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Is Early Ergonomics Better Economics?

By David L. Post, HFES President

When I embarked on my presidency a few months ago, I thought I had a good idea of what to expect. After all, I'd served two terms on Executive Council and thus had ample opportunity to observe the president's duties and even assist in performing some. So far, my expectation has proven accurate, with one exception: the letters.

At the start of my first term on Council, I had the naïve idea that I'd hear regularly from members who had concerns they wanted me, as one of their elected representatives, to pursue. Other than the occasional "by the way" sort of remark I've encountered in casual conversations, though, I don't recall anyone formally addressing an HFES issue through me during my years as an at-large member, as secretary-treasurer, or even as president-elect.

So it came as a surprise when I began my presidential year and it suddenly became clear where all those formal communications go. In retrospect, it *shouldn't* have been surprising – when something seems important enough to write an organization about it, we want to go straight to the top, for obvious reasons. I've been receiving a variety of communiqués, mostly via e-mail, and – so far, anyway – I'm enjoying it, for one of the same reasons I enjoy being a first-line supervisor in my day job: It's nice to feel needed and that you're helping people.

Costs of Late HF/E Input?

The most thought-provoking e-mail I've received to date came a few days ago from my friend Bob Osgood. He forwarded a query that's apparently been making the rounds lately. It read: "I have found several committee findings that state: not integrating HF/E in the beginning of a program leads to higher overall program cost through redesigns/reworks to accommodate the humans or additional training to enable the humans to function in a suboptimum design. Does anyone have any quantifiable data regarding cost overruns attributed to the lack of proper HF/E integration? I know space programs (*Apollo*, *Skylab*, *Shuttle*, and *ISS*) are notorious for cost overruns, but I cannot find what part of the overruns can be attributed to poor HF/E. Are there any programs that have looked at this issue and published a 'lessons learned' with projected savings?" Bob added to this anonymous message, "Does HFES have any readily available data like this to help us when this type of inquiry comes along?"

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HFES 100 Trial Use Standard Released

by Thomas J. Albin, HFES 100 Committee Chair

After many years of extensive work, the draft revision of the HFES publication, *American National Standard for Human Factors Engineering of Visual Display Terminal Workstations* (ANSI/HFES100-1988), has been completed. The revised successor to the 1988 U.S. standard, BSR/HFES100, *Human Factors Engineering of Computer Workstations* (trial use standard), becomes available for public review and comment at the end of March.

Workplace use of computers has increased dramatically since 1988. According to the U.S. Census Bureau, half of all adults in the United States use computers in the workplace. Many spend the majority of their days engaged in computer work. The same source noted that about three-fourths of all school-age children use computers. At the same time that the number of users has increased, the means of interacting with and using computers has also changed. As computers become fixtures in more and more workplaces, the need to develop and maintain technical standards to derive the maximum benefit from computer use becomes increasingly apparent.

The new document recognizes the growing importance of computer workstations and the consequent benefits to users and employers from workstations that are ergonomically designed and integrated to enhance productivity and comfort. BSR/HFES100 guides designers in ways to accommodate variation both in the size of individual users and in the manner of usage. It also provides guidance to the individuals who must integrate individual workstation components designed for a wide variety of users into a system that fits the intended individual user.

Changes since the 1988 Standard

The previous version of the standard addressed only one reference posture: upright seated. Unfortunately, this sometimes

continued on next page

Nomination Ballots

Ballots for nominating 2002-2003 officers and at-large Executive Council members will be mailed later this month to all full Members and Fellows. If you have not received your ballot by the end of March, please call the Member Services department at 310/394-1811 or send e-mail to stefanie@hfes.org.



led to the mistaken conclusion that the only correct working posture was upright seated. There are four primary reference postures in the revised document: upright seated, reclined seated, declined seated, and standing. The upright seated posture is already familiar from the 1988 standard; the reclined seated posture occurs when the chair backrest tilts backward from the vertical, the declined when the seat tilts forward (below horizontal); the standing when the user stands while working. These four reference postures, which primarily address trunk and leg posture, represent the variety of postures likely to be used by computer users rather than an exhaustive listing of all acceptable postures. BRS/HFES100 provides similar guidance to designers with regard to expected postures of other body parts, such as the neck, arms, and hands.

Based on these postural design parameters, BSR/HFES100 sets a goal of defining workstations that will accommodate, at the least, a population ranging between the U.S. 5th percentile adult female and the 95th percentile adult male. However, existing anthropometric data did not readily yield the information necessary to specify all the pertinent dimensions for all the reference postures – at least not without encountering the fallacy of adding percentiles. Accordingly, the revised trial use standard utilizes new methodologies of combining existing anthropometric dimensions. As a result, more accurate specifications were developed for relevant workspace dimensions. These methodologies are published in the draft for the use of those who wish to adapt the workspace dimensions to other anthropometric data.

Input and display devices are also addressed in the current revision. It includes a discussion of nonkeyboard input devices (in the 1988 standard, only keyboards were discussed). Similarly, the display section has been expanded to cover both color and flat-panel displays.

Availability and Comments

Copies of BSR/HFES100 may be obtained from HFES. The cost is \$50 for HFES members, \$85 for nonmembers, plus \$7 U.S. shipping/handling per single copy and California sales tax, if applicable (go to <http://hfes.org> for shipping costs on multiple-copy purchases).

The release of the draft standard for trial use begins the process of public comment. Individuals who wish to comment are invited to do so. Please send comments to Thomas J. Albin, c/o Human

Factors and Ergonomics Society, P.O. Box 1369, Santa Monica, CA 90406-1369; fax 310/394-2410. As comments are received, the document will be revised as necessary and then submitted to the ANSI canvass review process.

The revision represents the collective effort of many individuals over a period of many years. HFES is deeply grateful for the donation of their time and knowledge and the support of their employers. 

ANNUAL MEETING

2002 Annual Meeting Moves to Baltimore

Due to construction delays at the Pittsburgh Convention Center, HFES will be moving its annual meeting to the new Baltimore Marriott Waterfront Hotel, Baltimore, Maryland. The dates of the meeting will also move to a week later – September 30 through October 4, 2002.

John Ruffner, president of the Potomac Chapter, will head the host committee for 2002, and an enthusiastic group of volunteers in Pittsburgh will have their duties deferred until 2006, when the meeting will be held in that city.

Calling All Exhibitors

HFES invites companies providing publications, products, and services to exhibit at the 46th Annual Meeting in Baltimore. More than 90% of attendees report visiting the exhibit hall during the meeting, seeking books, standards, furniture, work aids, and tools for hardware and software measurement, modeling, and design.

The rate for a 10' × 10' booth is \$2000; \$750 for a tabletop. Coffee break and other sponsorships are available. Corporate sponsorships are welcome for any aspect of annual meeting support. For more details, contact Lois Smith in the HFES central office (310/394-1811, lois@hfes.org).

Erratum

Upon further analysis of the data, the authors found an error in the results reported with respect to symptoms of visual discomfort in the following paper: Lorusso, T. P., Hedge, A., & Middendorf, S. (2001). *Proceedings of the Human Factors and Ergonomics Society 45th Annual Meeting*. (pp. 786–790). Santa Monica, CA: Human Factors and Ergonomics Society.

In the original report it was stated that the installation of any of the four filter types reduced symptoms of visual discomfort for participants when compared with the control condition (no filter). However, upon further review it was discovered that although there was a trend of symptom reduction after filter installation, these differences were not significant. The results reported for filter preference, ratings of the visual environment, monitor characteristics, self-report of productivity, and disruption of work are all correct in the original paper.

For the current version of the report, please visit <http://ergo.human.cornell.edu> or contact Alan Hedge (ah29@cornell.edu) or Tom Lorusso (tpl22@cornell.edu). 



Bulletin

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HFES Members Sought for Voting Standard

The Institute of Electrical and Electronics Engineers (IEEE), working in conjunction with the National Association of State Election Directors and the Federal Election Systems, seeks HFES member input on new standards for voting equipment. According to Stephen Berger, who chairs the IEEE 1583 Standards Committee, the effort will help the roughly 200,000 voting centers in the United States meet the diverse needs of the people they serve. The committee is looking at such issues as how to better serve disabled voters, make sure that each vote cast is counted, and do it all cost-effectively. Says Berger, "The IEEE standard will account for electronic, mechanical, and human factors, and is intended to be a definitive guide for those who make and purchase voting equipment. While it will be a voluntary standard, states that adopt it will find it easier to upgrade their voting systems."

The committee, which meets quarterly, is seeking input from HFES members, particularly for its task group on accessibility/usability. If you are interested in participating, please send an e-mail to HFES Executive Director Lynn Strother at lynn@hfes.org.

Support the HFES Book Drive

The HFES Book Drive continues to assist researchers and educators in developing countries around the world through donations of HF/E materials. The HFES University of Central Florida Student Chapter has been responsible for the collection, cataloging, and mailing of donated references since January 2000. From that time through March 2001, the chapter reports that approximately 1300 books, journals, and proceedings were donated to 21 academic institutions in more than 15 developing nations.

Please search your personal library for any HF/E materials you would be willing to donate to support professionals around the world. Send your materials to Raegan Hoeft, 12424 Research Parkway, Room 408, Orlando, FL 32826, 407/384-2090; hoeft2@hotmail.com.

NEWS

Decade of Behavior Endorsing Societies Meet

The Decade of Behavior, launched in September 2000, is a multidisciplinary public education initiative focused on the themes of health, education, safety, prosperity, and democracy. HFES is one of the 64 societies participating in the initiative.

A meeting of the Decade of Behavior endorsing societies was

held in January. Society representatives provided input on Decade governance and programs and discussed strategies for increasing the endorsers' role in planning activities for the initiative. One goal of the meeting was to expand current programs and/or begin new programs proposed by the national advisory committee. The attendees also set out to form a committee of society representatives that will meet on a regular basis to address Decade initiatives.

Four subcommittees were formed. The Applications to Societal Issues Subcommittee, led by HFES Fellow Marilyn Sue Bogner and Veronika Oven (American Organization of Nurse Executives) will develop concrete examples that illustrate for the general public the relevance of behavioral and social science research to societal issues. The content of this activity is health care – more specifically, error in health care.

The Museum Exhibit Subcommittee, headed by Neil Grunberg (Society for Research on Nicotine and Tobacco) and Barb Wanchisen (Federation of Behavioral, Psychological, and Cognitive Sciences), will develop a museum exhibit on the phenomena of human behavior using a variety of disciplinary perspectives.

Helaine Patterson (American Educational Research Association) and Deborah Frisch (Society for Judgement and Decision Making) lead the Research Award/Highlights Subcommittee, which will work on distributing research findings to the public and policymakers. The first phase of activity for this subcommittee will involve contacting disciplinary organizations to compile examples of research that has had a significant impact on public policy or general behavioral practice.

The Violence and Incarceration Subcommittee, led by Janet Brown (American Speech-Language-Hearing Association) and Jason Levy Zlotnik (Institute for Advancement of Social Work Research), will work on transforming language research to practice, specifically in the relationship of literacy to adult and juvenile violence and incarceration.

At the next meeting of the endorsing societies, as yet to be scheduled, details of the committee's structure and operation will be discussed.

For more information about the Decade of Behavior, visit <http://www.decadeofbehavior.org>.

PEOPLE

William Johnson has left his position as chief technology officer for Galaxy Scientific to join Lufthansa Technical Training as regional director for North and Latin America. He continues consulting as BillJohnson Consulting, and may be reached at North & Latin America Lufthansa Technical Training GmbH, 3873 Chaucer Wood, Atlanta, GA 30319; 770/458-3022, fax 770/458-4244; drbillj@drbillj.com.

Richard Pearson has retired after 35 years at North Carolina State University. He continues to work as a forensic consultant and has recently been appointed to the North Carolina Safety and Health Review Board. Contact him at Sage Forensics, 5441 Blue Sage, Raleigh, NC 27606-9027; 919-828-2443; rpearson@sageforensics.com.

The human factors and ergonomics (HF/E) community lost one of its best-known – and most beloved – on December 12 when Paul C. Champney died of post-surgery complications. Born in 1928, Paul energetically approached his personal and professional life with a goal of making “what is” better. Paul earned his B.A. with honors from Hobart College (Geneva, NY) in 1952 following two years of U.S. Coast Guard service at the end of World War II. He spent the next decade as an emulsions production professional at Eastman Kodak. This represented a “postgraduate education,” sensitizing him to practicable enhancements to worker productivity and well-being. This, and the support of Harry Davis and other colleagues, served him well as he progressed from industrial engineering analyst to senior ergonomist-group leader at Kodak (1962–1984). Paul was instrumental in incorporating HF/E into Kodak management and design teams based on his and others’ efforts, ultimately embodied in the classic book, *Ergonomic Design for People at Work*. During this time, Paul began his service to HFES in a long line of local, technical, and national offices (e.g., chair of the 1981 HFES Annual Meeting). Paul continued his HF/E professional and service efforts after retirement from Kodak. First with Westinghouse (1985–1999) and later as a consultant (1989–2001), he conducted HF/E analyses, taught courses, and served as an expert witness. He also continued to serve the HF/E community, most recently as chair of the 2001 Annual Occupational Ergonomics and Safety Meeting and editor of *Advances in Occupational Ergonomics and Safety-4*. Paul will be remembered by the many whose careers he encouraged and lives he touched. His steadfast presence and warm and friendly welcome at professional meetings will be greatly missed.

–*Alvah C. Bittner and Cheryl Bennett*



IN THE TRADES

William Marras, Ohio State University, was featured in an article entitled “Reasons Behind Recurring Back Injury” in the January issue of *IIE Solutions*. The article highlighted Marras and his team’s findings that one of the most important factors in recurring back injury is the natural tendency of individuals to avoid using hurt muscles. The findings suggest a need to train people in proper back muscle use as part of their overall strength training for rehabilitation.



IN THE NEWS

Barry Beith was featured in the January 2002 issue of *IT Magazine*. In an article titled “Making Business Very Personal,” Beith discussed his work as president of HumanCentric Technologies and the importance of usability engineering in the design engineering process. View the article on line at <http://www.it-pub.com/0102/0102.htm>.



CALL FOR PAPERS

Aviation Psychology Symposium

Papers, workshops, and poster presentations are invited for the International Symposium on Aviation Psychology, to be held April 14–17, 2003, in Dayton, Ohio. Topic areas include cockpit and air traffic control design, crew management, cognitive processes, physiological factors, stress and fatigue, communication, cultural factors, simulation, and pilot selection and/or training. Abstracts are due *July 15, 2002*. Contact Richard S. Jensen, Flying J Farm, 5329 Van Fossen Road, Johnstown, OH 43031; 740/967-4030; rjensen@core.com.



SHORT COURSES

Ergonomics for Manufacturing Excellence (April 8–9, 2002, Minneapolis, MN). Society of Manufacturing Engineers, P.O. Box 6028, Dearborn, MI 48121; 800/733-4763, fax 313/240-8252; mcdalu@sme.org, <http://www.sme.org/training>.

Signal Analysis for Medicine and Physiology (April 15–19, 2002, Southampton, UK). Institute of Sound and Vibration Research, University of Southampton, Southampton SO17 1BJ UK; +44 0 23 8059 3066, fax +44 0 23 8059 3190; msh@isvr.soton.ac.uk, www.isvr.soton.ac.uk/courses/short.

Putting Ergonomics into Practice (April 30–May 3, 2002, Columbus, OH). Institute for Ergonomics at the Ohio State University, 1971 Neil Ave., 210 Baker Systems, Columbus, OH 43210; 614/292-4564, fax 614/292-7852; ergonomics@osu.edu, <http://osuergo.eng.ohio-state.edu/Institute/index.htm>.

Biomedical Signal Processing: Concepts and Techniques (June 10–14, 2002, Southampton, UK). Institute of Sound and Vibration Research, University of Southampton, Southampton SO17 1BJ UK; +44 0 23 8059 3066, fax +44 0 23 8059 3190 UK; +44 023 8059 3066; msh@isvr.soton.ac.uk, www.isvr.soton.ac.uk/courses/short.



Announcement deadline: 1st day of the month prior to the desired issue; for events or deadlines within the first 3 weeks of a month, send information at least 2 months in advance. Items are published according to space availability.

- ★ **16th Symposium on Human Factors in Aviation Maintenance**, April 2–4, 2002, San Francisco, CA. Rachel Kadetsky, Galaxy Scientific Corp., 2500 C English Creek Ave., Egg Harbor Township, NJ 08234; 609/645-0900; hf2002@galaxyscientific.com, <http://www.galaxyscientific.com/2002HFAMS/index.html>.
- ★ **Ergonomics Society 2002 Annual Conference**, April 3–5, 2002, Cambridge, England. Annual Conference Programme Secretary, Ergonomics Society, Devonshire House, Devonshire Square, Loughborough, Leicestershire LE11 3DW UK; +44 1509 234904, fax +44 1509 235666; ergsoc@ergonomics.org.uk, <http://www.ergonomics.org.uk>.
- ★ **10th ASME International Conference on Nuclear Engineering**, April 14–18, 2002, Arlington, VA. ASME/ICONE10, 22 Law Dr., P.O. Box 2900, Fairfield, NJ 07007-2900; 800/843-2763, fax 973/882-1717; bendoj@asme.org, <http://www.asme.org/icone10>.
- ★ **40th Annual International Performance Improvement Conference and Expo**, April 21–25, 2002, Dallas, TX. International Society for Performance Improvement, 1400 Spring St., Ste. 260, Silver Spring, MD 20910; 301/587-8573, fax 310/587-8573; conference@ispi.org, <http://www.ispi.org>.
- ★ **Global Air & Space 2002**, April 22–24, Arlington, VA. 1801 Alexander Bell Dr., Ste. 500, Reston, VA 20191-4344; 703/264-7500, fax 703/264-7551; kimberlym@aiaa.org, <http://www.aiaa.org>.
- 2nd Annual DoD Ergonomics Working Group Conference: Forging Ahead – Preventing Work-Related Musculoskeletal Disorders**, *Rescheduled*: April 29–30, 2002, Chantilly, VA. LTC Mary Laedtke, 410/436-7323; Mary.Laedtke@apg.amedd.army.mil, <http://chppm-www.apgea.army.mil/ergowg/conference/>.
- ★ **ASMA 2002**, May 5–9, 2002, Montreal, Canada. Aerospace Medical Association, 320 S. Henry St., Alexandria, VA 22314-3579; 703/739-2240, fax 703/739-9652; <http://www.asma.org>.
- ★ **11th Conference on Computer-Generated Forces and Behavior Representation**, May 7–9 2002, Orlando, FL. Allison Griffin, SISO Support, Institute for Simulation and Training, 3280 Progress Dr., Orlando, FL 32826; 407/882-1344, fax 407/658-5059; agriffin@ist.ucf.edu, <http://www.sisostds.org/cgf-br/11th/paprcall.htm>.
- ★ **IIE Annual Conference**, May 19–22, 2002, Orlando, FL. Institute of Industrial Engineers, 25 Technology Park, Norcross, GA 30092; 800/494-0460; 800/494-0460, fax 770/441-3295 cs@iienet.org, <http://www.iienet.org/annual>.
- ★ **SID International Symposium, Seminar, & Exhibition**, May 19–24, 2002, Boston, MA. Brian Berkeley, Symposium Chair, Apple Computer, 1 Infinite Loop, MS 305 3BB, Cupertino, CA 95104; berkeley.b@apple.com.
- ★ **XVth World Congress on Safety and Health at Work**, May 26–31, 2002, Vienna, Austria. Kongressburo, Adalbert Stifter-Strasse 65, A-1200 Vienna, Austria; +43 1 33111-537, +43 1 33111-469, safety2002@auva.sozvers.at, <http://www.safety2002.at>.
- ★ **Society for Environmental Graphic Design 2002 Annual Conference & Expo**, May 29–June 1, 2002, Denver, CO. Society for Environmental Graphic Design, 1000 Vermont Ave., Ste. 400, Washington, DC 20005; 202/638-5555, fax 202/638-0891; SEGDOoffice@aol.com, www.segd.org.
- ★ **3rd International Conference on Design and Emotion**, July 1–3, 2002, Loughborough, UK. Deana McDonagh, Dept. of Design and Technology, Loughborough University, Loughborough, Leicestershire, LE11 3TU, UK; +44 0 1059 222652, fax +44 0 1509 223999, designandemotion2002@lboro.ac.uk, <http://www.designandemotion2002.lboro.ac.uk>.
- ★ **International Federation for Information Processing World Computer Congress 2002**, August 25–30, 2002, Montreal, Canada. Conference Secretariat, 550 Sherbrooke St. West, Ste. 355, W. Tower, Montreal, Quebec H3A 1B9 Canada; fax 514/368-9972; contact-wcc2002@cips.ca, <http://www.wcc2002.org/en/cg6.html>.
- ★ **Human Factors and Ergonomics Society 46th Annual Meeting**, *Rescheduled*: September 30–October 4, 2002, New Location: Baltimore, MD. HFES, P.O. Box 1369, Santa Monica, CA 90406-1369; 310/394-1811, fax 310/394-2410; info@hfes.org, <http://www.hfes.org>.
- ★ **National Safety Council 90th Annual Congress & Expo**, October 7–9, 2002, San Diego, CA. National Safety Council, 1121 Spring Lake Dr., Itasca, IL 60143-3201; 630/285-1121, fax 630/285-1315; <http://www.nsc.org>.
- ★ **9th World Congress on Intelligent Transport Systems**, October 14–18, 2001, Chicago, IL. ITS America, 400 Virginia Ave. SW, Ste. 800, Washington, DC 20024-2730; 202/484-4847, fax 202/484-3483; <http://www.itsworldcongress.org>.
- ★ **Environmental Design Research Association Annual Conference**, May 22–26, 2002, Philadelphia, Pennsylvania. edra 33, edra Business Office, P.O. Box 7146, Edmond, OK 73083-7164; 405/330-4863, fax 405/330-4150; edra@telpath.com, <http://www.telpath.com.edra.home.html>.
- ★ **Safety on Roads: International Conference**, October 21–23, 2002, Bahrain. Hashim Al-Madani, University of Bahrain, College of Engineering CTRS, P.O. Box 32038, Bahrain; +973 782134, fax +973 684844; soric02@eng.uob.bh, <http://www.uob.edu.bh>.
- ★ **Intelligent Systems and Applications 2002**, December 16–18, 2002, Shanghai, China. International Computing Sciences Conventions, P.O. Box 1091, 3360 BB Sliedrecht, Netherlands; +31 184 496999, fax +31 184 421065; operating@itstransitional.com, <http://www.icsc-naiso.org/organizer.html>.
- ★ **XVth Triennial Congress of the International Ergonomics Association**, August 24–29, 2003, Seoul, Korea. Gangnam P.O. Box 467, Seoul, 135-146, Korea; +82 2 552 8350, fax +82 2 552 8325; info@iea2003.org, <http://www.iea2003.org>.

★ *Indicates new listing.*



Is Early Ergonomics Better Economics? (continued from page 1)

At first glance, there seems to be nothing unusual here. Basically, two of our perennial concerns are expressed: (a) the desire for a means to persuade employers that HF/E is a worthwhile investment; and (b) the regret that our involvement is so often an afterthought in the design process. We discuss these two topics among ourselves so frequently that Hal Hendrick and Dave Woods used them as the bases for their presidential addresses (1999 and 2001, respectively). But further inspection reveals that the message combines these concerns to yield a twist that's new, at least for me. The request in this case is for data showing the cost savings from bringing HF/E expertise in on the ground floor.

My first reaction is that this concern, like the second, is a big improvement over the first. It's implicit that HF/E is being applied – it's merely a question of when. I find it tempting to be glib and point out that because bringing us in late is inefficient, we should quit whining and enjoy the increased employment that results. But this attempt at humor overlooks the reality that quickly improvised bandages and the like, rather than the increased employment that would result from sincere efforts to solve the fundamental design problems, are the typical consequence. So it often seems cheaper to postpone our services.

My second reaction is that I live a sheltered existence. At the Air Force Research Laboratory's (AFRL's) Human Effectiveness Directorate, where I work, HF/E is the essence of what we do. It's integrated from Day 1 into every product we develop and transition to system program offices and industry. Furthermore, at the highest level, the Department of Defense recognizes the importance of HF/E formally in the products it buys, via the standards it imposes that include HF/E criteria. And although the question of whether HF/E should be recognized organizationally as a distinct endeavor is debated by our executives each time we rearrange AFRL, no one questions the need to engage in it, as far as I know. At least, no one has ever asked me to justify keeping my job or those of my charges.

So What's the Answer?

But none of these digressions help the person who posed the original problem. I know the answer to Bob's question is "no" – HFES has no data that show economic benefits resulting from early HF/E involvement in design. Claire-Marie Karat published an article in the *HFES Bulletin* 10 years ago (which won our Best *Bulletin* Article award) that discussed the general topic of cost savings from HF/E in the context of software development. She cited another paper that claimed the cost of making changes during product development is anywhere from 1.5 to 6.0 times higher than during product definition; after product release, the cost is 60 to 100 times higher. Hal Hendrick presented numerous examples of cost savings resulting from HF/E in his well-known "Good Ergonomics Is Good Economics" presidential address (available in Adobe Acrobat format on our Web site at <http://hfes.org/publications/goodergo.pdf>). Beyond these publications, though, I know of no resources HFES can offer.

Speaking as a scientist, I doubt any analysis of savings attributable to early HF/E involvement I'd find fully satisfactory is even possible. After all, a proper exploration of the topic would require

experiments in which the same products are developed and sold with HF/E entering the picture at different points along the way – experiments no company would consider seriously. Even then, there would be too many uncontrollable variables. No, I think the only feasible approach is the one used by the same sort of financial analysts who, until recently, thought Enron was a great company to invest in: Make various assumptions and then calculate their financial implications. I trust we know how much faith to put in such results, and I suspect the business world – including HF/E employers – does too. But in lieu of anything better, industry is accustomed to relying on them nonetheless.

Perhaps companies have performed analyses like this already. If so, my guess is that they have no interest in sharing their results with the competition, and what's more, they haven't even shared them with their HF/E groups. But maybe I'm wrong, so consider this column my call to you to answer the person who started this thread. If you have information that addresses cost savings attributable to HF/E at the front end or, for that matter, at any stage of product development, please pass it to me and I'll find a forum where the results can be shared for everyone's benefit. HFES may not have the resources to develop information like this, but we should be able to provide a clearinghouse.

As for the rest of you: Keep those e-mails and letters coming. I haven't heard from anyone in the last few days, and I need some new problems to tackle.

Reference

Karat, C. C. (1992). Cost-justifying human factors support on software development projects. *Human Factors Society Bulletin*, 35(11), 1–4. 

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Opinions expressed in BULLETIN articles are those of the authors and should not be considered as expressions of official policy by the Human Factors and Ergonomics Society.

FLASH!

ANNUAL MEETING UPDATE!

The location and dates for the
HFES 46th Annual Meeting
have changed:

**September 30–October 4,
2002, Baltimore, Maryland**

**New early registration dead-
line: August 30, 2002.**



**Human
Factors
and
Ergonomics
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