

Human Factors – rok 2008, roč. 50

Číslo 3 - Special 50th Anniversary Issue



Tématické celky:

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[**Pozn.** V tomto čísle dostupné texty článků, jsou provázány přes odkaz v názvu.]

RETROSPECTIVES OF PAST EDITORS

Salas, Eduardo. [*At the Turn of the 21st Century : Reflections on Our Science.*](#) S. 351-353(3).

As the new century began, I took over as editor of the journal. By all accounts I inherited a robust journal - thanks to my predecessor. I made little adjustments on process and expanded the Editorial Board to reflect important emerging topics in human factors. The journal I "inherited" was in good shape, and I hope I left it a little better. In this paper, I reflect on the state of our science after making over 500 decisions over eight years (four as editor and four as associate editor). My reflections include issues concerning our theories, methodologies, and practice. These are offered as food for thought and in the hope that as we all reflect on the state of our science, we strive to make it better, more robust, and more relevant and that it has a greater influence on the world we live in. Time will tell.

- **Keywords:** HUMAN FACTORS SCIENCE; EDITOR'S REFLECTIONS; EDITOR'S COMMENTARY; HUMAN FACTORS THEORY; METHODOLOGY; HUMAN FACTORS PRACTICE; HUMAN FACTORS PRINCIPLES

Český abstrakt: Článek se zamýšlí nad stavem americké vědy po cca 500 rozhodnutích během osmi let (čtyři jako redaktor a čtyři jako vedoucí redaktor). Zamyšlení obsahuje otázky týkající se teorií, metodologie a praxe. Autor doufá, že budou-li se všichni zamýšlet nad stavem americké vědy, stane se lepší, relevantnější a bude mít větší vliv na svět, v němž žijeme.

- věda - USA - úvahy

Howell, William C. [*Human Factors in the 1990s : Sealing Transition Cracks.*](#) S. 354-358(5).

This is an account of my 8-year tour as *Human Factors* editor during the last decade of the past century. I accepted this appointment with the understanding that the journal, although highly successful, was entering a period of transition during which problems were surfacing that would require some strategic redirection. Together with Human Factors and Ergonomics Society staff and my editorial board, which in addition to peer review I relied on heavily for advice on journal policy, we effected a number of changes. In this article, I review those changes along with the issues they were designed to address and the reasoning behind each. It remains for the reader to judge whether the net effect of these changes has been for the better.

- **Keywords:** RETROSPECTIVE; EDITOR REFLECTIONS; HISTORY; EDITORIAL DUTIES; PUBLICATION ACTIVITIES; SPECIAL TOPICS

Český abstrakt: Článek hodnotí příspěvek speciálního čísla časopisu HF o lidských faktorech v průmyslových systémech. Nebyl zjištěn očekávaný přímý citační vliv tohoto zvláštního čísla. Bylo zjištěno, že citací byl podobný počet jako u jiných článků tohoto časopisu. Jiné časopisy však byly založeny v Severní Americe, kde je více publikačních možností v oblasti lidských faktorů a ergonomie. Ta je nyní více akceptována, zvláště co se týče fyzikální ergonomie.

- faktor lidský - ergonomie - USA - časopisy

Williges, Robert C. [*Personal Reflections From the Fifth Editor of Human Factors*](#). S. 359-360(2).

The fifth editor of *Human Factors* provides reflections on journal publication spanning four volumes printed from 1976 to 1980. During that period, most of the publication and management activities were handled by volunteer efforts of the editor, the editorial board, and the editor's organization. Electronic word processing was not readily available, and most publication tasks required laborious clerical support, resulting in long publication lags. The editor provides reflection on the steps taken by the Human Factors and Ergonomics Society to separate editorial and production activities during that period to provide more support for the journal editorial duties. This resulted in the Society becoming its own publisher, building the beginning of a publication staff in the central office, and increasing the published page count. Rigorous editorial reviews were used to improve the scientific quality of the journal. The publication emphasis was on empirical research, but theoretical articles and research reviews were also considered for publication. Regular journal articles, short research notes, and special topics were published as ways to broaden the scientific coverage and shorten the publication lag.

- **Keywords:** EDITOR REFLECTIONS; EDITORIAL DUTIES; PUBLICATION ACTIVITIES; SPECIAL TOPICS

REVIEWS OF PIVOTAL PAPERS

Roscoe, Stanley N.; Acosta, Hector M. [*A Flight by Periscope and Where It Landed*](#). S. 361-367(7).

Objective: This study defines display design factors linking visual accommodation and the perceived size of distant objects. **Background:** In 1947, in anticipation of augmented contact and sensor-relayed contact displays, a periscope was installed in an airplane to serve as a sensor-based contact display simulator. To achieve normal landing performance, however, the unity image had to be magnified. This successful intervention, first published in 1966 in *Human Factors*, implicated oculomotor mechanisms and higher perceptual functions and became the observational basis for a series of investigative hypotheses. **Method:** Observers registered the perceived size of the collimated image of a "moon" by adjusting a disk of light while alternatively providing

optometric measurements of accommodative distance. **Results:** Various investigators found high correlations between focal distances and perceived moon sizes. **Conclusion:** The simulated moon provided a superior vehicle for revealing the relationship between focal distance and perceived size and the factors affecting both. The operational display design implications and the possibility of a partial explanation for the moon illusion provided the motivation for an important doctoral research project involving eight factors that affect both focal distance and perceived size. **Application:** The investigation reaffirmed that virtual images, as found in head-up and head-mounted displays (HUDs and HMDs, respectively), do not consistently draw focus to optical infinity and that a variety of factors necessarily manipulated by display designers and present in many operational systems can affect visual performance partially through the mediation of accommodation.

- **Keywords:** PERISCPIC DISPLAY; VISUAL ACCOMMODATION; MOON ILLUSION; PERCEIVED SIZE; HELMET-MOUNTED DISPLAYS; HEAD-UP DISPLAYS; AUGMENTED CONTACT DISPLAYS; TONIC FOCUS; FOCAL DISTANCE; HMD; HUD; DISTANCE PERCEPTION; AUGMENTED DISPLAYS; TEXTURE GRADIENT; TARGET BRIGHTNESS; DISPLAY CONTRAST; MANDELBAUM EFFECT; DISPLAY MAGNIFICATION; TARGET ANGULAR SIZE; FIELD OF VIEW; COLLIMATION; PHOTOPIC LUMINOUS TRANSMITTANCE

Drury, Colin G. [Human Factors in Industrial Systems : 40 Years On.](#) S. 368-374(7).

Objective: I evaluate the contribution of a pioneering *Human Factors* special issue on human factors in industrial systems. **Background:** Papers on the content of the journal's first 10 years showed that industrial human factors/ergonomics (HF/E) in 1969 was quite a rarity in the journal and the society. **Method:** The 12 papers in the special issue are reviewed briefly and show a wide range of topics, including traditional industrial engineering, physical HF/E, and more mainstream applications of HF/E in this domain similar to those in military and aerospace domains. The evaluation is through citations, later journal content, society technical group membership, and specific influences of Harris's own paper in the issue. **Results:** The expected direct citation influence of this special issue was not found: Citation counts were in line with all papers in *Human Factors*. However, other journals have been founded in North America that serve industrial HF/E and provide an outlet for more papers per year than *Human Factors*. In addition, the industrial domain is well represented in the Human Factors and Ergonomics Society. Finally, Harris's paper has been influential in the specific area of HF/E in inspection. **Conclusions:** Industrial HF/E is now more accepted within the HF/E community, although largely in the physical ergonomics subspecialty. **Application:** There is now evidence of use of HF/E techniques more broadly in industry, including service as well manufacturing enterprises.

- **Keywords:** INDUSTRIAL SYSTEMS; INDUSTRIAL ENGINEERING; WORKPLACE DESIGN; DOMAINS; INSPECTION; CITATIONS; INFLUENCE; SURVEYS

Harris, Douglas H. [Myths and Realities of Electronics Maintenance.](#) S. 375-379(5).

Objective: The author presents and discusses discoveries and developments contributing to enhanced electronics maintenance performance. **Background:** This body of research is viewed from the vantage point of Nick Bond's 1970 Ely Award-winning article in *Human Factors*, "Some Persistent Myths About Military Electronics Maintenance." **Method:** Bond identified a set of myths and summarized research that not only produced information and techniques leading to demonstrably improved maintenance performance but also exploded many unfounded beliefs that were commonly held before the research had been conducted and the findings disseminated.

Results: The period from 1964 through 1986, as reflected by publications in the journal, was a productive period of research that led to greater understanding of human factors in electronics maintenance and to numerous advances that contributed, ultimately, to more effective maintenance performance. **Conclusion:** Technological advances, combined with what we learned about maintenance performance, have substantially reduced the maintenance burden and enhanced the maintenance of electronic systems. **Application:** Some of the principal lessons learned from this research on electronics maintenance apply to understanding the effects of equipment complexity, providing an optimal role for automation, designing more appropriate on-the-job training, and enhancing troubleshooting skills.

- **Keywords:** ELECTRONICS MAINTENANCE; TROUBLESHOOTING; AUTOMATION; IMPACT OF MICROELECTRONICS; TRAINING TECHNOLOGIES; MAINTENANCE BURDEN

Český abstrakt: Článek předkládá a diskutuje objevy a vývojové práce, které přispívají ke zvýšení výkonu elektronické údržby. Bylo zjištěno, že období od r. 1964 do r. 1986 bylo produktivním obdobím pro výzkum, který vedl k lepšímu pochopení lidských faktorů v elektronické údržbě, a přispělo k značnému pokroku a konečně k efektivnějšímu výkonu v této oblasti.

- údržba - elektronika - faktor lidský - USA

Shinar, David. [Looks Are \(Almost\) Everything : Where Drivers Look to Get Information.](#) S. 380-384(5).

Objective: To describe the impact of Rockwell's early eye movements research. **Background:** The advent of a new technology enabling measurements of eye movements in natural environments launched the seminal research of a *Human Factors* pioneer, Tom Rockwell, into how drivers process visual information. **Method:** In two seminal *Human Factors* articles-"Mapping Eye-Movement Pattern to the Visual Scene in Driving: An Exploratory Study" (Mourant & Rockwell, 1970) and "Strategies of Visual Search by Novice and Experienced Drivers" (Mourant & Rockwell, 1972)-Rockwell and his student, Ron Mourant, examined drivers' eye movements in naturalistic driving environments. **Results:** The analyses of the visual fixations revealed systematic relationships between the sources of information the drivers needed to drive safely and the spatial distributions of their visual fixations. In addition, they showed that as drivers gain skill and experience, their pattern of fixations changes in a systematic manner. **Conclusions:** The research demonstrated that fixations and saccadic eye movements provide important insights into drivers' visual search behavior, information needs, and information acquisition processes. **Application:** This research has been a cornerstone for a myriad of driving-related studies, by Rockwell and other researchers. Building on Rockwell's pioneering work, these studies used eye-tracking systems to describe cognitive aspects of skill acquisition, and the effects of fatigue and other impairments on the process of attention and information gathering. A novel and potentially revolutionary application of this research is to use eye movement recordings for vehicle control and activation of in-vehicle safety systems.

- **Keywords:** DRIVER BEHAVIOR; DRIVING SKILL ACQUISITION; SURFACE TRANSPORTATION SYSTEMS; VISION; SENSORY AND PERCEPTUAL PROCESSES; EYE MOVEMENTS; ATTENTION; TRACKING; PSYCHOMOTOR PROCESSES

Rempel, David. [The Split Keyboard : An Ergonomics Success Story.](#) S. 385-392(8).

Objective: The author reviews the paper by Kroemer (1972) on the design of the split geometry keyboard and the subsequent 35 years of research on the topic. **Background:**

It was first suggested in the 1920s that arm strain in the typist could be reduced by splitting the keyboard into two halves and inclining the two halves laterally. The first systematic research on the split keyboard was conducted by Kroemer in the 1960s and published in his 1972 article. **Methods:** The literature on split geometry keyboards was identified, and the progression of the research was reviewed. **Results:** The Kroemer article marked the beginning of a prolonged, worldwide research effort to determine whether and how the split keyboard design might improve comfort and prevent pain in keyboard users. **Conclusions:** In the early 1990s, split keyboard designs began to be broadly commercially available. Clear evidence of a health benefit of the split keyboards emerged in the late 1990s. By 2006, a split keyboard was the number one-selling keyboard, of all keyboards sold, in the U.S. retail market. **Application:** The history of research on this topic, the challenges to changing the conventional design, and the broader acceptance of the split design are a success story with lessons for all of us.

- **Keywords:** KEYBOARDS; DISPLAYS AND CONTROLS; BIOMECHANICS; WORK PHYSIOLOGY; INPUT DEVICE; MUSCULOSKELETAL DISORDERS; OFFICE ERGONOMICS

Český abstrakt: Článek podává přehled práce K. Kroemera v r. 1972 v oblasti konstrukce rozdělené geometrické klávesnice a prací během dalších 35 let v daném výzkumu. Kroemerův článek znamenal počátek dlouhodobého celosvětového výzkumu ke stanovení, zda a jak může rozdělená klávesnice zlepšit komfort a zabránit bolesti při práci. V r. 2006 byla tato klávesnice číslem jedna v prodeji.

- klávesnice - počítače - ergonomie

Marras, William S. [A Critical Review of a Pivotal Scientific Contribution : Liles and Associates 24 Years Later. S. 393-396\(4\).](#)

Objective: This review evaluates (in retrospect) the contribution of Liles and associates (1984) to the causality debate of the work relatedness of low back pain. **Background:** Often it takes years to appreciate the role of a paper with respect to the body of literature as a whole. **Method:** Although many papers appear remarkable when they are first published, the real value of a contribution often can be appreciated by considering how the paper "fills in the pieces of the puzzle" over time. This paper examines how the Liles paper influenced low back pain causality efforts after its introduction. **Results:** This analysis indicates that Liles and associates contributed to the science of low back disorder causality by (a) advancing the idea of quantitative measures used for field studies, (b) identifying a dose-response relationship for low back pain, and (c) recognizing the influence of a system of work and nonwork influences related to low back pain development. **Conclusion:** The Liles contribution to *Human Factors* has proven to play a pivotal role in our understanding of how low back pain is influenced by work exposure. **Application:** The concepts introduced here can help future efforts associated with understanding musculoskeletal disorder causality and work.

- **Keywords:** LOW BACK PAIN; BIOMECHANICS; EPIDEMIOLOGY; REVIEW; LOW BACK DISORDERS; MUSCULOSKELETAL DISORDERS

Český abstrakt: Přehled hodnotí (v retrospekci) příspěvek ke kauzální debatě o pracovním vlivu na bolesti v dolní části zad. Provedená analýza ukázala, že Liles a spol. přispěl k vědě o kauzalitě bolestí a) zkvalitněním myšleny kvantitativních opatření pro terénní studie, b) identifikací vztahu dávky a odpovědi a c) poznáním působení systému vlivů práce a ne-práce při rozvoji této bolesti.

- nemoci pohybové - onemocnění muskuloskeletální - nemoci z povolání - páteř - bolesti v zádech

Wickens, Christopher D. [Situation Awareness : Review of Mica Endsley's 1995 Articles on Situation Awareness Theory and Measurement](#). S. 397-403(7).

Objective: This article summarizes two articles by Endsley on situation awareness (SA) and presents the influence of the concept on subsequent practice and theory of human factors. **Background:** In her articles, Endsley integrated and consolidated existing research done in the prior decade. **Method:** I carefully examined and integrated subsequent articles on the SA topic written by Endsley and by others. **Results:** This integration revealed that SA has been applied to areas of training, error analysis, design, selection, teamwork, and automation. Some key issues related to automation and SA are reviewed in detail. **Conclusion:** Situation awareness is a viable and important construct that still possesses some controversy over measurement issues. **Application:** Ways in which human factors practitioners have used the SA construct and numerous citations are provided to assist designers.

- **Keywords:** SITUATION AWARENESS; AUTOMATION; COGNITION

Český abstrakt: Článek shrnuje dvě práce a diskutuje vliv koncepce na subsekvenci praxi a teorii lidských faktorů. Bylo zjištěno, že SA bylo použito pro oblast výcviku, analýzy chyb, pro design, výběr, týmovou práci a automatizaci. Některé klíčové otázky o automatizaci a SA byly zkoumány podrobně. SA je životaschopný a významný jev s některými rozpory v otázkách měření.

- faktor lidský - psychologie práce

Lee, John D. [Review of a Pivotal Human Factors Article : "Humans and Automation: Use, Misuse, Disuse, Abuse"](#). S. 404-410(7).

Objective: This paper considers the influence of "Humans and Automation: Use, Misuse, Disuse, Abuse" and examines how it relates to the evolving issue of human-automation interaction. **Background:** Automation presents important practical challenges that can dramatically affect satisfaction, performance, and safety; philosophical challenges also arise as automation changes the nature of work and human cognition. **Method:** Papers cited by and citing "Humans and Automation" were reviewed to identify enduring and emerging themes in human-automation research. **Results:** "Humans and Automation" emerges as an important node in the network of automation-related papers, citing many and being cited by many recent influential automation-related papers. In their article, Parasuraman and Riley (1997) integrated previous research and identified differing expectations across designers, managers, and operators regarding the need to support operators as a source of automation problems. They also foresaw and inspired research that addresses problems of overreliance and underreliance on automation. **Conclusion:** This pivotal article and associated research show that even though automation seems to relieve people of tasks, automation requires more, not less, attention to training, interface design, and interaction design. The original article also alludes to the emergence of vicious cycles and dysfunctional meta-control. These problems reflect the coevolution of automation and humans, in which both adapt to the responses of the other. **Application:** Understanding this coevolution has important philosophical implications for the nature of human cognition and practical implications for satisfaction, performance, and safety.

- **Keywords:** AUTOMATION; TRUST; TECHNOLOGY ACCEPTANCE; JUDGMENT; DECISION MAKING; COGNITIVE PROCESSES; ATTENTIONAL PROCESSES; USE; MISUSE; DISUSE

Český abstrakt: Článek zkoumá, jaký měl vliv článek "Lidé a automatizace" ve vztahu k vyvíjícímu se problému interakce člověka a automatizace. Je to významný počin v množství článků o automatizaci, citovaný mnoha současnými časopisy. Parasuraman a

Riley (1997) integrovali předchozí výzkum a identifikovali různá očekávání konstruktérů, managerů a operátorů ohledně potřeby podpořit operátory jakožto zdroj automatizačních problémů.

- automatizace - interakce - člověk - faktor lidský

DISCOVERIES AND DEVELOPMENTS

Moray, Neville. [*The Good, the Bad, and the Future : On the Archaeology of Ergonomics.*](#) S. 411-417(7).

Objective: This article places the 50th anniversary edition of the *Human Factors* journal in a historical context. **Background:** It is appropriate to celebrate the 50th anniversary of the founding of *Human Factors* and the Human Factors and Ergonomics Society, but in so doing, we celebrate only the recent history of ergonomics. **Method:** By digging into the history of ergonomics, we can better understand the evolution of method, practice, and concepts in the human factors discipline. **Results:** One develops a greater admiration for early practitioners of human factors and ergonomics, as well as the importance of history. **Conclusion:** Some satisfaction about the rise, evolution, and fall of ergonomic ideas is justified. "If I have seen further..." **Application:** We can better define the starting point for the next 50 years.

- **Keywords:** HISTORY; PREDICTION; ERGONOMICS

Český abstrakt: Článek dává 50. výročí existence časopisu *Human Factors* do historického kontextu. Při oslavách výročí slavíme pouze současnost ergonomie. Zajdeme-li do historie, budeme moci lépe pochopit vývoj metod, praxe a koncepce oboru lidských faktorů. Tím budeme moci lépe stanovit startovací bod pro dalších 50 let.

- faktor lidský - časopisy - historie - USA

Sheridan, Thomas B. [*Risk, Human Error, and System Resilience : Fundamental Ideas.*](#) S. 418-426(9).

Objective: I review and critique basic ideas of both traditional error/risk analysis and the newer and contrasting paradigm of resilience engineering. **Background:** Analysis of human error has matured and been applied over the past 50 years by human factors engineers, whereas the resilience engineering paradigm is relatively new. **Method:** Fundamental ideas and examples of human factors applications of each approach are presented and contrasted. **Results:** Probabilistic risk analysis provides mathematical rigor in generalizing on past error events to identify system vulnerabilities, but prediction is problematical because (a) error definition is arbitrary, and thus it is difficult to infer valid probabilities of human error to input to quantitative models, and (b) future accident conditions are likely to be quite different from those of past accidents. The new resilience engineering paradigm, in contrast, is oriented toward organizational process and is concerned with anticipating, mitigating, and preparing for graceful recovery from future events. **Conclusion:** Resilience engineering complements traditional error analysis but has yet to provide useful quantification and operational methods. **Application:** A best safety strategy is to use both approaches.

- **Keywords:** RISK; ERROR; RESILIENCE; SAFETY; RELIABILITY; ACCIDENTS; ORGANIZATIONAL BEHAVIOR; SYSTEM DESIGN; MACRO DESIGN FEATURES (NETWORKS WEB CONFERENCING E; COMMUNICATION SYSTEMS; RELIABILITY ISSUES; MANUFACTURING; PROCESS CONTROL SYSTEMS; MACROERGONOMICS AND THE ENVIRONMENT; SYSTEM DESIGN FEATURES; AEROSPACE SYSTEMS; HUMAN ERROR

Český abstrakt: Je podán přehled a kritické základní myšlenky tradiční analýzy chyb a rizik a novějšího a kontrastujícího paradigmatu inženýrství odolnosti (resilience engineering). Analýza lidské chyby zrála a byla aplikována po 50 let ergonomy, zatímco výše uvedený obor je poměrně nový. Doplnuje tradiční analýzu chyb, avšak poskytuje i kvantifikaci a operační metody.

- chyby lidské - pružnost - rizika - psychologie práce - faktor lidský - inženýrství rizikové

Charness, Neil; Tuffiash, Michael. [*The Role of Expertise Research and Human Factors in Capturing, Explaining, and Producing Superior Performance*](#). S. 427-432(6).

Objectives: The goal of this article is to identify some of the major trends and findings in expertise research and their connections to human factors. **Background:** Progress in the study of superior human performance has come from improved methods of measuring expertise and the development of better tools for revealing the mechanisms that support expert performance, such as protocol analysis and eye tracking. **Methods:** We review some of the challenges of capturing superior human performance in the laboratory and the means by which the expert performance approach may overcome such challenges. We then discuss applications of the expert performance approach to a handful of domains that have long been of interest to human factors researchers. **Results:** Experts depend heavily on domain-specific knowledge for superior performance, and such knowledge enables the expert to anticipate and prepare for future actions more efficiently. Training programs designed to focus learners' attention on task-related knowledge and skills critical to expert performance have shown promise in facilitating skill acquisition among nonexperts and in reducing errors by experts on representative tasks. **Conclusions:** Although significant challenges remain, there is encouraging progress in domains such as sports, aviation, and medicine in understanding some of the mechanisms underlying human expertise and in structuring training and tools to improve skilled performance. **Applications:** Knowledge engineering techniques can capture expert knowledge and preserve it for organizations and for the development of expert systems. Understanding the mechanisms that underlie expert performance may provide insights into the structuring of better training programs for improving skill and in designing systems to support professional expertise.

- **Keywords:** EXPERTISE; EXPERT PERFORMANCE; SKILL; SKILL ACQUISITION; SIMULATION; SIMULATOR; PROTOCOL ANALYSIS; EYE TRACKING; SPORTS; MUSIC; CHESS; MEDICINE; AVIATION; HUMAN FACTORS

Český abstrakt: Cílem článku je identifikovat některé hlavní trendy a zjištění ve výzkumu odbornosti a jejich vazeb na lidské faktory. V přehledu jsou uvedeny některé problémy při podávání lepšího výkonu v laboratoři a prostředků zlepšení přístupu k výkonu expertů. Je stimulován pokrok v oblastech jako sport, letectví a medicína v pochopení některých mechanismů, vyžadujících odbornost, a při zlepšování odborného výkonu

- faktor lidský - odborníci - výkon - výkonnost

Warm, Joel S.; Parasuraman, Raja; Matthews, Gerald. [*Vigilance Requires Hard Mental Work and Is Stressful*](#). S. 433-441(9).

Objective: We describe major discoveries and developments in vigilance research. **Background:** Vigilance tasks have typically been viewed as undemanding assignments requiring little mental effort. The vigilance decrement function has also been considered to result from a decline in arousal brought about by understimulation. **Methods:** Recent research in vigilance is reviewed in four areas: studies of task type, perceived mental

workload during vigilance, neural measures of resource demand in vigilance, and studies of task-induced stress. **Results:** Experiments comparing successive and simultaneous vigilance tasks support an attentional resource theory of vigilance. Subjective reports also show that the workload of vigilance is high and sensitive to factors that increase processing demands. Neuroimaging studies using transcranial Doppler sonography provide strong, independent evidence for resource changes linked to performance decrement in vigilance tasks. Finally, physiological and subjective reports confirm that vigilance tasks reduce task engagement and increase distress and that these changes rise with increased task difficulty. **Conclusions:** Converging evidence using behavioral, neural, and subjective measures shows that vigilance requires hard mental work and is stressful. **Application:** This research applies to most human-machine systems that require human monitoring, particularly those involving automated subsystems.

- **Keywords:** VIGILANCE; MONITORING; STRESS; MENTAL WORKLOAD; ATTENTIONAL PROCESSES; PSYCHOLOGICAL STATES; RESOURCE THEORY; NEUROERGONOMICS; BRAIN IMAGING

Český abstrakt: Jsou popsány hlavní objevy a vývojové práce ve výzkumu bdělosti (vigilance). Úkoly s ní spojené jsou obvykle vnímány jako vyžadující malou duševní námahu. Současný výzkum je veden ve 4 oblastech: studie typu úkolu, vnímaná duševní zátěž během bdělosti, požadavky na činnost nervů a studie stresu působeného úkoly. Aplikace behaviorálních, nervových a subjektivních měření ukazuje na stresující charakter tvrdé duševní práce.

- stres - pozornost - práce duševní - vigilance

Durso, Francis T.; Sethumadhavan, Arathi. [Situation Awareness : Understanding Dynamic Environments](#). S. 442-448(7).

Objective: We present a snapshot of the work on situation awareness, which involves operators' comprehension of the dynamic situation that they are monitoring or controlling. **Background:** Although human factors has always been concerned with helping the operator in his or her work environment, research exploded in the mid-1990s on one relevant construct, situation awareness. **Method:** We discuss how a distinction present years ago, the product of comprehension versus the process of comprehension, not only continues today but characterizes different research directions. Research on situation awareness has benefited and can continue to benefit from an analogy to the better understood comprehension of narrative and expository text, although such an analogy between text and dynamic environments will ultimately have limits. **Results:** Situation awareness as a notion that organizes and focuses research efforts has rightfully spread to research in virtually every industrial domain, and it is an essential part of work on automation and design. **Conclusion:** Work on situation awareness has had a ubiquitous influence on cognitive engineering and has even pushed the envelope of basic cognitive psychology into dynamic domains. **Application:** Considering situation awareness is also important in cognitive ergonomic issues relevant to training, teamwork, and the design of new human-technical systems.

- **Keywords:** SITUATION AWARENESS; AUTOMATION; COMPREHENSION; DESIGN; COGNITIVE PROCESSES; MENTAL MODELS

Český abstrakt: Je podán stručný přehled práce při uvědomování si situace, což vyžaduje u operátora pochopení dynamické situace, kterou monitoruje nebo řídí. Diskuse o produktu pochopení versus procesu pochopení dnes nejen pokračuje, ale charakterizuje různé směry výzkumu. Výzkum těží z analogie s lepším pochopením výpravného a vysvětlujícího textu, i když tato analogie mezi textem a dynamickým prostředím má svá omezení.

- operátoři - vnímání - psychologie práce

Wickens, Christopher D. [Multiple Resources and Mental Workload](#). S. 449-455(7).

Objective: The objective is to lay out the rationale for multiple resource theory and the particular 4-D multiple resource model, as well as to show how the model is useful both as a design tool and as a means of predicting multitask workload overload. **Background:** I describe the discoveries and developments regarding multiple resource theory that have emerged over the past 50 years that contribute to performance and workload prediction. **Method:** The article presents a history of the multiple resource concept, a computational version of the multiple resource model applied to multitask driving simulation data, and the relation of multiple resources to workload. **Results:** Research revealed the importance of the four dimensions in accounting for task interference and the association of resources with brain structure. Multiple resource models yielded high correlations between model predictions and data. Lower correlations also identified the existence of additional resources. **Conclusion:** The model was shown to be partially relevant to the concept of mental workload, with greatest relevance to performance breakdowns related to dual-task overload. Future challenges are identified. **Application:** The most important application of the multiple resource model is to recommend design changes when conditions of multitask resource overload exist.

- **Keywords:** MULTIPLE RESOURCES; ATTENTION; MENTAL WORKLOAD; TIME-SHARING

Český abstrakt: Cílem článku bylo vytvořit princip teorie rozmanitých zdrojů a jejich 4-D model a ukázat, jak je tento model užitečný jako nástroj konstrukce i jako prostředek k predikci přetížení při pracovní zátěži rozmanitými úkoly. Výzkum prokázal význam čtyř rozměrů pro vysvětlení interference úkolů a spojování zdrojů se strukturou mozku. Nízké korelace identifikují existenci doplňkových zdrojů.

- zátěž pracovní - přetížení - úkoly pracovní - mozek - rozměry - zdroje

Klein, Gary. [Naturalistic Decision Making](#). S. 456-460(5).

Objective: This article describes the origins and contributions of the naturalistic decision making (NDM) research approach. **Background:** NDM research emerged in the 1980s to study how people make decisions in real-world settings. **Method:** The findings and methods used by NDM researchers are presented along with their implications. **Results:** The NDM framework emphasizes the role of experience in enabling people to rapidly categorize situations to make effective decisions. **Conclusion:** The NDM focus on field settings and its interest in complex conditions provide insights for human factors practitioners about ways to improve performance. **Application:** The NDM approach has been used to improve performance through revisions of military doctrine, training that is focused on decision requirements, and the development of information technologies to support decision making and related cognitive functions.

- **Keywords:** DECISION MAKING; COGNITIVE TASK ANALYSIS; NATURALISTIC DECISION MAKING; MACROCOGNITION; JUDGMENT; RPD MODEL

Kleiner, Brian M. [Macroergonomics : Work System Analysis and Design](#). S. 461-467(7).

Objective: Our goal was to briefly describe how macroergonomics was developed to fill a void in human factors and ergonomics. **Background:** A study commissioned by the Human Factors Society in 1978 resulted in the formalization of a new subdiscipline of human factors, called *organizational design and management*, which eventually was

coined *macroergonomics*. **Method:** Differentiators of macroergonomics are presented along with methods adapted from other domains as well as unique methods. **Results:** Based on laboratory and field studies conducted at multiple universities, government facilities, and industries, work system factors can be manipulated in the laboratory and studied in the field successfully. Also, case studies in academia, industry, and government demonstrate 60% to 90% performance impact and positive qualitative changes such as culture change. **Conclusion:** Macroergonomics offers a perspective as well as methods and tools for more successful human factors and ergonomics design, development, intervention, and implementation. **Application:** Human factors engineers or psychologists and ergonomists can use the perspective of macroergonomics to achieve better results or can expand their involvement of macroergonomics through the use of methods and tools.

- **Keywords:** WORK SYSTEM; WORK DESIGN; BUILT ENVIRONMENT DESIGN; MACROERGONOMICS AND THE ENVIRONMENT; ORGANIZATIONAL BEHAVIOR/DESIGN

Český abstrakt: Cílem článku byl popis toho, jak se makroergonomie vyvíjela k zaplnění mezery v lidských faktorech a ergonomii. Výsledkem studie je vytvoření nové subdisciplíny lidských faktorů, nazvané organizování a management, příp. makroergonomie. Ta nabízí perspektivu metod a nástrojů pro úspěšnější koncepci lidských faktorů a ergonomie, její vývoj a implementaci.

- ergonomie - faktor lidský - koncepce - makroergonomie

Parasuraman, Raja; Wilson, Glenn F. [Putting the Brain to Work : Neuroergonomics Past, Present, and Future](#). S. 468-474(7).

Objective: The authors describe research and applications in prominent areas of neuroergonomics. **Background:** Because human factors/ergonomics examines behavior and mind at work, it should include the study of brain mechanisms underlying human performance. **Methods:** Neuroergonomic studies are reviewed in four areas: workload and vigilance, adaptive automation, neuroengineering, and molecular genetics and individual differences. **Results:** Neuroimaging studies have helped identify the components of mental workload, workload assessment in complex tasks, and resource depletion in vigilance. Furthermore, real-time neurocognitive assessment of workload can trigger adaptive automation. Neural measures can also drive brain-computer interfaces to provide disabled users new communication channels. Finally, variants of particular genes can be associated with individual differences in specific cognitive functions. **Conclusions:** Neuroergonomics shows that considering what makes work possible - the human brain - can enrich understanding of the use of technology by humans and can inform technological design. **Application:** Applications of neuroergonomics include the assessment of operator workload and vigilance, implementation of real-time adaptive automation, neuroengineering for people with disabilities, and design of selection and training methods.

- **Keywords:** AUTOMATION; VIGILANCE; MONITORING; ATTENTIONAL PROCESSES; INDIVIDUAL DIFFERENCES; HUMAN-COMPUTER INTERACTION; HCI; COMPUTER SYSTEMS; MENTAL WORKLOAD; NEUROERGONOMICS; HUMAN BRAIN FUNCTION; ADAPTIVE AUTOMATION; NEUROENGINEERING; BRAIN-COMPUTER INTERFACES; GENETICS

Český abstrakt: Autoři popisují výzkum a aplikace ve významných oblastech neuroergonomie. Protože ergonomie zkoumá chování a myšlení při práci, měla by zahrnovat i výzkum mechanismu mozku v závislosti na lidském výkonu. Studie napomohly identifikovat složky duševní zátěže, stanovení zátěže ve složitých úkolech a vyčerpání zdrojů v bdělém stavu.

- faktor lidský - ergonomie - výkon pracovní - zátěž mentální - psychologie práce - mozek

Roth, Emilie M. [Uncovering the Requirements of Cognitive Work](#). S. 475-480(6).

Objective: In this article, the author provides an overview of cognitive analysis methods and how they can be used to inform system analysis and design. **Background:** Human factors has seen a shift toward modeling and support of cognitively intensive work (e.g., military command and control, medical planning and decision making, supervisory control of automated systems). Cognitive task analysis and cognitive work analysis methods extend traditional task analysis techniques to uncover the knowledge and thought processes that underlie performance in cognitively complex settings. **Methods:** The author reviews the multidisciplinary roots of cognitive analysis and the variety of cognitive task analysis and cognitive work analysis methods that have emerged. **Results:** Cognitive analysis methods have been used successfully to guide system design, as well as development of function allocation, team structure, and training, so as to enhance performance and reduce the potential for error. **Conclusions:** A comprehensive characterization of cognitive work requires two mutually informing analyses: (a) examination of domain characteristics and constraints that define cognitive requirements and challenges and (b) examination of practitioner knowledge and strategies that underlie both expert and error-vulnerable performance. A variety of specific methods can be adapted to achieve these aims within the pragmatic constraints of particular projects. **Application:** Cognitive analysis methods can be used effectively to anticipate cognitive performance problems and specify ways to improve individual and team cognitive performance (be it through new forms of training, user interfaces, or decision aids).

- **Keywords:** DECISION MAKING; NATURALISTIC DECISION MAKING; COGNITIVE TASK ANALYSIS; COGNITIVE WORK ANALYSIS; COGNITIVE ENGINEERING; COGNITIVE PROCESSES; WORD DOMAIN ANALYSIS; COGNITIVE SYSTEMS ENGINEERING

Český abstrakt: V článku je poskytnut přehled kognitivních metod analýzy a jejich využití v informační systémové analýze a designu. Kognitivní analýza úkolů a metody analýzy kognitivní práce rozšiřují tradiční techniky analýzy úkolů ke zjišťování znalostí a myšlenkových procesů, jež jsou základem výkonu v poznávacím komplexu. Tyto metody jsou úspěšné při vývoji funkční alokace, týmové struktury a tréninku.

- analýzy systémové - design - úkoly kognitivní - znalosti odborné - myšlení

Hoffman, Robert R. [Human Factors Contributions to Knowledge Elicitation](#). S. 481-488(8).

Objective: The objective of this article is to lay out contributions of human factors to knowledge elicitation (KE) methodology. **Background:** The background is historical, dating to about 1985, and involves the convergence of expert systems with applied psychology and cognitive psychology. **Method:** The method is a literature review, focusing on past issues of *Human Factors*. **Results:** Human factors researchers have contributed significantly to KE methodology. However, KE methodology "belongs to" a number of communities of practice and has applications that transcend individual disciplines. **Conclusion:** Knowledge elicitation, thought of as a kind of cognitive task analysis, grows in importance with the increasing use of information technology to form complex sociotechnical work systems and the increasing importance of expertise to knowledge-based organizations. **Application:** I discuss some open issues for further research and methodological investigation.

- **Keywords:** KNOWLEDGE ELICITATION; METHODOLOGY; EXPERTISE STUDIES; COGNITIVE TASK ANALYSIS; KNOWLEDGE REPRESENTATION; EXPERT SYSTEMS; DIFFERENTIAL ACCESS HYPOTHESIS; ECOLOGICAL VALIDITY; CRITICAL DECISION METHOD; CONCEPT MAPPING; TACIT KNOWLEDGE; KNOWLEDGE MANAGEMENT

Pew, Richard W. [More Than 50 Years of History and Accomplishments in Human Performance Model Development](#). S. 489-496(8).

Objective: I provide a summary that introduces three significant threads in the development of human performance models (HPMs)-manual control models derived from engineering control theory, network models founded on the definition of human reliability, and models derived from cognitive architectures. **Background:** HPMs are important because they allow the quantification of human performance capacities and limitations to be included in the analysis and simulation of engineering systems. **Method:** For each thread, founding articles and contemporary developments are cited that illustrate the range of innovation that has taken place. **Results:** Many contemporary concepts are rooted in this modeling history. **Conclusion:** The most successful models represent circumstances for which the situational and temporal environment in which the human performance takes place is most heavily constrained. **Application:** Applied illustrations are drawn from vehicle handling qualities, unmanned aerial systems, and mission training, for example.

- **Keywords:** DRIVER BEHAVIOR; PILOT; CREW BEHAVIOR; MENTAL WORKLOAD; AEROSPACE SYSTEMS; ATTENTIONAL PROCESSES; SIMULATION; VIRTUAL REALITY; HUMAN PERFORMANCE MODELS; HUMAN FACTORS HISTORY; MANUAL CONTROL; HUMAN RELIABILITY; COGNITIVE ARCHITECTURE

Český abstrakt: Článek poskytuje souhrn, uvádějící tři významné myšlenky ve vývoji modelů lidského výkonu - modely ručního řízení, síťové modely založené na definici lidské spolehlivosti a modely odvozené z kognitivní struktury. Četné současné koncepce mají kořeny v této historii modelování. Lze využít pro zlepšení kvality řízení vozidel, trénink aj.

- výkon - výkon pracovní - spolehlivost - řízení

Gray, Wayne D. [Cognitive Architectures : Choreographing the Dance of Mental Operations With the Task Environment](#). S. 497-505(9).

Objective: In this article, I present the ideas and trends that have given rise to the use of cognitive architectures in human factors and provide a cognitive engineering-oriented taxonomy of these architectures and a snapshot of their use for cognitive engineering. **Background:** Architectures of cognition have had a long history in human factors but a brief past. The long history entails a 50-year preamble, whereas the explosion of work in the current decade reflects the brief past. Understanding this history is key to understanding the current and future prospects for applying cognitive science theory to human factors practice. **Method:** The review defines three formative eras in cognitive engineering research: the 1950s, 1980s, and now. **Results:** In the first era, the fledging fields of cognitive science and human factors emphasized characteristics of the *dancer*, the limited capacity or bounded rationality view of the mind, and the *ballroom*, the task environment. The second era emphasized the dance (i.e., the dynamic interaction between mental operations and task environment). The third era has seen the rise of cognitive architectures as tools for choreographing the dance of mental operations within the complex environments posed by human factors practice. **Conclusions:** Hybrid architectures present the best vector for introducing cognitive science theories into a renewed engineering-based human factors. **Application:** The taxonomy provided in this article may provide guidance on when and whether to apply a cognitive science or a hybrid architecture to a human factors issue.

- **Keywords:** BOUNDED RATIONALITY; COGNITIVE MODELING; COGNITIVE ARCHITECTURES; EXTENDED MIND HYPOTHESIS; UNIT TASK; MENTAL OPERATIONS; TASK ENVIRONMENT; INTERACTIVE ROUTINES

Český abstrakt: Článek předkládá myšlenky a trendy, které daly podnět k použití kognitivních struktur v lidských faktorech a poskytují kognitivní, technicky orientovanou taxonomii těchto struktur a dále stručný přehled jejich užití pro kognitivní techniku. Přehled definuje tři formativní fáze ve výzkumu této subdisciplíny: 50. léta, 80. léta minulého století a současnost. Fáze jsou charakterizovány z uvedených hledisek.

- faktor lidský - struktura - psychologie práce - procesy duševní

Sarter, Nadine. [*Investigating Mode Errors on Automated Flight Decks : Illustrating the Problem-Driven, Cumulative, and Interdisciplinary Nature of Human Factors Research.*](#) S. 506-510(5).

Objective: The goal of this article is to illustrate the problem-driven, cumulative, and highly interdisciplinary nature of human factors research by providing a brief overview of the work on mode errors on modern flight decks over the past two decades.

Background: Mode errors on modern flight decks were first reported in the late 1980s. Poor feedback, inadequate mental models of the automation, and the high degree of coupling and complexity of flight deck systems were identified as main contributors to these breakdowns in human-automation interaction. Various improvements of design, training, and procedures were proposed to address these issues. **Methods:** The author describes when and why the problem of mode errors surfaced, summarizes complementary research activities that helped identify and understand the contributing factors to mode errors, and describes some countermeasures that have been developed in recent years. **Results:** This brief review illustrates how one particular human factors problem in the aviation domain enabled various disciplines and methodological approaches to contribute to a better understanding of, as well as provide better support for, effective human-automation coordination. **Conclusion:** Converging operations and interdisciplinary collaboration over an extended period of time are hallmarks of successful human factors research. **Application:** The reported body of research can serve as a model for future research and as a teaching tool for students in this field of work.

- **Keywords:** PILOT-AUTOMATION INTERACTION; MODE AWARENESS; MODE ERROR; FLIGHT DECK AUTOMATION; INTERDISCIPLINARY RESEARCH; MENTAL MODEL; MONITORING

Parasuraman, Raja; Wickens, Christopher D. [*Humans : Still Vital After All These Years of Automation.*](#) S. 511-520(10).

Objective: The authors discuss empirical studies of human-automation interaction and their implications for automation design. **Background:** Automation is prevalent in safety-critical systems and increasingly in everyday life. Many studies of human performance in automated systems have been conducted over the past 30 years.

Methods: Developments in three areas are examined: levels and stages of automation, reliance on and compliance with automation, and adaptive automation. **Results:** Automation applied to information analysis or decision-making functions leads to differential system performance benefits and costs that must be considered in choosing appropriate levels and stages of automation. Human user dependence on automated alerts and advisories reflects two components of operator trust, reliance and compliance, which are in turn determined by the threshold designers use to balance automation misses and false alarms. Finally, adaptive automation can provide additional benefits in balancing workload and maintaining the user's situation awareness, although more research is required to identify when adaptation should be user controlled or system driven. **Conclusions:** The past three decades of empirical research on humans and

automation has provided a strong science base that can be used to guide the design of automated systems. **Application:** This research can be applied to most current and future automated systems.

- **Keywords:** ALERTS; ADAPTIVE AUTOMATION; AUTOMATION; COMPLIANCE; DECISION MAKING; HUMAN-COMPUTER INTERACTION; INFORMATION ANALYSIS; RELIANCE; TRUST

Český abstrakt: Autoři diskutují empirické studie součinnosti člověk - automatizace a jejich důsledky pro projektování. Automatizace převládá v bezpečnostně kritických systémech a je jí stále více v každodenním životě. Automatizace v informační analýze nebo v rozhodovacích funkcích vede k výhodám diferenciálního systémového výkonu, což je třeba vzít v úvahu při výběru vhodných úrovní a etap automatizace.

- automatizace - člověk - systémy bezpečnostní - výkon

Lee, John D. [Fifty Years of Driving Safety Research](#). S. 521-528(8).

Objective: This brief review covers the 50 years of driving-related research published in *Human Factors*, its contribution to driving safety, and emerging challenges.

Background: Many factors affect driving safety, making it difficult to assess the impact of specific factors such as driver age, cell phone distractions, or collision warnings.

Method: The author considers the research themes associated with the approximately 270 articles on driving published in *Human Factors* in the past 50 years. **Results:** To a large extent, current and past research has explored similar themes and concepts. Many articles published in the first 25 years focused on issues such as driver impairment, individual differences, and perceptual limits. Articles published in the past 25 years address similar issues but also point toward vehicle technology that can exacerbate or mitigate the negative effect of these issues. Conceptual and computational models have played an important role in this research. **Conclusion:** Improved crashworthiness has contributed to substantial improvements in driving safety over the past 50 years, but future improvements will depend on enhancing driver performance and perhaps, more important, improving driver behavior. Developing models to guide this research will become more challenging as new technology enters the vehicle and shifts the focus from driver performance to driver behavior. **Application:** Over the past 50 years, *Human Factors* has accumulated a large base of driving-related research that remains relevant for many of today's design and policy concerns.

- **Keywords:** DRIVER BEHAVIOR; DRIVING SAFETY; IN-VEHICLE TECHNOLOGY; COLLISION AVOIDANCE; DISTRACTION; HIGHWAY AND VEHICLE DESIGN; SURFACE TRANSPORTATION SYSTEMS; ACCIDENTS; SAFETY; AND HUMAN ERROR

Laughery, Kenneth R.; Wogalter, Michael S. [On the Symbiotic Relationship Between Warnings Research and Forensics](#). S. 529-533(5).

Objective: We describe a major factor in research in warnings - namely, forensics.

Background: During the past three decades, much of the empirical warnings research has been published in human factors and ergonomics (HF/E) literature. A major impetus to that research has been concurrent activity by HF/E professionals participating as expert witnesses in product liability and personal injury cases in which there is a claim of failure to adequately warn about associated hazards. **Method:** We review how the issues in forensics can identify researchable questions. This effort has prompted important questions to be addressed that have resulted in publications. Two examples are provided: vehicle seat recline and explicitness. **Results:** The research has contributed to theory and model building of the processing involved. The research prompted by practical forensic issues can contribute to knowledge that is not limited in scope to particular

instances, as is sometimes ascribed to applied research; it can also offer confirmatory support for theory or its modification. **Conclusion:** A practice-driven approach to the initiation of research can benefit not only application and practice but also theory. **Application:** Results in the warnings research domain can enhance safety and aid decisions in forensic contexts.

- **Keywords:** FORENSICS; WARNINGS; ACCIDENTS; SAFETY; HUMAN ERROR; COMMUNICATIONS; HAZARDS; EXPLICITNESS; LITIGATION; PRODUCTS; EXPERT WITNESS; RISK PERCEPTION

Stone, Nancy J. [*Human Factors and Education : Evolution and Contributions.*](#) S. 534-539(6).

Objective: The major contributions of human factors to education are highlighted. **Background:** Over the past 50 years, the education of human factors specialists has evolved, as well as the application of human factors and ergonomic knowledge to education. **Method:** Human factors and ergonomics professional documentation and literature were reviewed to identify major events relevant to human factors education or the application of human factors to education. **Results:** Human factors education has evolved from training in experimental psychology to highly specialized accredited human factors programs and a number of undergraduate programs, leading to program accreditation and the certification of professionals. In addition, human factors specialists have applied their knowledge to human factors education and, more recently, to educational systems in general. The greatest focus has been on technology such as multimedia. Others have evaluated the design of the physical environment, focusing primarily on seating. The research also often targets undergraduate or graduate education. Therefore, it has been proposed that a greater focus is needed at the K-12 educational level, especially given the advancement and implementation of technology in the classroom. **Conclusion:** Human factors and ergonomic expertise can benefit the educational system. Yet, there is a need to constantly evaluate the benefits of new technology in the classroom as well as the environmental design aspects of the educational environment while considering learners of different age groups, ethnicities, and sexes. **Application:** Better application of human factors and ergonomics to the learning environment could enhance the educational experience for all learners.

- **Keywords:** PROGRAMS; ACCREDITATION; CERTIFICATION; STUDENT LEARNING; TRAINING; EDUCATION; HUMAN FACTORS; ERGONOMICS; MULTIMEDIA; VIRTUAL REALITY; SIMULATION; INSTRUCTIONAL SYSTEMS

Český abstrakt: Významný příspěvek ergonomie k výchově je zřejmý. Po 50 let se rozvíjela výchova odborníků v tomto oboru, stejně jako aplikace ergonomických znalostí ve výchově. Je podán přehled dokumentace a literatury z oboru ergonomie k identifikaci událostí relevantních pro výchovu v oboru ergonomie nebo pro aplikaci ergonomie na výchovu a vzdělávání. Článek uvádí vývoj i současný stav problému.

- ergonomie - faktor lidský - vzdělávání - výchova - literatura - dokumentace

Salas, Eduardo; Cooke, Nancy J.; Rosen, Michael A. [*On Teams, Teamwork, and Team Performance : Discoveries and Developments.*](#) S. 540-547(8).

Objective: We highlight some of the key discoveries and developments in the area of team performance over the past 50 years, especially as reflected in the pages of *Human Factors*. **Background:** Teams increasingly have become a way of life in many organizations, and research has kept up with the pace. **Method:** We have characterized progress in the field in terms of eight discoveries and five challenges. **Results:** Discoveries pertain to the importance of shared cognition, the measurement of shared cognition, advances in team training, the use of synthetic task environments for

research, factors influencing team effectiveness, models of team effectiveness, a multidisciplinary perspective, and training and technological interventions designed to improve team effectiveness. Challenges that are faced in the coming decades include an increased emphasis on team cognition; reconfigurable, adaptive teams; multicultural influences; and the need for naturalistic study and better measurement. **Conclusion:** Work in human factors has contributed significantly to the science and practice of teams, teamwork, and team performance. Future work must keep pace with the increasing use of teams in organizations. **Application:** The science of teams contributes to team effectiveness in the same way that the science of individual performance contributes to individual effectiveness.

- **Keywords:** TEAMS; TEAMWORK; TEAM PERFORMANCE; TRAINING; GROUPWARE; EDUCATION; INSTRUCTIONAL SYSTEMS; COMPUTER SYSTEMS; COGNITIVE PROCESSES

Český abstrakt: Je podán přehled klíčových objevů a vývojových prací v oboru za uplynulých 50 let, zvláště těch, které byly zveřejněny v časopise *Human Factors*. Týmová práce se stala způsobem života v mnoha organizacích a výzkum s ním držel krok. Je charakterizován pokrok v osmi objevech a pěti otevřených problémech. Práce v oboru lidských faktorů významně přispěly k vědě a praxi. Budoucí práce musí sledovat zvýšené používání týmů v organizacích.

- faktor lidský - skupiny pracovní - práce týmová - ergonomie

Charness, Neil. [*Aging and Human Performance*](#). S. 548-555(8).

Objectives: I identify major theoretical and practical contributions to aging and human performance as reflected primarily in the pages of *Human Factors*. **Background:** Populations worldwide are aging. True experimental work on aging is not possible because age levels cannot be manipulated. Sophisticated theoretical frameworks and modeling techniques are required to reach valid inferences about age effects and age changes. **Method:** Citation analysis was used to identify articles in *Human Factors* dealing with age or aging and to rank them for citation impact. **Results:** Special issues on aging were followed by increased publication rates for articles on age or aging, particularly in the 1990s. Most-cited articles deal primarily with age and driving. **Conclusions:** Applied contributions rely on improved measurement of performance and on methodological advances, including simulation and modeling. Design changes that provide environmental support for declining cognitive, perceptual, and psychomotor abilities can serve as a powerful intervention for maintaining and improving older adult performance. Training is also a robust way to improve performance at both the basic ability level and the level of task performance. Human factors specialists can improve quality of life for an aging population. **Applications:** Guidelines for older users are now being developed by standards bodies and are implemented in domains such as Web design. Much of the focus of human factors research has been on improving efficiency in the performance of aging adults in the workforce, but reducing errors and increasing comfort and satisfaction in health-related activities should receive greater attention.

- **Keywords:** AGE; AGING; TECHNOLOGY; WORK; PSYCHOMOTOR; PERCEPTION; COGNITION; USABILITY; TRAINING; DESIGN; GERONTECHNOLOGY; SIMULATION; MODELING; GOMS; DRIVING; HUMAN PERFORMANCE; NEURAL NOISE; CITATION ANALYSIS; INTERINDIVIDUAL DIFFERENCE; INTRINDIVIDUAL CHANGE; SLOWING; COGNITIVE RESERVE; ENVIRONMENTAL SUPPORT; PILOTING; WORKPLACE PERFORMANCE; CAREGIVER; ASSISTIVE TECHNOLOGY; ERROR; ROBOTIC ASSISTANT

Český abstrakt: Článek zmiňuje významné teoretické i praktické příspěvky k tomuto tématu, především na stránkách časopisu HF. Byla provedena citační analýza k

identifikaci článků týkajících se stáří a stárnutí. O tématu se píše stále častěji, zvláště v 90. letech. Jsou uvedeny metody ke zvýšení výkonu. Odborníci na lidské faktory mohou zlepšit kvalitu života stárnoucí populace.

- věk - stárnutí - faktor lidský - výkon - literatura

Norman, Kent L. [*Better Design of Menu Selection Systems Through Cognitive Psychology and Human Factors*](#). S. 556-559(4).

Objective: In this study, I seek to emphasize the contributions of cognitive psychology and human factors research in the design of menu selection systems. **Background:** Menu selection systems are used in computer interfaces to allow users to enter choices, set parameters, and navigate to items, functions, and locations. Designers of these systems have many choices concerning the organizational structure and layout of the menu interface. **Method:** I review several of these concerning hierarchies of menus, organization and clustering of items, and item distinctiveness. Special attention is given to cases in which designer's intuition differed from theory and experimental results. **Result:** Cognitive psychology and human factors have contributed both theory and empirical research that have helped to resolve differences of opinion and establish general principles for design. **Conclusion:** It is argued that cognitive psychology has contributed substantially to the design of better menu selection systems. **Application:** It is imperative that designers continue to apply these findings to interfaces that they develop and that researchers continue to study the characteristics and efficacy of innovative menu designs as they appear.

- **Keywords:** MENU SELECTION; MENU NAVIGATION; MENU DESIGN; INTERFACE DESIGN; HUMAN-COMPUTER INTERACTION; HCI; COMPUTER SYSTEMS; COGNITIVE PROCESSES

Český abstrakt: Článek podává přehled některých hierarchií menu, jejich organizace a seskupení i jejich charakteristických zvláštností. Velká pozornost byla věnována případům, kdy se intuice konstruktéra lišila od teorie a experimentálních výsledků. Kognitivní psychologie a ergonomie přispěly jak teoretickému, tak i empirickému výzkumu, který pomohl řešit rozdíly v názorech a stanovil základní principy pro navrhování.

- rozhraní - počítače - psychologie osobnosti - faktor lidský

Boehm-Davis, Deborah A. [*Discoveries and Developments in Human-Computer Interaction*](#). S. 560-564(5).

Objective: This paper describes contributions made to the science and practice of human-computer interaction (HCI), primarily through *Human Factors* and the society's annual proceedings. **Background:** Research in HCI began to appear in publications associated with the Society around 1980 and has continued through the present. **Method:** A search of the literature appearing in either the journal or the proceedings was done to identify the specific contributions made by researchers in this area. **Results:** More than 2,300 papers were identified, some comparing the actual or predicted performance of a new device, display format, or computer-based system with an existing or alternative system. Other work describes methods for evaluating systems performance. **Conclusion:** This work has had a tremendous impact, particularly the work of Fitts, Smith and Mosier, and Virzi. **Application:** Work on HCI has contributed to (a) current national and international guidelines, (b) the development of user interface management systems, (c) the provision of guidance as to where best to invest resources when evaluating computing systems, and (d) the prediction of human performance using those systems.

- **Keywords:** HUMAN-COMPUTER INTERACTION; HCI; COMPUTER SYSTEMS; INTERFACE EVALUATION; USABILITY; FITTS' LAW; GUIDELINES; MODELING; EVALUATION METHODS

Český abstrakt: Článek popisuje příspěvky HCI vědě a praxi, především v člancích v časopise Human Factors a v ročenkách. Bylo identifikováno více než 2300 článků, některé srovnávaly skutečný nebo předvídaný výkon nového stroje, formát displeje nebo systém založený na počítači s existujícím nebo alternativním systémem. Další práce popisují metody hodnocení výkonu systémů. Tato práce má obrovský dopad.

- počítače - systém člověk - stroj - interakce - faktor lidský - bibliografie