

HSI at the Deck Plates: Navy Human Systems Integration Lessons Learned

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INTRODUCTION

The acronym HSI (human systems integration) has a relatively recent usage but an exceptionally long heritage.¹ According to the Human Systems Information Analysis Center, HSI “optimizes the human part of the total system equation by integrating human factors engineering (HFE); manpower, personnel, training (MPT); health hazards; safety factors; medical factors; personnel (or human) survivability factors; and habitability considerations into the system acquisition process” [2]. In short, HSI is about people and how well they fit with their work and non-work situations. As stated by former Chief of Naval Operations, Admiral Vern Clark (Figure 1), “People remain at the heart of all we do; they are capital assets in our Navy. We have invested heavily to do what is right for our people. As we look to the future, we will build on the impressive progress we have made in recruiting, assigning, and retaining our military and civilian professionals. Growth and development is our byline and I expect every leader to be deeply involved in developing their shipmates” [3]. Clark further stated that “readiness, advanced technology, the maritime domain, and the genius of our people—these are our asymmetric advantages” [4]. This paper describes the methodology and findings of a recent HSI research study in the Fleet.

HSI LESSONS LEARNED

Collection Effort Methodology

In the summer of 2003, many military organizations were collecting lessons learned from Operation Iraqi Freedom (OIF). (See, for example, [5].) A fairly systematic search of those efforts revealed that practically all of them focused on topics such as battlespace awareness; intelligence, surveillance, and reconnaissance (ISR); command and control (C²); communications; and focused logistics. Although such topics are critical to military success, a better understanding of HSI lessons learned would support the human element in military operations and is essential to the implementation of the concept of FORCENet². Consequently, a study

¹ The HSI acronym is approximately one decade old and derives primarily from the various human factors disciplines, but the principles of managing naval human resources date back to the Navy’s earliest days [1].

² FORCENet will be the Navy component of the Global Information Grid (GIG). FORCENet will integrate “WARRIORS, sensors, networks, command and control, platforms and weapons into a networked distributed combat force, scalable across the spectrum of conflict from seabed to space and sea to land.” (CNO’s Strategic Study Group –XXI definition from 22 July 02 CNO Briefing)

ABSTRACT

This paper describes the methodology and findings of a recent human systems integration (HSI) research study in the Fleet. HSI was systematically evaluated at 16 commands (carriers, large deck amphibious ships, frigates, submarines, etc.) to determine what topics concerned our fleet warfighters. In-depth interview (four per command) and self-administered HSI forms (about 2,000) were analyzed. Preliminary findings suggested two primary critical topics of concern: training and, surprisingly, collaboration. Other critical topics included information and knowledge management, personal and personnel readiness, technology usability issues, and habitability and morale. These findings are necessary to addressing capability issues in support of the Navy as it responds to the challenges of the 21st Century.



FIGURE 1. Chief of Naval Operations (CNO), Admiral Vern Clark. Clark served as CNO from 21 July 2000 to 22 July 2005.

was conducted to assess Navy HSI topics at the deck plates in operational Navy commands (as opposed to command level feedback).

Given that time and resources were seriously limited, two methods were used to obtain fleet HSI lessons learned: (1) a one-page, two-sided self-administered HSI-focused Lessons Learned Form (SAF), and (2) a parallel one-page, two-sided HSI-focused Interview Guide Sheet (IGS) that included an expanded set of HSI topics. In consideration of the Fleet's time, the decision was made to minimize command impact by visiting each command once, conducting four interviews, and leaving a set of self-administered forms to be administered to a representative sample of officers and crew. By design, the entire process, including the in-brief (posted on the Internet; see FORCENet HSI Webpage, [6]), would take about 4 hours. Minimizing impact on the Fleet was a prime objective of this effort.

SAF Methodology

The SAF was designed to be self-administered, thus enabling feedback from a relatively large and representative sample during times convenient to the commands. The SAF included a brief purpose statement as well as a set of instructions to complete the form. It covered all eight of the traditional domains of the HSI,³ as well as several other topics. These additional topics were included to address the issues identified below.

This HSI Lessons Learned collection effort was conducted within the FORCENet frame of reference; that is, the realm of both tactical and non-tactical C² and decision making in a network-centric environment. It was recognized that because most of the traditional HSI topics were identified prior to the information technology (IT) and Internet revolutions, IT-related topics were poorly represented in the traditional HSI domain areas, and thus had to be added to the SAF. Additionally, because manpower issues represent the CNO's number one priority [3], manpower-related topics needed to be highlighted in this HSI assessment.

Accordingly, in addition to some basic demographic information, the SAF included open-ended questions covering traditional HSI domains, IT, information and knowledge management, and the Internet.

Ideally, HSI feedback should be obtained onsite, either during or immediately following the conduct of operational missions. Since that was not possible, the best alternative was to solicit HSI feedback from operational units (nine on the east coast and seven on the west coast⁴) after they returned from deployment by asking respondents to think back to their recent deployment.

The focus of the effort was on OIF, and thus a short series of questions on the front side of the form requested information about tasks and work duties during OIF, contrasted with tasks and duties currently being performed. The purpose of asking the same question twice was to steer the respondent's thoughts and memories concerning the likely dichotomy

³ From Handbook of Human Systems Integration, p. 3, [7]

⁴ Appreciation is extended to these 16 commands for their HSI support: Carrier Air Wing Three, Carrier Group Two, USS *Boise* (SSN 764), USS *Donald Cook* (DDG 75), USS *Harry S. Truman* (CVN 75), USS *Iwo Jima* (LHD 7), USS *Kearsarge* (LHD 3), USS *Milius* (DDG 69), USS *Mitscher* (DDG 57), USS *Montpelier* (SSN 765), USS *Nimitz* (CVN 68), USS *Pearl Harbor* (LSD 52), USS *Shiloh* (CG 67), USS *Tarawa* (LHA 1), VAW-116 (Carrier Airborne Early Warning Squadron 116), VFA-137 (Strike Fighter Squadron 137).

between conditions during their operational deployment during OIF and post-deployment. Three additional questions centered on off-duty issues, including suggestions for making the job better and contributing factors to making errors.

The reverse side of the form identified nine HSI topics, and requested open-ended comments about each. The nine topics were (1) habitability, (2) health hazards, (3) human factors engineering (HFE), (4) information and knowledge management, (5) Internet, (6) manpower, personnel, and training (MPT), (7) medical factors, (8) personnel survivability, and (9) safety factors. In addition, the respondent was requested to evaluate each topic on a six-point scale (6 = Very Satisfied to 1 = Very Dissatisfied).

IGS Methodology

The Interview Guide Sheet (IGS) was used to conduct four separate interviews from military personnel, each having OIF experience. The request stipulated that each command provide two officers (W-1 to O-5) and two enlisted personnel (E-5 to E-9). In addition, the commands were requested to select half of the interviewees who had tactical networking experience and half with non-tactical networking experience (logistics, personnel, supply, etc.). The IGS listed 19 topics: all of the HSI topics covered on the SAFs, in addition to other topics apropos to FORCEnet, such as battlespace awareness, decision speed and superiority, command and control, ISR, data and information management, knowledge and wisdom, and collaboration. Prior to each of the interviews, the interviewee was shown all 19 topics and was asked to choose which topics he or she believed were the most important to discuss. In only one case did an interviewee not choose five or more topics, and that person was asked to add topics to achieve a minimum of five topics.

HSI SAF FINDINGS

More than 2000 SAFs were completed, with an approximate 10:1 ratio between enlisted and officers. Furthermore, these personnel represented over 90 different enlisted ratings and officer designators to coincide with the request for a representative sample. A few of the more representative themes derived from the SAFs include:

- Practically everyone uses applications from the Microsoft® Office Suite, in particular Outlook®, but definitely not equally well.
- Training availability, both formal and on-the-job, is variable in the Fleet.
- Inadequate bandwidth is an issue (especially if the user is not part of the Battle Group staff). Inadequate bandwidth affects the ability to do the job effectively. It is important to note that resolution of this issue not only involves increasing the amount of bandwidth available to the ships but the more efficient use of that available bandwidth.
- Better access to more computer terminals (for work, training, and for reading e-mail while deployed) is needed. Many existing terminals/ local-area networks are old and unreliable.
- Compilation of information from various sources (various Web sites, databases, official message traffic) is very difficult.

The HSI satisfaction ratings suggested that this sample group was least satisfied with Habitability (634 comments and a mean of 3.38) and the Internet (532 comments and a mean of 3.72). Figure 2 summarizes SAF comment and rating data.

HSI IGS FINDINGS

Sixty-six interviews were conducted at 16 commands. The frequency of each topic chosen by these OIF-experienced crewmembers provided an index of several of the top HSI-related issues in today’s Navy. The top two topics on the minds of these interviewees were (1) education and training, with a focus on training, and (2) collaboration. Compared to even a decade ago, personnel on today’s ships tend to operate computer-based systems, often at sophisticated workstations. Although training was raised as an HSI issue more than any other in this effort, not one interviewee said that he or she received too much training. A small minority stated that the training was good, but the vast majority found fault with one or more aspects of technical training. Two topics mentioned repeatedly were the need for hands-on training in the schoolhouses, and the lack of underway on-the-job experience for the junior sailors. Collaboration, a modern 21st century issue, was the second main topic of concern. In particular, managing information and knowing where to go to obtain it, how to share it, and with whom to share it are not always easy in operational Navy commands. As shown in Figure 3, other topics that achieved high levels of attention related to personal and personnel readiness, technology usability, and habitability and morale.

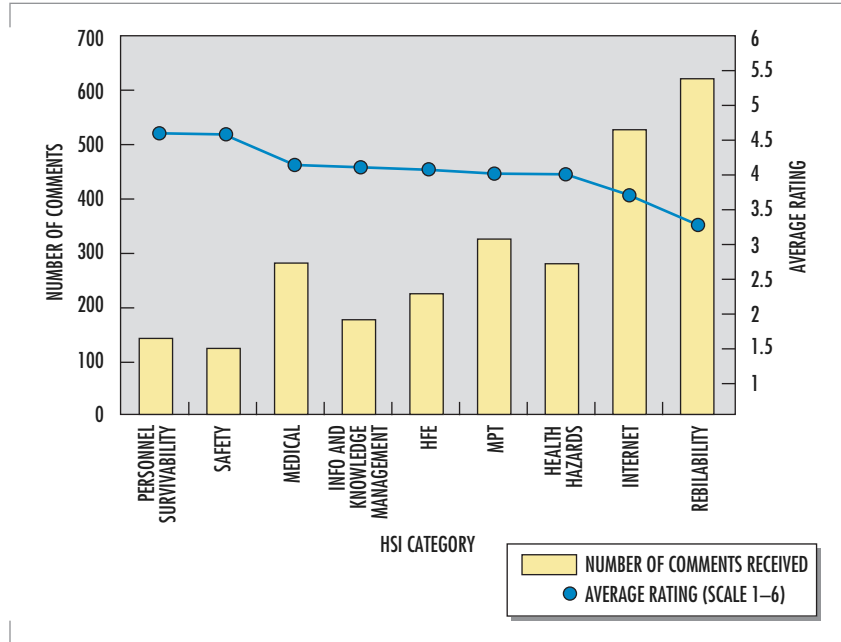


FIGURE 2. Summary of SAF comments and ratings.

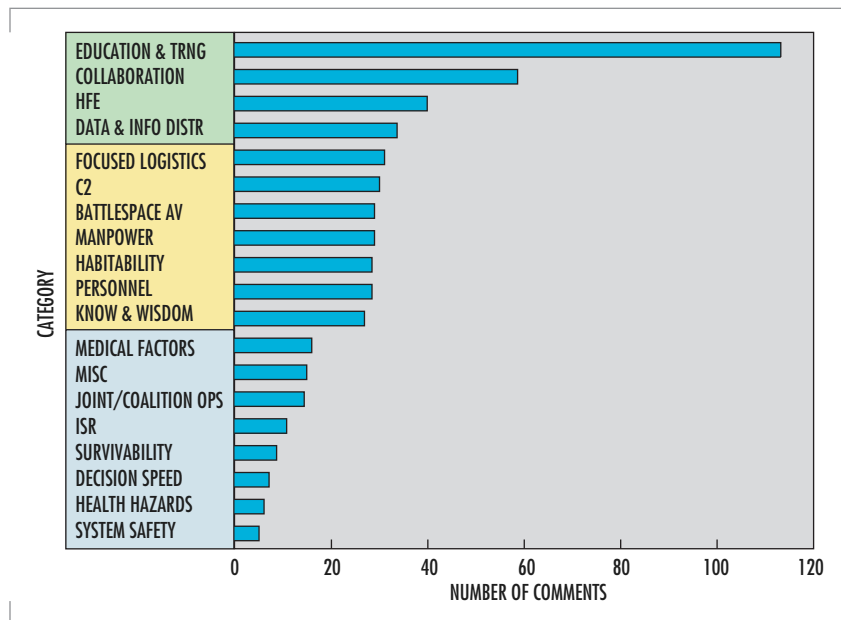


FIGURE 3. Summary of interview comments.

DISCUSSION

The HSI Lessons Learned collection effort identified issues in three major capability areas (1) use of chat, (2) information management, and (3) skills to perform required tasks.

Preliminary analysis shows that *chat* has become an integral element of both tactical and non-tactical warfighting operations. Use of chat facilitates timely information exchange, coordination, and collaboration. It is

widely available and user friendly. However, current shortfalls of chat are becoming increasingly visible (i.e., no standard currently exists for chat software applications; only limited tactics, techniques, procedures, protocol, and policy have been promulgated; unreliable logging capability due to lack of official timestamp and backup capability; and no user-specific feedback that all recipients have received and understand the communication).

Information management is a two-edged sword—personnel are being flooded by too much information from too many sources, making data compilation and reconciliation difficult. Furthermore, the required information is not easily found or accessible. Unfortunately, this problem may get worse as the Navy moves forward with digital information management. Lastly, there is no consistent means for an individual to verify the accuracy or reliability of the data once it is found.

Preliminary analysis has shown that junior personnel are arriving at their command with inadequate *skills to perform required tasks*. This is compounded by the observation that more senior personnel are seldom adequately trained to address technology upgrades. Skills acquisition and performance support tools have become increasingly critical given optimum manning and increased optempo.

Another useful insight derived from this effort is that the traditional HSI component list (HFE, MPT, safety, habitability, health, personnel survivability, and medical factors) represents five core disciplines that have yet to align or integrate their processes. Moreover, they each developed over time and during times prior to the recent and significant impacts associated with IT and the Internet. Thus, an integrated product team should be initiated to address the potential convergence of the traditional HSI disciplines, and to add information and knowledge components to the HSI domain.

Lastly, Runnerstrom [8] provided recent examples of Navy HSI successes and shortfalls. He commented that “Merely establishing a requirement for HSI will not produce effective HSI because the infrastructure does not exist to implement the requirement.” This can be paraphrased to state that establishing the HSI requirement is insufficient because there exists no comprehensive naval HSI feedback system. This is an area that the HSI community within the Navy should investigate.

CONCLUSION

The warrior is at the center of FORCEnet. As the Navy develops the doctrine, organization, training, materiel, leadership, personnel, and facilities aspects associated with FORCEnet, capability issues such as those discussed in this paper will need to be addressed. In addition, non-traditional areas related to how the human works in a net-centric environment in the Information Age need to be added to the HSI domain. Finally, a comprehensive naval HSI feedback system needs to be established.

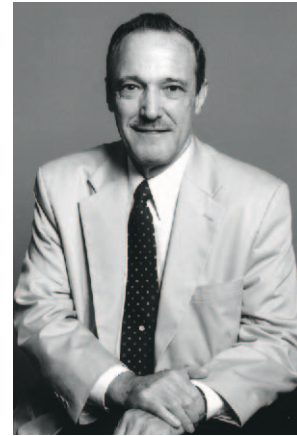
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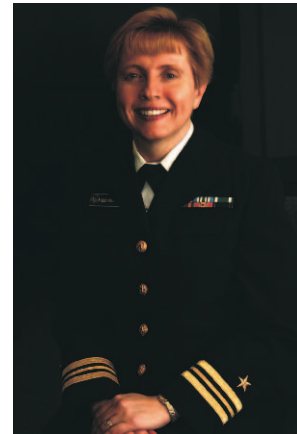
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