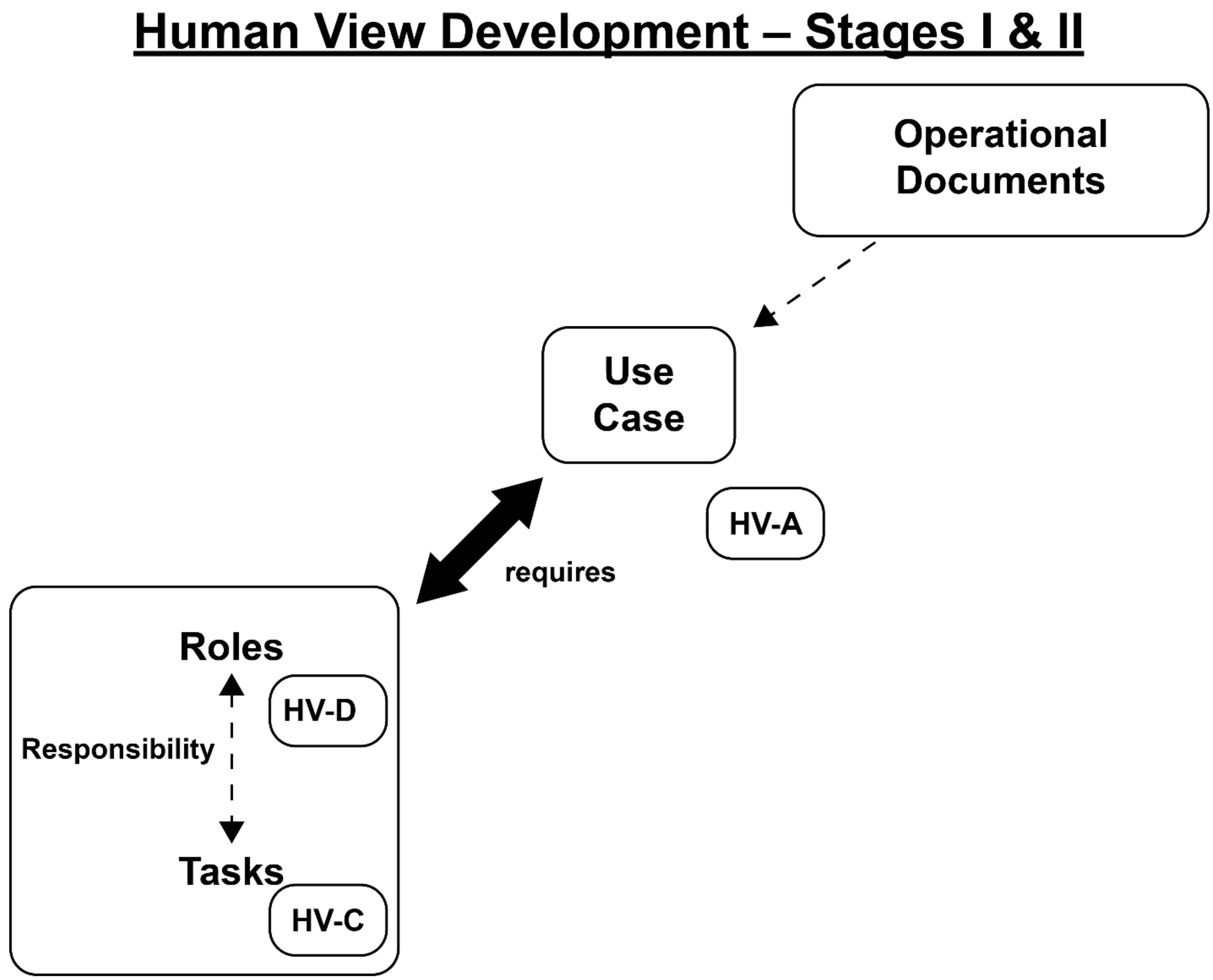

Figure 7–2. Human view development—Stages I and II

d. Third stage. The third stage focuses on human interactions and develops a human network, usually represented as a work process (HV–E) which describes the interactions of the roles completing tasks to support the use case. This is another key product of the human viewpoint as it describes human activity over time, which is a driver of workload (and overload) for the individual roles. At this stage, role locations can also be included, which is important for designing distributed teams. Metrics (HV–G) representing human performance criteria are also determined. SMEs are often consulted at this stage to ensure that the human interactions with the system are accurately represented. This stage is shown in figure 7–3, below.

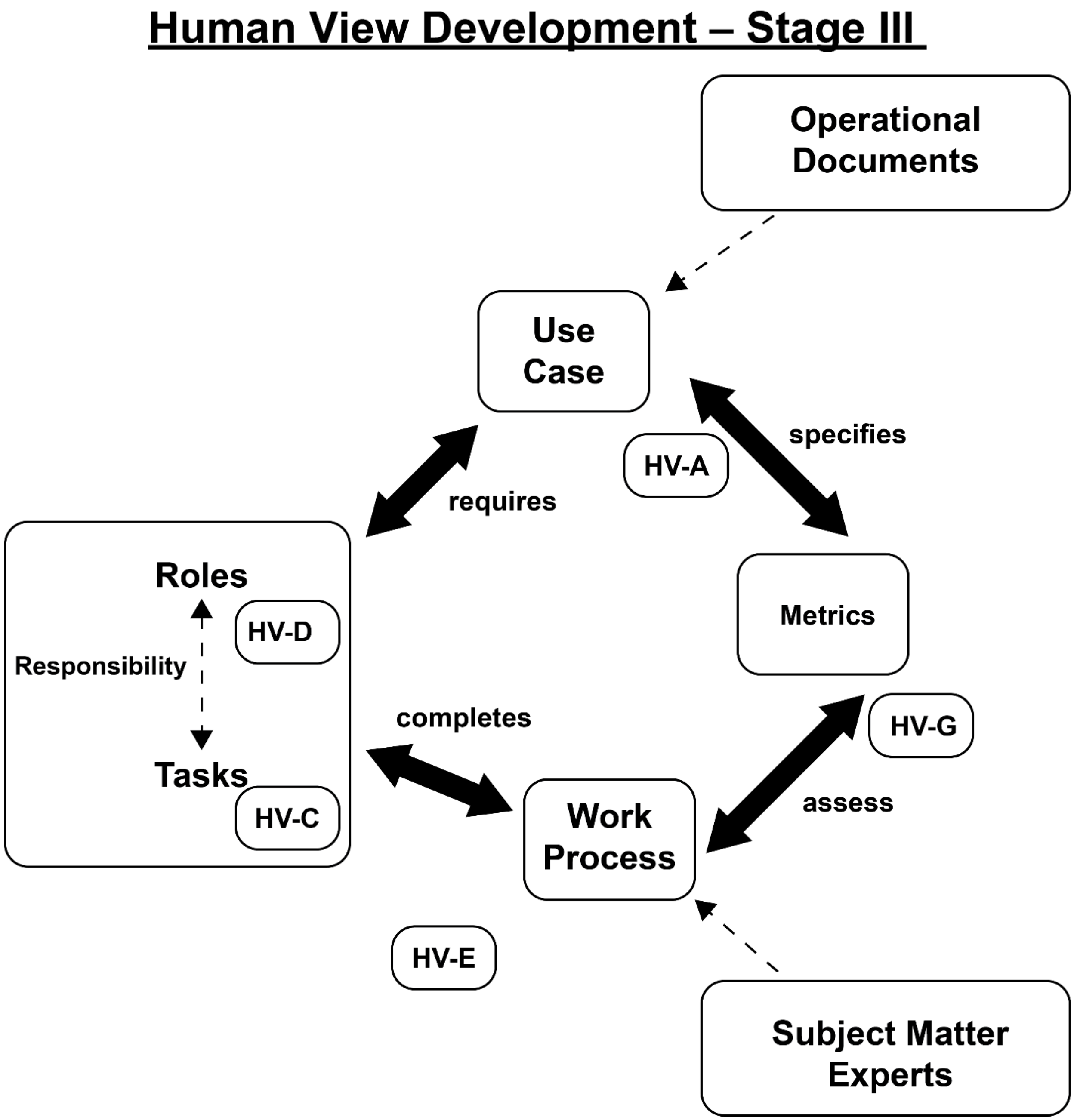

Figure 7–3. Human view development—Stage III

e. Fourth stage. In the fourth stage, manning assignments (HV–BI) are completed by mapping personnel to roles based on current qualifications. Additional training (HV–F) requirements are determined based on anticipated knowledge, skills, and ability requirements. Other human factors constraints (HV–BII) are captured that may impact the human system, such as work cycle and availability. After the completion of the individual products, the human dynamics (HV–H) can be used to pull together the information captured in all the products to evaluate the total human system behavior. Figure 7–4, below shows the completed human view development process.

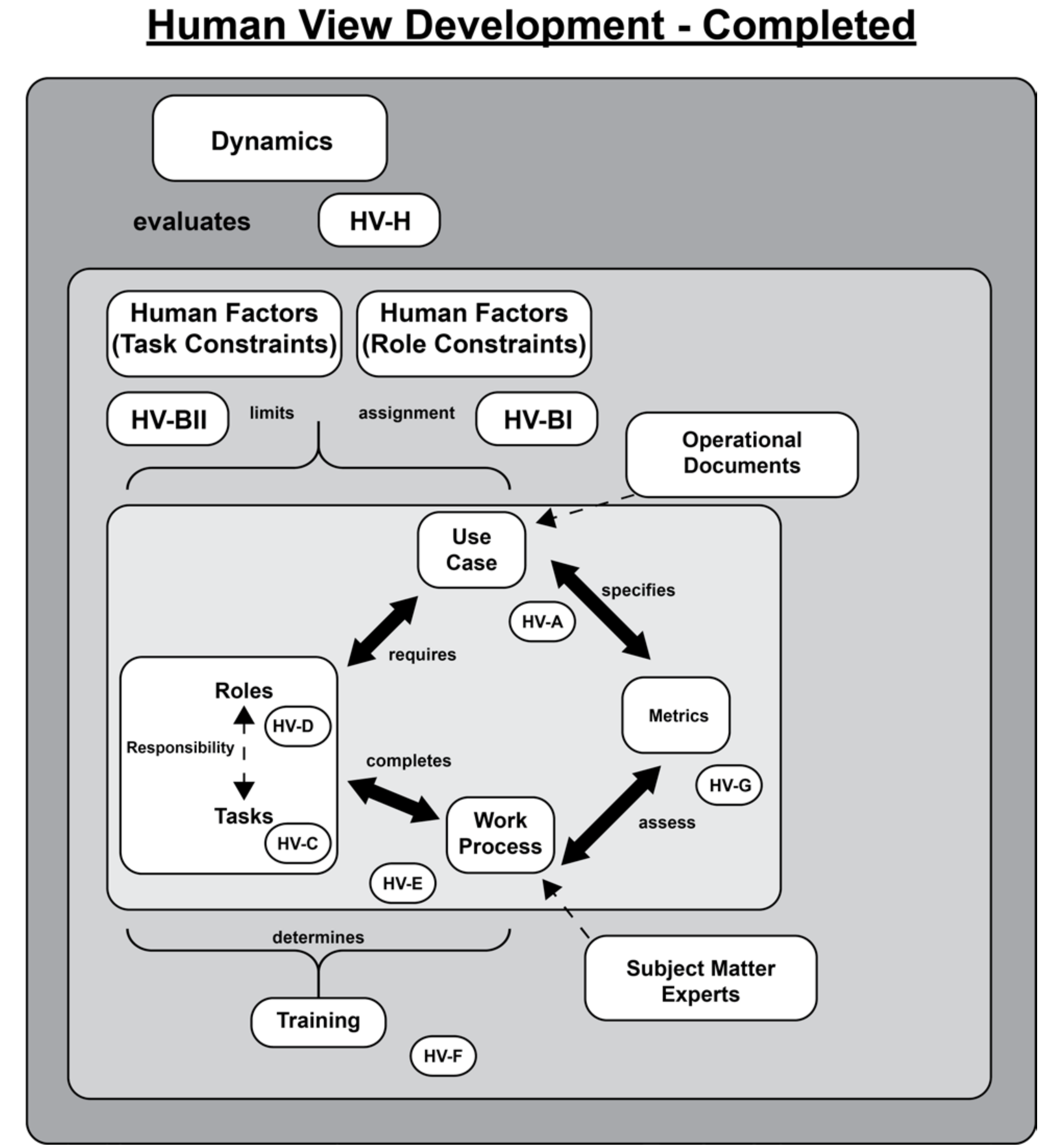

Figure 7–4. Human view development—Completed

f. All personnel. The human viewpoint models should capture information about all personnel who interact with the system in any capacity. The operators, maintainers, and support personnel possess specific knowledge, skills, and abilities that must be accounted for in the system design, along with their physical characteristics and constraints, just as the technology elements of the system have inherent capabilities and constraints.

Section II

Applying the Human Viewpoint

7–3. Applying the human viewpoint in acquisition

a. The human viewpoint models can provide information to the JCIDS analysis starting in the pre-MS A stage. At this stage, capability gaps, capability needs, and approaches to provide these capabilities are defined. By including the human data in the architecture, it also presents an opportunity to address MPT needs required by the conceptual system. Table 7–3, below, shows the individual models that support the pre-acquisition JCIDS process.

Table 7–3
Support of human view products for Joint Capabilities Integration and Development System-

JCIDS step	Goal	Supporting human viewpoint models
Functional area analysis	Tasks to be accomplished	HV–A provides an overview of objectives HV–C provides insights into tasks that are required to achieve military objectives HV–G provides performance standards and metrics for system tasks
Functional needs analysis	List of capability gaps	HV–B1 may identify manpower gaps that cannot be supported by current personnel HV–D identifies the needed roles to support tasks HV–E identifies information exchange requirements between roles–may also identify implications of distributed (reach back teams)
Functional solution analysis	Potential integrated DOTMLPF approaches to capability gaps	HV–B1 provides the ability to conduct strategic manpower tradeoffs and comparisons between potential options HV–B2 identifies the impact on personnel issues on career progressions (as well as costs) HV–F identifies the impact on training programs (and costs)
Post independent analysis	Initial capabilities document	Complete set of initial human view product documents

b. The human viewpoint supports HSI's goals of optimizing total system performance, reducing life cycle costs, and minimizing risk of Soldier loss or injury by ensuring a systematic consideration of the impact of the materiel design on Soldiers throughout the acquisition process. Figure 7–5, below shows the application of HSI both pre- and post- MS A. The human viewpoint models capture the different HSI perspectives, which applied during the system acquisition process can result in risk reduction and fewer changes in the mature system. The HSI issue processing cycle supports personnel planning for the deployed system by analyzing the work allocation, personnel demand, and required training. It also allows early assessment and mitigation alternatives for survivability aspects (that is, force protection, safety, and HHs).

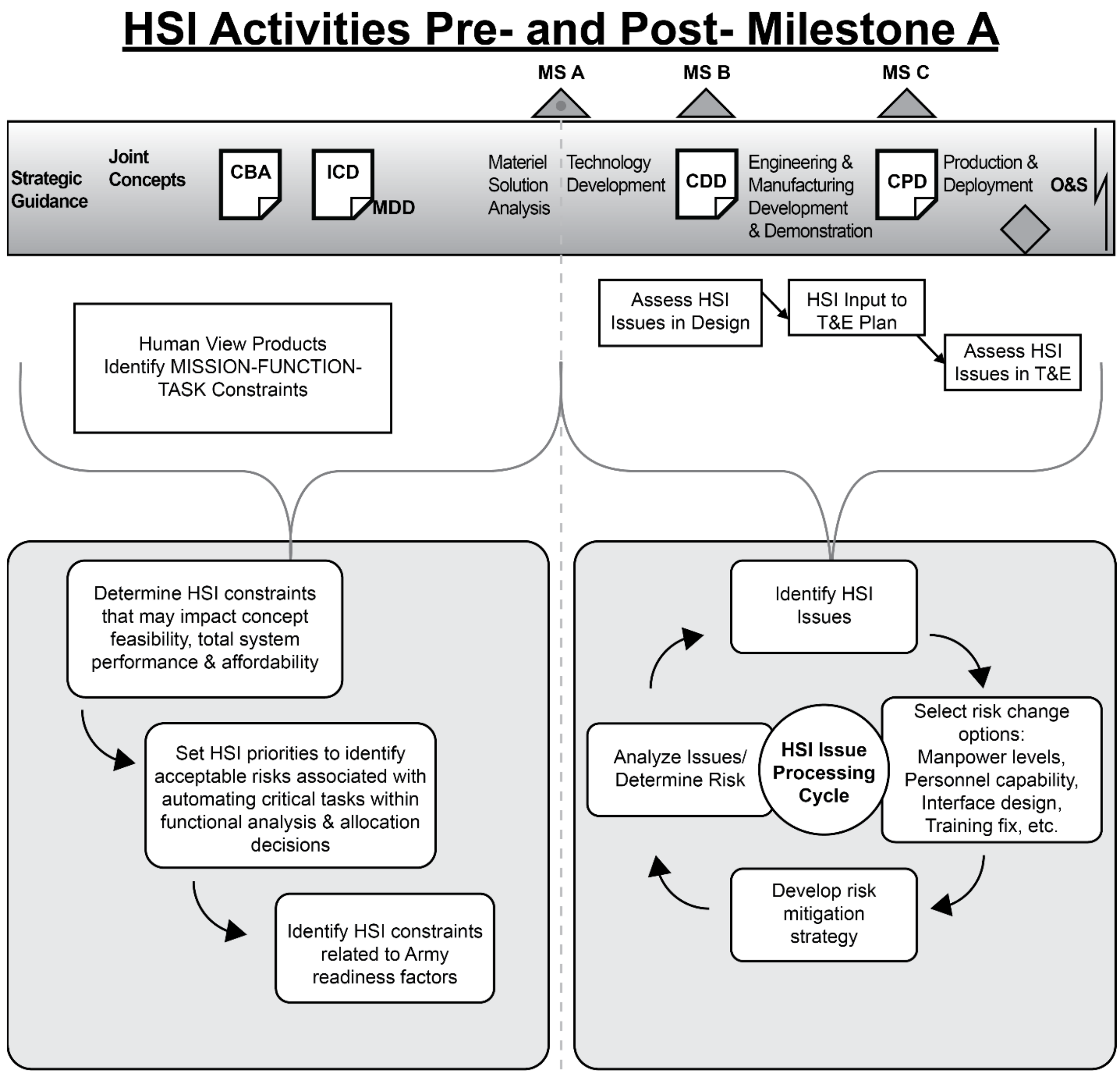

Figure 7–5. Human Systems Integration activities pre-and post-Milestone A

c. The human viewpoint provides a way to include HSI into the mainstream acquisition and system engineering process by promoting early and often consideration of human roles. It provides early coordination of task analysis efforts by both system engineering and HSI Teams. Implementing a human perspective can reduce system risk due to technical design problems by communicating information about the needs and constraints of the human component and insure optimal performance and safety.

d. It is not necessary to complete the full set of models to benefit from a human architecting effort. Each individual model captures a "snapshot" of different aspects of the human system and can add value to the architecture description. For example, the HV–C captures the human-level activities of a system. These tasks can be described in terms of a sequence diagram, a temporal ordering of the tasks. This can give an indication of how a given sequence of tasks will perform, and the performance predictions for alternative sequences of tasks can be compared. Analyses with single products can also provide insights in comparing "as-is" and "to-be" architectures. For example, an analysis of the role assignments (HV–D) based on task changes may result in recommendations to reallocate tasks based to other roles based on workload, skill requirements, or locations. For network based systems, an analysis of the HV–E may result in coordination requirements for distributed team members to define responsibilities and information sharing. Even using a subset of the human viewpoint models provide the opportunity to capture and organize diverse human information to assess design and recommend improvements.

7–4. How the human viewpoint supports and affects Human Systems Integration

The human viewpoint supports HSI's goals of improved integration of humans and systems. Humans play a pivotal role in the performance and operation of most systems, (that is systems must be supported by sufficient manpower, and personnel must be adequately trained to operate the system), therefore the absence of a human perspective in the architecture framework leaves a gap in both the system architecting and acquisition process. The human viewpoint organizes information and provides a comprehensive representation of human capabilities related to expected performance. It provides a basis for decisions by stakeholders by enabling structured linkages from the engineering community to the manpower, personnel, training, and human factors communities. It provides a fully integrated set of products that can be used to inform and influence system design, development, and production process, facilitates human system tradeoff considerations, and it ensures the human component has visibility as part of the system acquisition process.

7–5. Summary

There is a direct relationship to the information captured in the Human View products to the simulation model outcomes. The Human View can show the effect of high workload, poor training, and inadequate communications on system outcomes. The Human View documents the unique implications humans bring to the system design. A universally accepted Human View enables consistency and commonality across service elements and international forces. Ultimately, the goal of the Human View is to show that failing to consider human issues in system design can have an impact on overall performance.