PART II

SYSTEMS ACQUISITION AND MANAGEMENT PROCESSES

Human systems integration (HSI) deals with processes and methods to better understand and accommodate the role of the human being within systems. It is a thorough and comprehensive systems engineering and management strategy that is begun early in the process of system acquisition to ensure that all pertinent human concerns are addressed throughout the life-cycle process. Five chapters are provided that describe how HSI is involved throughout the major stages in acquiring a system, beginning with requirements determination, to system specifications, to system design and development, and finally to test, evaluation, and assessment of system performance.

The focus of Chapter 6 by Harrison and Forster is on the very earliest stages of the acquisition process. They rightly point out that decisions made in the concept stages will determine whether a project will proceed, define the key risks and issues to be addressed, and determine the allocation of resources for subsequent phases; yet human factors disciplines have traditionally been perceived as limited in their ability to contribute at this phase. Part of the perceived inability to contribute in the early stages comes from the fact that many tools and techniques available have been more suited to assessment of designs rather than addressing predesign concepts and analyses. Another part of the perceived limitations for human factors early in the acquisition process comes from cultural attitudes such as those described in Chapters 2 and 3. Together the limitations of tools and cultural attitudes have severely constrained the ability of HSI specialists to exert influence at perhaps the most critical stage in the system life cycle. Harrison and Forster present information that should be helpful in illustrating ways for the HSI professional to begin to reverse these past limitations. Their contribution takes two forms. First they discuss HSI activities that *should* be undertaken at early concept stages, including a general description of the requirements determination process, the types of HSI requirements and constraints that *should* be integrated into major project documents, and the roles of user information and target audience descriptions. Second, they present a promising new approach, developed within the United Kingdom (UK) Ministry of Defence's (MoD) Corporate Research Program. Known as the early human factors analysis (EHFA), the UK approach provides a mechanism to identify human-related risks and requirements early in

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an acquisition program and make an early cost and benefits assessment of the analysis results. Although this effort draws particularly on applications to UK defense acquisition, the principles described are generally applicable to other military and nonmilitary systems acquisition.

In Chapter 7 Hamilton describes the relationship between required HSI tasks and the acquisition process from the contractor's point of view. This is accomplished in three ways:

1. The critical contractor products and HSI tasks are described for each major stage of contract procurement activity—from contract award through the system life cycle up to testing and certification.
2. The principal documentation events of the contractor solicitation and selection process are discussed, which include the buyer solicitation announcement, the buyer request for proposal (RFP), the seller proposal, and the buyer source selection.
3. Guidelines are provided for contractor HSI practitioners on how to prepare proposals and plan and manage an integrated HSI program.

Chapter 8 by Barnes and Beevis, attempts to increase the reader's appreciation of the difficulty in designing modern complex systems by focusing on the system interactions among human, environmental, operational, and engineering components. It points out that design optimization through trade-offs entails measuring the performance not only of the various components but also of their interactions. Barnes and Beeves propose a systematic approach to measuring human performances trade-offs in terms reflecting system goals and subgoals. These models address human performance measurement not only in terms of the intended user but also as an integral part of the cost–benefit equation used to drive the design process. The chapter also discusses the advantages and limitations of various measurement techniques emphasizing the unique measurement problems that the human introduces into the process. The authors conclude that measuring complex systems requires some combination of modeling, hypothesis testing, and realistic simulation methods.

In Chapter 9 Olson and Sage discuss how HSI is affected by the increasing use of computer-based models and simulations within the system engineering and product acquisition domains. Although most of the chapters in this handbook focus on human involvement in the use of the system being engineered, this chapter focuses on another realm of human involvement—that of the human in the acquisition process itself. In summarizing the changing acquisition process and environment, the authors describe simulated-based acquisition as a potential model for the future and speculate on the role that humans will play in this new environment involving simulation-based acquisition.

In Chapter 10 Ehrhart and Sage present an HSI framework for user-centered systems engineering. The framework emphasizes methods for creating, structuring, and applying models and processes needed to identify and address HSI issues across all phases of the acquisition life cycle. The chapter discussion centers on the opportunities and challenges of the system acquisition life cycle, showing how HSI issues can be incorporated into systems engineering processes. More specifically, the framework provides a guide for the systems engineering manager to better appreciate and employ cognitive systems engineering methods to define problems, identify and represent cognitive task requirements, develop design goals, and implement and evaluate system designs for human–machine decision making.