MANPRINT BULLETIN

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MANPRINT Update

Dr. Harold R. Booher
Director, MANPRINT Office, ODSCPER

What's In a Name?

Everything! Three years ago, when I became the Director for MANPRINT, very few people knew what MANPRINT represented, much less what the program sought to accomplish. Today, MANPRINT is synonymous with success, "doing things right," and most of all, with improving our warfighting capability. Furthermore, MANPRINT is now known internationally. Ask the United Kingdom Ministry of Defence or elements of the Singapore Army, and they will tell you what it stands for and what it is trying to accomplish. MANPRINT has come a long way in a very short time because of support from the highest levels of the Army leadership and the dedicated MANPRINT practitioners throughout the Army.

In this update, I will first address a few of the key MANPRINT events from the past before turning my focus to the future.

Where have we been?

Our successes have been many during the past year, among them, the MANPRINT with Industry Executive Seminars, the Army Acquisition Executive (AAE) Memorandum 89-2, and MANPRINT in the United Kingdom.

MANPRINT with Industry Executive Seminars. Why are they so important? MANPRINT is an Industry and Army partnership and these seminars give us—Army and Industry—the opportunity to share ideas, identify problems, and seek solutions. During the latter part of 1988, we revitalized our MANPRINT with Industry Executive Seminar program by setting four main goals: 1) emphasize the importance, 2) explain the process, 3) identify and discuss successes and 4) promote open discourse.

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MANPRINT Agenda for the 90s

In his front page article, Dr. Harold R. Booher, Director for MANPRINT, takes a glance back at MANPRINT's past successes before outlining what lies ahead in MANPRINT's future.

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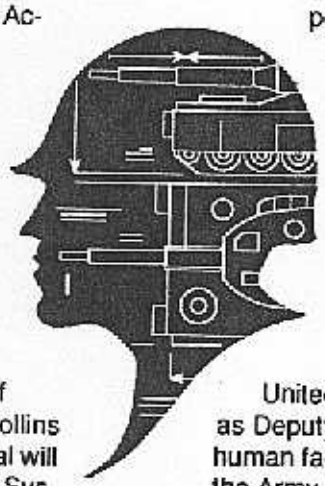
During the first two seminars, both hosted by General Arthur E. Brown, Jr., then the Army Vice Chief of Staff, industry stated emphatically that if MANPRINT were to be taken seriously, then the Army would have to make it a separate major area in the Source Selection Evaluation Board Process. General Brown directed that policy be established to make MANPRINT a separate major area. This direction resulted in the development and publication of Army Acquisition Executive Memorandum (AAE) 89-2, Treatment of MANPRINT in Solicitations and the Source Selection Process. The third seminar, hosted by Lieutenant General Donald S. Pihl, Military Deputy to the Assistant Secretary of the Army for Research, Development and Acquisition, was equally successful in terms of support for the AAE Memorandum and the need to consider a MANPRINT Military Standard.



Our fourth seminar is scheduled for March 20, 1990, in Alexandria, Virginia. Highlighting this seminar will be industry and government presentations on MANPRINT activity within their organizations. Martin Marietta will give a presentation on the Line of Sight - Forward Heavy program and Collins Aviation Group of Rockwell International will review the Automated Target Handover System. Government presentations will include the Soldier Support Center MANPRINT effort associated with the Individually Carried Record and the Troop Support Command MANPRINT emphasis in Aviation Lighting Devices, Chemical and Biological Protected Shelters, and Meal Ready to Eat (MRE) Programs.

Army Acquisition Executive (AAE) Memorandum. On March 31, 1989, Mr. Michael P.W. Stone signed AAE Memo 89-2. Aside from Army Regulation 602-2 and DOD Directive 5000.53, MPTS in the Defense Acquisition Process, this is the single most important document to the institutionalization of the MANPRINT program.

AAE Memo 89-2 states that, "MANPRINT shall be a separate major area in source selection with the same visibility as Technical, Management and Cost and that MANPRINT shall be evaluated throughout." This single document is the "payoff" for all the good work done by MANPRINT practitioners. It assures that MANPRINT will be a major part in the Source Selection Evaluation Board process and that manufacturers adhering to MANPRINT considerations will be successful in their attempts to win contracts.

MANPRINT in the UK. The United Kingdom Ministry of Defence has established a MANPRINT office for their Army Department. MANPRINT will be represented by the Assistant Chief of the General Staff (a two-star post) on the Equipment Policy Committee, which is similar to our Defense Acquisition Board. Early initiatives for the new office include public relations, establishing research agreements, and drafting procedures and guidelines.

Colonel Richard Kinsella-Bevan has been appointed as head of MANPRINT. Colonel Kinsella-Bevan's recent experience includes being the Military Studies Director on a major operational analysis study which examined the appropriate anti-armor mix for the 21st century. He completed the HQDA MANPRINT Familiarization Seminar held January 17-19, 1990, at the Humphrey's Engineering Center, Ft. Belvoir, Virginia.

Elizabeth Wheatley, formerly of the United Kingdom MANPRINT Study Team, serves as Deputy. Ms. Wheatley previously worked in human factors for the Royal Navy and has been with the Army since 1982.

I would like to thank everyone for the hospitality and support extended to the UK MANPRINT Study Team during their visit last April. The information provided has been invaluable to the British MANPRINT effort.

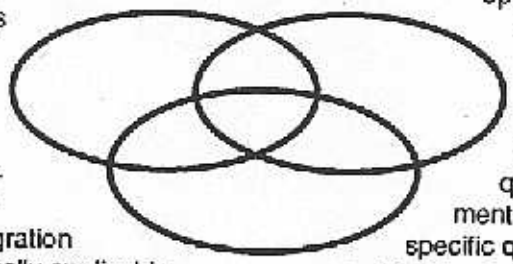
The British MANPRINT Office address is: ASD 5 (MANPRINT), Room 5154, Main Building, Ministry of Defence, Whitehall, London SW1A 2HB. Phone: 1 (London) 218-2550.

Where are we going?

The MANPRINT Directorate will be extremely busy for the remainder of this fiscal year planning and organizing events to further institutionalize MANPRINT throughout the Army and Industry. I have already mentioned our fourth MANPRINT with Industry Executive Seminar, which should be even more successful than those previously conducted. The seminar is only the beginning of a series of events: a MANPRINT book will be published in May; a

MANPRINT Practitioner's Conference is being planned for June; HARDMAN III (MANPRINT Methodologies) is scheduled to be delivered to the Army Research Institute in July; the final report of the MANPRINT Enhancement Study is scheduled for August; and Headquarters Department of the Army Pamphlet 602-2, MANPRINT Practitioner's Guide, and a Manufacturer's MANPRINT Management Plan - Expert System are currently under development and should be completed in late summer or early fall.

MANPRINT Book. This book will be the first guide to the technical and managerial concepts of MANPRINT. Entitled *The MANPRINT Approach to Systems Integration*, it will outline how the MANPRINT approach can enable both the Department of Defense and civilian organizations to convert from "equipment-oriented" engineering to systems that effectively integrate people and equipment. Using a unique three-tiered approach that encompasses managerial context, user-centered design, and system integration methodology, the book will be equally applicable to defense and nondefense-oriented industries.



HARDMAN III. The HARDMAN III decision support system, being developed by the Army Research Institute, offers MANPRINT practitioners a set of integrated analytical tools to evaluate and influence system design. A prototype of the system is expected in July of this year. Debugging the software is to be completed by August, after which "beta" testing is to occur. During this prototype testing, specific users will be identified and monitored for their comments and recommendations on how to improve these tools for MANPRINT practitioners.

MANPRINT Practitioner's Conference. The second annual MANPRINT Practitioner's Conference will be held June 19-21, 1990. Although the conference is intended primarily for government personnel, industry representatives are encouraged to develop presentations on MANPRINT initiatives within their organizations or new MANPRINT tools being used to enhance their programs. Letters requesting submission of proposed presentation abstracts will be mailed to prospective attendees in March.

MANPRINT Enhancement Study. During December of 1989, the MANPRINT Enhancement Study Advisory Group approved the study management methodology and execution plan proposed by the Science Applications International Corporation (SAIC). At this meeting, the emphasis of the study was revised to ensure that sufficient effort is placed upon the future direction of the MANPRINT program. Among the study targets are two key areas: 1) identify the gaps which must be filled to help MANPRINT practitioners do their jobs more easily, and 2) identify the efforts necessary to better institutionalize MANPRINT in the materiel acquisition process. Representatives from various TRADOC and AMC branches are assisting in the study.

Manufacturer's MANPRINT Management Plan - Expert System (MMMP-ES). Currently under development, this is a computer-based expert system that will guide individuals in the development of an MMMP, which is cited in AMC Pamphlet 602-2, MANPRINT Handbook for Request for Proposal (RFP) Development. The expert system will ask specific questions concerning the system and its intended application. Based on the answers given, the MMMP-ES will select the appropriate report format and indicate specific passages to be included. The MMMP-ES is being developed for use by industry, although government personnel may find it useful as a learning tool. The final product will be a draft MMMP, which the manufacturer will have to refine before submitting. The program will run on an IBM-PC or any compatible with a hard disk, 640k RAM, printer, and word processing software.

HQDA Pamphlet 602-2 MANPRINT Practitioner's Guide. This DA pamphlet is being developed to supplement AR 602-2 and to incorporate much of the information contained in the numerous MANPRINT handbooks and guides that have been separately published. It will serve as the single focal point for guidance and references necessary to apply MANPRINT throughout the acquisition process.

The past few years have indeed been busy, but the success of the MANPRINT program has been dependent on the dedication and hard work of all MANPRINT practitioners. We are now just beginning to see the successes in system acquisitions that have been brought about by MANPRINT. I urge each of you to continue to bring MANPRINT to the forefront in the acquisition process.

Health Hazard Assessment Medical Support to MANPRINT

MAJ Jeff Driftmeyer, Ph.D.
TRADOC Surgeon's Office

The Army Medical Department's (AMEDD) Health Hazard Assessment (HHA) personnel met November 7-8, 1989 at Headquarters, Training and Doctrine Command (TRADOC), Ft. Monroe, Virginia. The theme for the workshop was "Looking Ahead to the Decade of the 90s," that is, how medical support to MANPRINT will evolve in future years.

COL Rick Erdtmann, Chief of Military and Preventative Medicine Division, Office of the Surgeon General (OTSG), proponent for the HHA program, opened the workshop with a briefing on goals and objectives for medical support to MANPRINT. MAJ Jeff Womack of TRADOC's MANPRINT office provided an update on ongoing initiatives in MANPRINT and how these affect the health hazard domain.

In keeping with the theme of the workshop, MAJ Cecil Webster of the Deputy Chief of Staff for Combat Developments, Plans, Concepts, and Technology Directorate described a joint TRADOC-AMC project to look at "next generation and future systems." This project was well received by the HHA community, especially representatives of the U.S. Army Medical Research and Development Command, whose mission includes conducting basic and applied scientific and medical research on potential health hazards of future Army systems.

MAJ(P) Tom Broadwater, OTSG Action officer for HHAs, provided an overview of the program, emphasizing the AMEDD role as team players in systems development. Having made many valuable contributions to problem solving over the last five years, HHA input has helped improve systems performance while protecting soldier health. MAJ Anthony Aiken of the Army's Environmental Hygiene Agency (AEHA) HHA office reported that his office has averaged roughly 60 reports each fiscal year for the past several years. While the number of HHA reports completed has reached a plateau, limited by current HHA manpower, MAJ Aiken's office has continued to grow into new areas, such as medical representation to source selection evaluation boards. This is another indication of integration of the health hazards domain into MANPRINT and the materiel acquisition decision program (MADP).

In keeping with the workshop theme of HHA in the 90s, afternoon sessions were devoted to future health hazards. Dr. Bernard Halpin of AMC's Materiel Technology Laboratory provided an eye-opening overview on the use of composite materials in Army systems—everything from sections of the Blackhawk airframe to an entire Bradley composite hull!

Updates by each of the MACOMs were followed by a thorough review of the revision of AR 40-10, presently in draft form for Army-wide staffing.

Closing remarks by COL Erdtmannn emphasized the importance of AMEDD involvement early-on in systems development. For example, in order to prepare the HHA report, use-scenarios and operational mode summary mission profiles should be forwarded with requests for an HHA. In HHA research and new technologies, attention will focus on generic questions, developing a closer link between LABCOM and MRDC HHA, and borrowing from the experiences of sister services. Voids in HHA in an NBC environment are continuing to be filled, as are mechanisms to ensure medical review and input to safety releases prior to testing new materiel systems.

The small but effective HHA community within the AMEDD continues to stress early medical support to MANPRINT and MADP—as team players resolving soldier health issues, potential or real, before they become "showstoppers" which either slow fielding or increase costs.

The next HHA workshop in 1990 will be hosted by the U.S. Army Aeromedical Research Laboratory. For information on that event, call AV 558-6800.

For more information, contact MAJ Jeff Driftmeyer, TRADOC, Office of the Surgeon, Ft. Monroe, VA 23651-5000. AV 680-2226, (804) 727-2226.

The Answer to the MANPRINT Question in Retrospect

Tom Doyle
Management Assistance Corporation of America

Now, four years after our MANPRINT baptism, with the Pedestal Mounted Stinger (PMS) successfully through its Initial Operational Test and Evaluation (IOT&E), we can reexamine the MANPRINT question: *Can this soldier, with this training, perform these tasks, to these standards, under these conditions?* How did we really address this question in the operational test environment? In reality, the full charter of MANPRINT, as intended by the question, was seldom evaluated.

The question, as it stands, accounts for all six domains of MANPRINT during evaluation. When fully stated, the more complete question might be:

> *Can these numbers (manpower) and kinds (personnel) of soldiers with this training, safely and efficiently perform these mission tasks using this HW and SW (human factors engineering, health hazards, and system safety) to these standards under these conditions? And if not, why not?*

The answer to the complete MANPRINT question requires the conduction of an operational assessment whose answers are a product of dynamic human task performance. This human task performance evaluation should use time (speed), accuracy, completeness, error, and recoverability, among other concepts, that quantify and quality human functions within an operational environment. It is the MANPRINT analysts and the evaluators they support who must reconcile human performance functions within their conceptual framework (MPT, HFE, HH, and SS).

After several operational tests, our experiences have convinced us that it was the methods and expertise of the MANPRINT analysts and evaluators that not only explained the human component's performance according to the defined standards and regulations, but also explained the human component's performance in terms of total system adequacy or system utility. It was, in fact, the operational MANPRINT analysts and evaluators who illuminated the need to answer the complete MANPRINT question. Experience has also led us to the conclusion that the complete assessment of the MANPRINT question places the soldier and his equipment in an operational environment to determine if he has enabled the PMS to meet its goal. MANPRINT must be planned into each operational test as a specific issue, rather than as a token concern within the classical areas of mission performance, RAM, and logistics. This type of planning was used during the recently completed and highly successful PMS Initial Operational Test and Evaluation (IOT&E). The process must begin by including well defined MANPRINT issues and criteria into the Test and Evaluation Plan (TEP). It is then up to the MANPRINT testers to ensure that the full scope of MANPRINT is included in the data requirements so that the complete MANPRINT question is addressed. When the MANPRINT question is asked regarding the system we are now evaluating, all of the MANPRINT domains must be included. We will then have provided the soldiers what they deserve: the best human-engineered system that we can give them.

For more information, contact Tom Doyle, Management Assistance Corporation of America, 8600 Boeing, El Paso, TX 79925. (915) 544-6374.

Updated MANPRINT POC List

You will receive your *MANPRINT Points of Contact* list shortly. POCs are asked to check the new publication for accuracy. Please report any changes to Ms. Carolyn Johnson, Automation Research Systems, Ltd., 4501 Ford Ave., 11th Floor, Alexandria, VA 22302; or telephone (703) 820-9000; or FAX (703) 671-3562.

TRADOC Hosts MANPRINT Senior Training Course (MSTC)

TRADOC hosted the MANPRINT Senior Training Course (MSTC) on November 27-29, 1989 at Ft. Monroe, Virginia to review the concepts of the MANPRINT program and the role of its senior managers. All Headquarters TRADOC general officers, the directors within the offices of the Deputy Chiefs of Staff for Combat Developments (DCSCD) and Training (DCST), the AMC Commander, and selected staff were invited to attend.

The course focused on the respective roles of the participants in the materiel acquisition process and reaffirmed the command's commitment to the MANPRINT program. GEN Foss hosted and led the first day's seminar for 24 general officer/senior executive service (GO/SES) personnel and the directors within the offices of the DCSCD and DCST.

The morning session of GO/SES seminar was an open discussion on the MANPRINT program. In his opening comments, GEN Foss emphasized that TRADOC must keep the soldier first in its focus in preparing the Army for warfighting. He further stated that TRADOC has the responsibility to coordinate and integrate the combat developments for the Army, to include MANPRINT considerations. It is through these efforts, GEN Foss emphasized, that TRADOC will help to ensure the Army and the soldier will maximize the use of reduced resources.

The afternoon session consisted of a system-specific MANPRINT review on the Advanced Anti-tank Weapon System-Medium (AAWS-M). The Infantry School Commander, MG Spigelmire, presented a briefing on how the MANPRINT requirements in the AAWS-M joint service operational requirement (JSOR) were translated into test plans for user testing. BG Schumacher, the Program Executive Officer, followed by describing how the MANPRINT requirements in the JSOR were translated into the request for proposal (RFP) and considered during source selection. Mr. Jim Horton, representing Texas Instruments, closed the MANPRINT review with a presentation on how industry is addressing MANPRINT concerns. The review clearly showed how the application of MANPRINT domains to the JSOR and the RFP for the AAWS-M will provide our soldiers with a far better weapon than its predecessor, the Dragon.

In his closing remarks, GEN Foss emphasized that he was personally committed to the MANPRINT program and that the concept of MANPRINT must be imprinted on the entire Army if the program is to achieve its fullest potential. He concluded by stating that school commandants will also give MANPRINT their personal attention to ensure the materiel acquisition process keeps the soldier in the loop.

The last two days of the MSTC provided a more detailed presentation of MANPRINT in materiel acquisition for 66 TRADOC System Staff Officers (TRASSOs) and action officers with DCSCD and DCST.

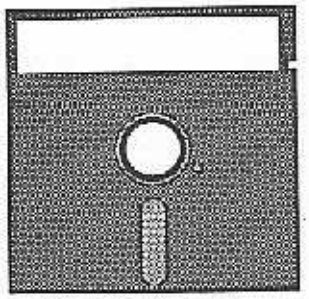
AMC Also Hosts MSTC

The Army Materiel Command (AMC) recently hosted a MANPRINT Senior Training Course (MSTC), held January 9-11, 1990 at Fort Belvoir, Virginia. The AMC-hosted course was similar to the TRADOC-hosted MSTC held November 27-29,1989 at Ft. Monroe, Virginia.

The course was structured around a one-day GO/SES session and an extended two-day portion for appropriate senior managers. The first day GO/SES session was chaired by LTG Cianciolo, Deputy Chief of Staff for RDA (AMC) and was assisted by Joyce L. Shields of Hay Systems, Inc. The objective of this session was to discuss the concept of the MANPRINT program and the roles of senior management. The system chosen for review was the Advanced Anti-tank Weapon System-Medium (AAWS-M), the same system used for the TRADOC MSTC. This was an excellent forum, which served the continuing education and implementation of MANPRINT in the materiel acquisition process. It also served to clarify and enforce the policy for MANPRINT in the source selection process.

"Object-Ada" Engineering: Managing the Object-Oriented Software Project

Roseanne Kane
David Linzer
System Automation Corporation



MANPRINT's directive of evaluating human factors in new systems presents challenges so complex that they can only be surmounted with the aid of sophisticated software systems. The Department of Defense has adopted Ada as its standard programming language since the mid-1980s. Ada is a language which is both newer and conceptually different than the classical programming languages. For those of us involved in developing software systems for the defense industry, it is critical to recognize how software managers and analysts can exploit Ada's potential to produce robust, economical systems.

Classical software project management is essentially the same regardless of the language of implementation, be it Pascal, C, Cobol, or Fortran. All of these languages are procedurally based: the functional unit of decomposition is a procedure, or an activity to be performed. Thus, the analysis and design stages for these languages can all be identical. However, this is precisely why projects of this sort are plagued with a myriad of problems that have brought about our present "software crisis." Problems in the software industry are all too well known, ranging from the inability to accurately predict project costs in terms of manpower and time in the beginning of a project, to highly unreliable end-products at the project's completion. Systems that require constant maintenance and cannot be easily modified abound. Software mainenance makes up an estimated 70% of the cost of the average software project.

Object-oriented engineering offers hope for a significant reduction of the number and severity of these problems. System Automation personnel have developed and implemented a project management methodology for linking Ada with the object-oriented methodology in a manner that will produce software systems that are more cost-predictable, more modifiable, more reliable, and, in the long run, more economical. So far our experience with this "object-Ada" methodology has been very encouraging.

Object-oriented projects see an object, not a procedure, as the functional unit of decomposition. This means that on the highest level of abstraction we are dealing with a system of units which are composed of smaller, more basic units. A class is comprised of objects with shared characteristics. The first step in analyzing an object-oriented system is to identify and define all relevant classes. This stage plays the most important role in the System Automation technology.

For every class, a set of operations that can validly be performed on objects of that class must be defined; we term these operational components. The more classes we can identify for a given system the smaller, more basic, and more verifiable the resulting operational components for the classes. By applying this methodology, we have strived for and achieved a system wherein the large majority of our operational components are made up of less than ten executable lines of code. The benefits of such small, modularized operational components are:

Cost predictability. The larger a component is, the more it camouflages its elements. This leads to components which are less understandable and less manageable. With small, understandable components, a project manager can easily predict the appropriate number of personnel and time required.

Manageability. The function of a given operational procedure can be immediately comprehended. The progress of programmers can thus be tracked and

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easily managed. Because the components are basic, they are relatively independent of one another. Thus, there is the additional benefit of being able to add programmers in the middle of a life cycle without burdening the existing team members.

Modifiability. With more manageable, understandable components, the modules of a system can be more easily traced, located, and modified.

Low Complexity. The smaller the size, the smaller the complexity. The less complex a system, the fewer test cases required to determine reliability. With fewer test cases needed, greater reliability insured.

Reliability. In addition to a smaller number of required test cases, the smaller, more basic a functional component the higher its degree of reuse throughout the system. Reliability is increased with the increased use of tested components.

Smaller systems. With an increased number of reused components, the absolute number of lines of code of a system decreases. Rather than incorporating and coding a large component, many existing smaller components can be called to perform the same function.

Efficient programming. Programmers are given smaller (although a greater number of) pieces of the design to implement. If these pieces are basic enough, it is obvious and straightforward how they are to proceed; programming becomes almost automatic.

The complexities and challenges inherent in the MANPRINT charter demand the support of sophisticated software systems. By applying the methodology of "object-Ada" project management that System Automation has develped, these systems can be made to be reliable, robust, manageable, and economical.

For more information, contact David Linzer at System Automation Corporation, 8555 Sixteenth Street, Silver Spring, MD 20910, (301) 585-9400.

There's never time to do it right, but there's always time to do it over.

(From *Murphy's Law* by Arthur Bloch, 1979.)

? DID YOU KNOW?

• that there are MANPRINT positions still available at the Operational Test and Evaluation Agency (OTEA)? Engineering Psychologist (GS-13)positions are available which involve planning, analyzing, and reporting MANPRINT aspects of operational testing. Contact Camilla Allen (Fort Myer CPO, 696-3180) for application materials under announcement M-830-89 (CA).

• that at the 1989 meeting of the Human Factors Society, Director for MANPRINT Dr. Harold Booher was named to chair the Public Interest Committee for the Society? Dr. Booher has been an active HFS member since 1968 and served on the Executive Council from 1987 to 1989.

Human Factors Society's 34th Annual Meeting to be Held in Orlando

The Human Factors Society will hold its 34th Annual Meeting from October 8-12, 1990 in Orlando, Florida. The Central Florida Chapter, this year's host, has established the theme, "Countdown to the 21st Century," reflecting its proximity to the Space Coast and the discovery that the space program embodies. As the new century approaches, contributors are urged to examine how human factors specialists can further enhance the humanization and mastery of technology to ensure that systems of the future promote effectiveness, safety, and ease of operation.

The meeting will begin with a full day of hands-on, how-to workshops, followed by four days of technical sessions, which will include interactive demonstrations and videotape presentations. Other activities include tours to local facilities of interest to human factors practitioners, as well as the annual banquet, at which several individuals will be honored for significant contributions to the field.

For more information, contact the Human Factors Society, PO Box 1369, Santa Monica, CA 90406, (213) 394-1811/9793 or FAX (213) 394-2410.

THE READING ROOM

Readings in Human-Computer Interaction: A Multidisciplinary Approach

Reviewed by Gail Fontenelle
MicroAnalysis and Design

Readings in Human-Computer Interaction: A Multidisciplinary Approach, Ronald M. Baeker and William A.S. Buxton, Editors. Los Altos, CA: Morgan Kaufmann, 1987, 738 pages.

This book is an excellent survey of many current issues in human-computer interaction. The readings sample notable contributions from several diverse disciplines, such as graphic and industrial design, organizational and cognitive psychology, sociology, and display technology.

The text is organized into three main sections: the context of human-computer interaction (the historical, sociopolitical environment), issues of the user and usage, (empirical evaluation, cognitive and perceptual issues), and the design and implementation of computer systems (interaction techniques, design methodologies). The book's 13 chapters include four case studies that analyze specific systems and applications. Each of the chapters and case studies consists of an original introduction followed by a number of reprinted articles. Introductions are well written, concise overviews of the topics and provide references and passages from other articles. A final chapter discusses research frontiers.

The result is an annotated sourcebook of outstanding papers in the field that is appropriately subtitled "A Multidisciplinary Approach." Reading through the book, I found that many of the reprints are classics, but each section offers several new and interesting citations and at least one paper pointing in a new direction that seemed worthy of further exploration. The chapter on the visual channel, for example, includes readings on digital typography, graphic design, color graphics, and frame-buffer display architecture.

The authors seem well versed in the many different disciplines as they apply to human-computer interaction. Only the discussion of research frontiers and unsolved problems exposes their preferences and disciplinary inclination. This chapter does not address my own research interest and therefore was a bit disappointing. A subsequent edition that discussed more issues or covered a more varied agenda would be valuable.

The book was intended to fill the gap in resources for the advanced undergraduate student, beginning graduate student, or practicing professional. The text successfully integrates a large body of recent results from the research community, professional practice, and real applications. The four case studies further enhance the value of this book as a tool for instruction by providing "real world" examples.

This book also serves as an invaluable index to the recent literature in several disciplines. The reference/bibliography section for each chapter lists such varied sources as professional journals, professional reports from government and corporations, and conference proceedings, making it not only a useful text for the student of human-computer interaction, but also a handy reference for the professional.

Readings in Human Computer Interaction is reasonably priced given the number of readings from such varied sources, some not widely avaliable. It is a worthy addition to either a personal library or a company reference library. It is exciting to know that professionals have invested this much time and effort in creating a multidisciplinary approach to human-computer interaction, an undertaking that is all too often given lip service, but is very seldom actively pursued or achieved.

This review previously appeared in the June1989 issue of the *Human Factors Society Bulletin.*