Preface to the Special 50th Anniversary Issue of Human Factors

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In this issue, we celebrate 50 years of Human Factors with a collection of 33 brief articles that illustrate several perspectives on its history. Published for the first time in 1958, the journal has since contained 2,771 scholarly articles, including 63 special sections. It was published first by Pergamon Press and, starting in the early 1970s, by the Human Factors and Ergonomics Society. It has been guided through its history by 12 editors and, in recent years, by teams of associate editors. It has also been nurtured along the way by a succession of dedicated editorial boards, many volunteer reviewers, and tireless editorial and production staffs.

Reflecting as it does growth in the burgeoning field of human factors/ergonomics, which in turn is a reflection of society's technological advancement, the journal has increased in volume from 264 pages published in 1959 to 1,156 in 2007. The breadth of its content has also kept pace with developments in the field and technology. Whereas early issues were dominated by articles with military and aerospace applications (the chief focus of the “human factors” field in that era), today’s include coverage of an ever-expanding “human factors and ergonomics” domain with topics such as aging, patient safety, automation, training systems, highway safety, and computer systems added to the mix. Of course, research addressing fundamental human capabilities, limitations, and tendencies (e.g., sensory, perceptual, cognitive, and motor functions) has been well represented from the start. It is important to recognize that this rather dramatic growth has occurred without any compromises in quality; indeed, by the most common quality index, the journal, with a current acceptance rate of 23%, ranks with the most highly regarded journals in any field.

It was decided, after some deliberation, that the best way to celebrate the journal’s impressive history in a commemorative issue was through the eyes of those best qualified to put it in perspective. To that end, brief retrospectives were solicited from a number of recognized authorities on three different facets of that history: the editorial operation, pivotal (or groundbreaking) works, and discoveries and developments within illustrative topic areas. The result is thus a collection of articles organized around these three themes. They are not intended as comprehensive reviews, nor does the collection as a whole attempt to cover the vast array of important topics defining today’s field of human factors and ergonomics – or its cumulative history. Significant work in areas such as consumer products, medical systems, individual differences, simulation, and virtual reality, for example, is not represented.

In short, the purpose of this 50th anniversary issue is simply to honor the five decades of work published in Human Factors by illustrating some of its more noteworthy accomplishments – not only for the field but also for society at large. Our hope is that this retrospective collage will stimulate interest both within and outside the human factors/ergonomics community. For outsiders and newcomers, it makes an impressive case for the field’s significant but often unrecognized contributions to the usability, effectiveness, and safety of a vast array of modern systems in which technology and humans must interact. Automobiles, aircraft, and power plants are safer; computer hardware and software is easier to use; training and education are more effective; physical work produces fewer injuries. By highlighting some of these contributions, the issue introduces the lay reader to this dynamic but somewhat underappreciated field.
Within the human factors/ergonomics community, this historical overview affords students and budding professionals insight into some of the pivotal work that shaped the field, thereby deepening their appreciation for their heritage and inspiring their efforts to build on it. Even seasoned veterans may discover areas with which they were relatively unfamiliar, along with perspectives on their own territory, viewed through the lens of their peers.

SECTION I: EDITORIAL RETROSPECTIVES

The first three articles, representing the journal’s editorial history, are written by past editors of *Human Factors*. Starting with my immediate predecessor, Eduardo Salas (2000–2004), and then his predecessor, Bill Howell (1993–2000), and ending with Bob Williges (1976–1979), these individuals describe different periods in the journal’s history and share their perspectives on its growth, changes in the field, and their respective roles in the journal’s development.

SECTION II: PIVOTAL WORKS

This section centers on eight specific works (articles or sets of articles) published at some point in *Human Factors* that were identified by recognized experts as having been “pivotal” in their influence on the thinking and subsequent work in their respective topic areas. Each of these pivotal works is reviewed by the expert who identified it, with an emphasis on the nature of its impact. Following a brief summary of the work itself, the author explains how the insight or reconceptualization it introduced affected future theory, research, or applications. Eight articles on pivotal works are presented in roughly chronological order.

Roscoe, in his 28th and final article in *Human Factors*, puts his own work (Roscoe, Hasler, & Dougherty, 1952/1966) in perspective and weaves a story of a program of research spanning the remainder of his life. This body of work on visual accommodation relevant to perceived size of distant objects has important implications for tasks such as landing a plane. Next, Drury reviews a special section of *Human Factors* on industrial systems published in 1969 and edited by Douglas Harris. Drury concludes that the special section was influential in drawing attention to the human factors of industrial systems, a direction that continued over the years, especially in regard to physical ergonomics issues in the industrial workplace.

Harris focuses his review on Bond’s (1970) article titled “Some Persistent Myths About Military Electronics Maintenance,” explaining how this work led to the improved maintenance of electronics systems. Shinar highlights pivotal contributions by Mourant and Rockwell (1970) involving the use of eye movement data to investigate driver distraction and visual scanning patterns. He points out that the methodology has been adopted and improved by many subsequent researchers, leading to a deeper understanding of driving behavior and improved driving safety. Rempel features a 1972 article by Kroemer on the split keyboard, showing how it set the stage for future work on keyboard ergonomics.

Marras singles out a 1984 article by Liles, Deivanayagam, Ayoub, and Mahajan as pivotal in the subsequent understanding of lower back pain causality, and Wickens describes how Endsley’s (1995a, 1995b) articles drew attention to the *situation awareness* construct, which has seen widespread application to problems in training, design, errors, teamwork, and automation. Finally, Lee explains how Parasuraman and Riley’s (1997) work on automation inspired research leading to the recognition that automation poses risks, including training and design concerns.

SECTION III: TOPIC AREAS: DISCOVERIES AND DEVELOPMENTS

Whereas the focus in Section II is on specific pivotal works published in *Human Factors*, this section illustrates selected topic areas in which the journal has played an important role and the discoveries and developments within each. In all, 22 such areas are examined in this collection of Discoveries and Developments articles written by individuals who have themselves contributed greatly to the areas that they highlight.

The articles demonstrate how bodies of research evolve, and this theme is particularly salient in the opening article in this section by Moray, who discusses the evolution of the field of human factors/ergonomics using an archaeological metaphor and helps to position the 50 years of the journal within a much broader context. The other Discoveries and Developments articles fall into three categories: (a) basics of human performance, (b) methods and...
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approaches in human factors/ergonomics, and (c) applications of HF/E.

Five articles touch on theoretical constructs that have been examined and developed over the years and have proven important in describing, understanding, and predicting human performance. Sheridan writes about error and its flip side, resilience. Charness and Tuffiash describe what may be considered closely related to resilience – expert performance. Warm, Parasuraman, and Matthews take a look at how the concept of vigilance has evolved over the past 50 years. Durso and Sethumadhavan focus on situation awareness and provide a perspective that complements Wickens’s article on Endsley’s pivotal work. The fifth article, by Wickens, describes the concept of workload and the closely related multiple-resource theory and the role that these concepts have played in understanding human performance. These five concepts – error, expertise, vigilance, situation awareness, and workload – have played central roles in human factors theory and practice over the years.

There are seven Discoveries and Developments articles that describe methodological approaches to human factors/ergonomics or specific methodologies. Three of these articles focus on approaches that can be characterized by their methodologies and exemplify human factors paradigms. Klein writes about naturalistic decision making, Kleiner about macroergonomics, and Parasuraman and Wilson about the new area of neuroergonomics. These approaches are distinct, yet they are all reactions to dealing with the complexities inherent in the modern human-machine system – a sociotechnical system composed of multiple humans and machines working in concert.

The other four articles focus on specific methodologies for examining human factors in complex sociotechnical systems. Roth covers cognitive analysis, and Hoffman writes about the closely related topic of knowledge elicitation. These two sets of methods focus on understanding and making explicit the cognition that underlies human performance. Pew covers human performance modeling, and Gray examines the closely aligned topic of cognitive modeling. These methodological articles point to places to go for detailed coverage, but their primary message focuses on how these techniques, tools, and approaches have advanced the science and practice of human factors.

The last articles sample nine areas in which human factors/ergonomics has been applied to address a variety of problems. Each article highlights HF/E contributions within the particular application area and provides pointers to works with more comprehensive coverage. Sarter focuses on mode errors, especially as applied to aviation. The next article, by Parasuraman and Wickens, covers the closely related application area of automation. Lee highlights influential work in the area of driving, and Laughery and Wogalter discuss the symbiotic relationship between research on warnings and forensics. Stone recounts the multiple ties that human factors/ergonomics has had with applications in education. Salas, Cooke, and Rosen cover applications to teamwork, and Charness examines applications to aging populations. The last two articles focus on applications to computer systems, with Norman touching on contributions of human factors to improved computer menus and Boehm-Davis covering applications to human-computer interaction more broadly.

I am honored to serve as editor during the 50th anniversary of the journal and very excited and proud to have had a hand at putting together this celebratory issue. There are, of course, many others who share the credit. The authors are all to be commended for taking on the challenging task of covering even the highlights of five decades of work in a 10-page article. I know that many of them struggled with the task and felt uncomfortable omitting some very good and influential work. The authors were greatly aided by a diligent team of associate editors, editorial board members, and volunteer reviewers who worked hard with the authors to achieve a standard worthy of this special issue. Lois Smith and Andrea Tomcsanyi at the Human Factors and Ergonomics Society’s central office also worked extremely hard to see that these 33 articles were all ready for print at the same time and that they lived up to the objectives of the 50th anniversary issue.

REFERENCES


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