

Forensic Human Factors and Ergonomics

Case Studies and Analyses

Edited by
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Preface

This is an exciting book. It is the first of its kind. It is a book that tells about people living their lives and then suddenly, out of the blue, they are injured, or in some cases, die. The case studies involve people using products, equipment, machines, etc. doing tasks in environments. Some of the injuries are truly horrific, often with tremendous cost to people's lives (money, effort, pain, and death). Companies' bottom lines are undoubtedly affected (in terms of legal fees, potential payouts, and negative effects on sales). Although there have been many case studies written about various small and large-scale events with harm to people or property, this book describes how human factors/ergonomics' (HFE) analyses could shed light on causative events and provide a useful analytical viewpoint that could reduce the extent of harm or prevent the event altogether.

I wish to thank the HFE experts who contributed the chapters. Many of these individuals have worked on hundreds of product liability lawsuits and so have been exposed to a large body of detail in cases on which they have worked. In consultation with the editor, the authors selected from their past case experiences and wrote a descriptive scenario of an injury event (or a composite of several similar cases) followed by a HFE analysis. The analyses are systematic and use conventional basic models of hazard analysis, hazard control, and information processing. Although there is a lot of commonality among the case studies in how they approach the analysis and discussion of the injury events, there are also many differences. The facts of even similar cases usually have numerous differences that could affect the extent of certain factors affecting the outcome. Thus, the analyses of seemingly similar cases may be different. A related point is that the authors give "an" analysis. Another HFE expert with the same facts might give a somewhat different analysis, depending on the specific facts of a case and their own specific background and emphases. An expert in a different but similar case might discuss or emphasize different aspects. In expert witness work, experts are asked their opinion. These analyses, while based on HFE research and principles, are also opinions.

There are two important points or benefits of the book. In a holistic way, cutting across the case studies, the reader will learn how injury cases can be approached from an HFE perspective. A second point, and possibly more important benefit of this book, is that the reader will see how similar and basic HFE analyses can be applied across many products, tasks, and environments and could take from this an appreciation that similar methodologies can be applied to other products, tasks, and environments. In other words, the methods, techniques, and applications of HFE analyses can be generalized to other cases involving different products and environments beyond those represented in this volume. A take away point is that there is a benefit to doing HFE analyses—it has the potential to improve things. This path is not only the right thing to do, but it also reduces personal injury and costs to companies, e.g., limits harm to their brand. It is not just theoretical; it is ethical and beneficial.

This book is not intended to negatively impact any specific persons, companies, or industries through the naming of names and revealing private or confidential information. Names of individuals and locations described in the scenarios have been altered. The scenarios themselves are a distillation of facts and events across several similar cases with similar products. All characters and entities in the scenarios should be considered fictional; any similarity to real or actual characters and entities is coincidental. Ultimately, the purpose of

describing the injury scenarios is to set the stage and provide a base or pool of information that is used in the HFE analyses. In the last section of each case study is a discussion about lessons learned and ways the situation could be improved. The whole enterprise is intended to demonstrate how HFE could contribute to decision making on how humans interface with products, tasks, and environments, with goal of producing productive, satisfying, and safer lives.

Chapter Authors

Collectively the authors of the case studies have extensive professional experience in forensic HFE in the role of an expert in various legal cases. Many have worked on hundreds of cases. Most of their cases would be product or premises liability litigation (but also traffic and industrial accidents) in which HFE principles are applied to real real-world (actual) events. Some of the work occurs behind-the-scenes as a *consulting* expert, but frequently the work is in the role of a testifying expert, which, depending on the case and jurisdiction, may involve writing reports, testifying in a deposition and/or at trial. Nearly all of the authors have doctorates either in HFE or from related fields such as industrial and systems engineering or experimental psychology or related fields.

Chapter 1 describes what the book attempts to do. A short comment is noteworthy. The book is not about expert witnessing and the tasks that an expert witness might undertake. Instead it is about HFE analyses of injury events. While the stories relate to and are derived from litigated cases, the machinations of the role of being an expert witness are not a focus of the book.

Peer Review

The case study chapters were peer-reviewed. This process involves having other experts review the submitted manuscript and offer comments and criticisms. This process was done to benefit quality and credibility of the work. For this book, two reviewers or one reviewer plus the editor provided feedback to chapter authors after their initial submission. Peer review is generally recognized as a good way to evaluate manuscripts submitted for publication. It serves to limit the publication of poor quality papers and enhance quality of manuscripts considered acceptable for publication.

Reviews were performed in a “blind” manner in which reviewers’ names were concealed from the authors so that comments could be given freely. Authors were asked to address and revise their chapters based on the reviewers’ comments in their resubmission. All of the authors responded with corrections, clarification, reduced length, etc. Some manuscripts were rejected after this review process if the corrections were inadequate or could not be made in time. Peer review helped with quality. Everyone involved, including those that had rejected chapters, were cordial and professional. If there were more time, the rejected papers could have been among the best chapters in this book.

Below is a list of individuals who participated in reviewing one or more manuscripts. They are the *Distinguished Editorial Board* for the book. Some of them are authors of chapters

in this volume. The majority of the others on this list are forensic HFE experts or in a related, relevant area. The authors and the reviewers received no monetary compensation for their work and time, i.e., pro bono—for the public good. Thank you very much for your time and expertise.

Distinguished Editorial Board

David J. Biss, Automotive Safety Analysis Corporation
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Ilene B. Zackowitz, Vredenburgh & Associates, Inc.

Lastly, I would like to acknowledge some of my colleagues to whom I am grateful. I would like to thank Kenneth R. Laughery, Sr., to whom the book is partly dedicated. He has been a wonderful mentor and a great friend and colleague. I would also like to thank Christopher B. Mayhorn, Michael J. Kalsher, Denis O. Gray, David B. Kaber, David R. Lenorovitz, Waldemar

Karwowski, Alison Vredenburgh, and Ilene B. Zackowitz for their consistent collegiality and friendship. I could not have asked for better buddies. They always came through when asked or badgered. There were also many students during my 27 years of teaching as a faculty member who had tremendous influence on my thinking and knowledge. There are also many people not mentioned here that had immense influence on me.

I would like to thank Cindy Renee Carelli, Executive Editor, of CRC Press/Taylor and Francis Group. She has been helpful in recruiting me to do this book and has encouraged me during the process. I would also like to thank the Project Editor, Marsha Hecht, who supervised the final production process. Lastly, I would like to thank Victoria Balque-Burns at Nova Techset who oversaw the book's production.

As the reader will note, there are numerous graphics/figures embedded in the book. In the hardcopy version of the book many of the figures are shown in color in a separate, inserted section. In the electronic version of the book most of the figures are in color and they are directly embedded. Color is often pertinent in hazard communications—a topic at many points in this book. Color can benefit perceptual and cognitive processes and is often a part of forensic HFE analysis (e.g., for warning detectability, noticeability, distinguishability, and connotation of hazard levels). I appreciate that the book was not limited to black and white figures.

I hope readers find the book useful.

Michael S. Wogalter
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Editor

Michael S. Wogalter is a Professor Emeritus of Psychology at North Carolina State University (Raleigh), having “retired” in 2013 after being a full-time faculty member there for over 20 years. Previously, he held full-time faculty positions at Rensselaer Polytechnic Institute (Troy, NY) and the University of Richmond. He holds a Ph.D. in Human Factors/Engineering Psychology from Rice University, a M.A. in Experimental Psychology from the University of South Florida, and a B.A. in Psychology from the University of Virginia. He is a Fellow of the Human Factors and Ergonomics Society and the International Ergonomics Society. His interests have been mostly in the areas of cognitive ergonomics, hazard communication, human–technology systems interaction, and forensic human factors. He has authored more than 370 publications, including books, journal articles, chapters, and conference proceeding articles. Mike has participated in hundreds of legal cases as an expert witness involving analyses of human perception, cognition, and warnings over the past three decades.

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Foreword

Human Factors and Ergonomics (HFE) concerns the interface between people and products they use, environments in which they function, and jobs/tasks they do. It is a discipline that discovers and applies information and knowledge about human behavior, including using information about people's characteristics, abilities, and limitations, so that their activities using products in disparate environments are productive and safe.

The past several decades have seen a substantial increase in HFE specialists serving as expert witnesses in product liability and personal injury litigation. The role of the forensic HFE expert witness in such litigation is to analyze the facts and issues in the case from an HFE perspective and to formulate opinions based on the results of the analyses. The expert may be called upon to provide his/her opinions verbally, by written reports, and/or by deposition. Should the case go to trial, the role of the expert is to educate the jury regarding the HFE issues.

A main purpose of this book is to show how the HFE professional can offer useful analyses of injury cases. Accordingly, a number of cases in which a product or environment was involved in severe injury, death, or property damage are described. Each case includes an HFE analysis of such an event, a discussion of better alternatives, and lessons learned. People's interaction with products, tasks and environments are complex, and not all interactions are "obvious" or generally known by the public. An HFE professional can offer insight on potential causes of injury events based on principles and research of which laypersons, including members of a jury, may be unaware without having formal training and experience in the discipline.

Of the 22 chapters in this book, 18 are case studies. The vast majority of the authors are HFE specialists who have considerable experience (and credentials) in the HFE discipline and who have served in the role of an expert witness in various product or premises liability cases.

A broad spectrum of HFE issues are presented using a range of products, concepts, tasks, and environments. The book focuses on how injury scenarios can be analyzed from an HFE perspective. In general, the book does not focus or describe particulars of the experts' role in litigation processes; there are many other books that address those matters. The attempt is to show that the HFE profession can offer insights that might be useful in litigation and also most importantly provide solutions to enhance future safety.

Chapters 1, 2, and 3, authored by the editor, Michael Wogalter, are intended to provide the reader with some background and perspective before reading the case studies in Chapters 4 through 21. Chapter 1 introduces the book and previews its purpose and content. Chapter 2 reviews the topics of hazard analyses and the basic hazard control hierarchy, which provide methodologies central to the analysis of many of the case studies. Chapter 3 describes the Communication-Human Information Processing (C-HIP) Model, a relevant theoretical model for analyzing warning effectiveness. The final chapter (Chapter 22), also by the editor, describes several main topical points that cut through several of the chapters and gives some final thoughts.

Because this book focuses on HFE analysis, its main utility is to provide guidance in fulfilling an important part HFE expert's role in litigation. It centers on analyzing descriptive injury scenarios using principles and methodologies of the HFE discipline. It is thus not

intended to be a compendium of tasks that an expert witness might do in the course of being retained in cases.

Forensic Human Factors and Ergonomics: Case Studies and Analyses can be used as a supplementary reading text in a general HFE or a forensic safety course. It could be primary text concerning forensic safety or a specialized safety psychology course. The book will be useful as reference for attorneys, engineers, designers, and architects.

Kenneth R. Laughery, Sr.
Professor Emeritus, Rice University
January 2018

Human Factors and Ergonomics

Book Series Foreword

This book is an important part of a growing Human Factors and Ergonomics book series by Taylor & Francis Group/CRC Press. *Forensic Human Factors and Ergonomics: Case Studies and Analyses* illustrates how injury cases can be viewed and analyzed using a human factors and ergonomics viewpoint. Useful lessons can be learned that are generalizable to other kinds of products, equipment, systems, environments, and tasks that will surely help to avoid or reduce injuries. This book is destined to become a classic worldwide and will be read for many years to come.

Waldemar Karwowski
Series Editor