Course Syllabus for:
Human Factors
769A09

Fall Term 2019
Course examiner: Erik Prytz
Course administrator: Anna Grabska Eklund
Version 3

1 Kursplan (svenska)

Huvudområde: Kognitionsvetenskap
Utbildningsnivå: Avancerad nivå
Fördjupningsnivå: A1X
Kursen ges för: Kognitionsvetenskap, masterprogram
Förkunskapskrav: Kandidatexamen 180 hp i huvudområdet kognitionsvetenskap, eller Kandidatexamen 180 hp i huvudområdet datalogi eller motsvarande samt godkända kurser om 30hp i något eller några av ämnena: psykologi, lingvistik, filosofi, neurovetenskap, antropologi eller motsvarande, eller Kandidatexamen 180 hp i något av huvudområdena Psykologi eller Neurovetenskap samt godkända kurser om 30hp i datavetenskap eller motsvarande.
Lärandemål
Efter avslutad kurs ska den studerande på en avancerad nivå kunna:

- redogöra för och kritiskt diskutera teorier och modeller inom områdena Human Factors och Resilience Engineering
- tillämpa metoder för att analysera komplexa system och människans roll i dessa
- identifiera, avgränsa och analysera ett människa-maskinsystem från ett Human Factors eller Resilience Engineering-perspektiv

Kursinnehåll
Kursen behandlar följande områden:

- Centrala teorier och modeller inom fältet Human Factors och Resilience Engineering som kan användas för att beskriva, förstå och analysera komplexa system och människans roll i dessa.
- Centrala begrepp kopplade till området.
- Metoder för att analysera och beskriva komplexa system och människans roll i dessa.
- Aktuell forskning inom området Human Factors

Undervisnings- och arbetsformer:
Undervisningen består av föreläsningar, praktiska övningar och seminarier. Den studerande förväntas arbeta med självstudier, enskilt eller i grupp.
Examination:
Kursen examineras genom aktivt deltagande på seminarier, genomförande av praktiska övningar, samt ett individuellt projekt som redovisas såväl muntligt som skriftligt. Detaljerad information återfinns i studieanvisningen.
Studerande, vars examination underkänts två gånger på kursen eller del av kursen, har rätt att begära en annan examinator vid förnyat examinationstillfälle. Den som godkänts i prov får ej delta i förnyat prov för högre betyg
Betygsskala: U, G, VG
Övrig information: Planering och genomförande av kurs ska utgå från kursplanens formuleringar. Den kursvärdering som ska ingå i varje kurs ska därför behandla frågan om hur kursen överensstämmer med kursplanen. Kursen bedrivs på ett sådant sätt att både mäns och kvinnors erfarenhet och kunskaper synliggörs och utvecklas.
Ämnesområde: Teknik i samhällsperspektiv
Utbildningsområde: Tekniska området
Institution: Institutionen för Datavetenskap

2 Course introduction

Welcome to 769A09, a course that centers on Human Factors theories, methods, and issues. This is an advanced, masters' level course with a student-centered learning perspective. The course offers a lot of freedom to choose topics of particular interest to you, and to focus in depth on one particular problem. There are three main components to the course: weekly seminars, weekly team challenges, and written individual work called a proposal. In addition, there are some guest lectures that provide additional insight on some topics. This document explains the course structure and format in detail.

2.1 Teachers and staff

Erik Prytz (erik.prytz@liu.se) at the Department of Computer and Information Science (IDA) is the course examiner.

Anna Grabska Eklund (anna.grabska.eklund@liu.se) is the course administrator.

3 Lectures

The course typically features around 2-3 lectures. One lecture is given to present the course structure and requirements, introduce content topics, and provide a fundament for the rest of the course content (including the seminars and proposal work). The remaining lectures are invited guest lectures on a range of topics relevant to the course goals.

The invited guest lecturers for the current course iteration are:

- **Professor Björn Johansson**, who will lecture about system safety and why the Death Star could have benefited from a Human Factors designer.
- **Dr. Peter Berggren**, who will lecture about team skills, team performance, and other team-related concepts, with examples from the military and medical domains.

4 Seminars

The course contains a set of about 6 seminars. The topics of the seminars are selected by the students based on a list of suitable topics relevant to the overall course goals. The purpose of this is to allow some flexibility to pursue topics of particular interest to the students. The available topics are:

1. Automation
2. Communication
3. Ethnography in complex systems
4. Expertise
5. Human error
6. Resilience
7. Situation awareness
8. Stress
9. Task analysis
10. Team performance
11. Training
12. Vigilance

4.1 Seminar structure

The structure of each seminar will be roughly as follows:

1. **Challenge review** (ca 5 minutes): The course examiner provides a review of the previous week's challenge and awards points to the teams.
2. **Flipped classroom** (ca 10 minutes): The course examiner answers questions about the reading material.
3. **Student-led discussion** (ca 70 minutes): The students discuss the material based on submitted questions.
4. **Class discussion and presentation of next week's challenge** (ca 5 minutes): The students and course examiner review the discussions during the seminar. The course examiner also presents next week's challenge.

The **challenge review** part is explained further in section 5, Team Challenges.

The **flipped classroom** part is intended to cover fundamental or basic questions about the topic, as well as to clarify the literature. The students will either submit questions in advance (more on this in the next section) or come prepared with questions for the flipped classroom part.

The **student-led discussion** portion will be conducted either with the whole class together or divided into smaller groups, depending on the number of students in the course. For each seminar, one student per group will be responsible to act as seminar leader. This will be assigned during the first lecture. There is a given set of "core" articles or chapters to read for each topic (see 4.2 seminar Literature). All students are responsible for reading the assigned material before the seminar and to submit 1) one to two discussion questions *per core article* and 2) two *overarching* questions spanning all assigned reading for that week. These questions must be submitted no later than one full weekday prior to the seminar (using Lisam). The course examiner will anonymize and forward these questions to the seminar leader(s). The seminar leader(s) will summarize the questions into a structured set of discussion topics that can be used as an aid during the discussion part of the seminar.

Students can also submit additional clarifying (non-discussion) questions to the course examiner prior to the seminar. These questions will be used during the flipped classroom part of the seminar. There is an example template on Lisam that can be used to write the questions.

Summary: responsibilities of the seminar leader
Before the seminar
- Summarize the submitted questions to a format that will support discussion during the seminar.

During the seminar
- Lead and facilitate the group discussion, supported by the submitted questions.

Summary: responsibilities of all students
Before the seminar
- Read the assigned literature.

- Submit, using Lisam, 1-2 discussion questions per article and 2 overarching questions no later than one full weekday prior to the seminar.
    - See deadlines on Lisam.

During the seminar

- Actively participate in the discussions.

4.2 Seminar Literature

This course does not have a specific textbook to cover the entire course. Rather, the required readings are based on the chosen topics. The list of literature per topic is provided in Appendix A. Please note that not all of the following articles will be included during the course. Only the chosen topics will be covered.

Each topic contains a set of "Core" articles and a set of "Extra" articles. The core articles are mandatory, and it is those articles that will be discussed during the seminar. The extra articles are *not* mandatory but rather provided as additional reading for the interested student. They can serve as a useful fundament for the proposal and other future work.

4.3 Absence

If you are absent from a seminar you will instead complete a written reflection on the material. This reflection should summarize and review the core literature for the seminar and include an overall reflection connected to the topic of the seminar. The entire reflection should be about 2 pages in length. Some absences are excused (e.g., death in the family, hospitalization, and similar) if cleared by course examiner prior to the seminar.

5 Team Challenges

The purpose of the team challenges is to provide an engaging learning activity tied to the topic discussed in the course. All students will be assigned to teams of about 4-5 members each. These teams will complete weekly challenges based on the previous week's topic. The challenges will be presented at the end of each seminar.

Each individual challenge is unique and will have specific goals and requirements. The way the challenge should be presented or reported is specific to each challenge. Points from zero to N, where N is a positive number greater than 0, are awarded by the course examiner depending on well the team meets the challenge goals and requirements. To 'pass' the challenge the team must score greater than zero. A score of zero is typically given on a "did not attempt" basis.

The teams will accumulate points by completing challenges. A weekly scoreboard will be kept and updated. The team with the highest score at the end of the course will win a *special prize*.

6 Proposal

The course includes an individual, written assignment called a *research proposal*.

A research proposal is a document that describes a specific research project – from the justification (why are you doing this?) to the research question(s), also known as a proposal statement (what will you investigate?), to the method (how are you doing this?) to limitations (what you are you not doing, and why?). You can think of it as a document containing the introductory, background, and methods chapter of a regular thesis, e.g. a bachelor's or master's thesis, with a few extra bits at the end for limitations, contributions, and, of course, references. Research proposals are often written by graduate students (master's or doctorate) to describe their intended dissertation or thesis research (called a thesis proposal).

It is important to keep in mind that the actual empirical investigation(s) outlined in the proposals will *not* be conducted in this course! A proposal, in general, is a detailed plan that is typically reviewed by a committee of senior faculty before the student can proceed with implementing the research. The course examiner will serve this function in this particular course.

6.1 Proposal requirements

The overall topic of the proposal must be in line with the course syllabus and should preferably follow one of the seminar topics outlined under section 4 Seminars. It must not be a topic that has been selected for this particular course iteration, and other topics may be permissible. The course examiner has the final say in which topics are allowed.

The scope of the research outlined in the proposal should be reasonable to complete in a semester for one student. That is, the planned research should be reasonable to conduct either as a master's thesis project (30 hp) or a larger project (12-16 hp). The research should be feasible given the resources typically available to students conducting such project or thesis courses, although some creative liberties are allowed (e.g., assuming access to certain equipment, systems, environments, or study populations).

As for the research itself you have a lot of liberty in your choice. The research can be oriented towards a practical, domain-related problem or towards basic research. The methodology can be controlled experiments, field studies, ethnographic research, or any of the many other methods taught in the cognitive science program. The research may be quantitative or qualitative, hypothesis-testing or exploratory. You are free to, within reason, choose your own method based on the nature of the question you ask (keeping in mind the feasibility criterium described previously).

It is important to keep in mind that this is a *research* proposal, not a *project* proposal. You should in your work outline the academic value of conducting this particular research and try to position it within the broader literature on the

topic. As such, you do *not* need to add project specifications such as number of work hours, budget or a time plan.

The general criteria for the proposal can thus be summarized as follows:

1. The topic of the proposal must be relevant to the course syllabus, i.e. the scientific fields of human factors and resilience engineering
2. The proposal must outline an explicit and clear likely contribution to the scientific body of knowledge about the particular topic or question
3. The proposed *empirical* investigation (e.g., study design) is suitable to answer the research question(s)
4. The proposal is feasible in that it could conceivably, with some assistance, be conducted by one master's student in one semester

6.2 Proposal structure

The written proposal should contain the following sections (page numbers are *guidelines* rather than limits):

- Title page
- Abstract (300 words)
- Introduction (ca 1-2 pages)
- Background (3-4 pages)
- Research statement (one page)
- Method (2-4 pages)
- Limitations (1-2 pages)
- Contributions (1 page)
- References
- (Appendices)

The title page must list the proposal title, author name, course name, course code, date, and course examiner. The title must be informative of the proposed research and must not be longer than 25 words in length (including subtitle, if applicable). The author name should only appear on the title page.

The abstract should clearly and accurately summarize the research proposal in 300 words or less. The purpose, research question(s), method, and potential contributions should all be covered in the abstract. The abstract should appear on its own page.

The introduction should introduce the general topic to the reader and provide a high-level justification for the proposed research. This justification can either be grounded in a practical or domain-specific problem, or a basic research-oriented problem. The introduction should be about one to two pages.

The background section should review prior peer-reviewed literature on the specific topic of research. This background section should be specific and relevant to the research statement. For example, it is more relevant to describe the knowledge gaps left by current studies than the history of the field. The background section should be ca 3-4 pages.

The research statement is the section where you explain what you propose to do. It should include the hypotheses or research questions derived from the reviewed literature in the background section. The statement should be specific and scientifically interesting. This section should be about one page.

The method section should be written in future tense and be very specific and detailed. In essence, this section should read as a detailed description of an already conducted study, although, of course, none has actually been conducted. Explicit references to design choices that are yet to be made can be included as long as the method for making that choice is outlined. For example, if you are proposing a planned experiment where you will play an auditory stimulus and you do not know how loud this stimulus must be you can explicitly state that the specific loudness (dB) will be determined through pilot testing. This section should include the usual headings for participants, apparatus, procedure, etc (see the APA manual for additional headings typically used). The section should also include a subheading for the planned analyses and describe how those will be conducted. The length of this section may vary, but 2-4 pages is a guideline. Additional material (such as informed consent forms, questionnaires, balance sheets, software screenshots, manuscripts with instructions to read to participants, etc.) should be included in appendices.

The limitations section should detail the various planned as well as unavoidable limitations on the proposed research. This includes both the theoretical background, scope of the research, and the methodological choices. This section should be about 1, perhaps 1-2 pages.

The contributions section should outline the (likely, or potential) contributions the proposed research will achieve. This can, for instance, be answering specific research questions, discovering new knowledge about some phenomenon, or settling a conflict in prior research. The contributions should be clearly outlined in relation to past research (as reviewed in the background section) and be generalized appropriately given the limitations. This section should be no more than one page in length.

6.3 Technical requirements

The entire proposal should be *about* 10 to 12 pages in length (excluding title page, abstract, references and appendices) and written with Times New Roman, 12 pts, single line spacing. This is not a strict page limit but rather a general guideline that should fit most proposals. However, if your proposal is shorter than 8 pages you must get approval from the course examiner before you present it. In general, brevity is preferred over wordiness, but the proposal must contain sufficient detail to be accurately graded.

The proposal can be written in Swedish or English. Students are encouraged to write in English to further improve their ability to write technical reports in English. However, this is not a requirement.

The proposal should follow an accepted formatting guideline for the references. I recommend the American Psychology Association's publication manual, version 6 (available as a reference work at the university library). *Please be aware that online sources for the APA manual may be outdated!* Always check that the information is correct according to the latest standard.

The proposal should be written in a clear and comprehensible manner. The text should have a logical flow and structure. Spelling mistakes and grammatical errors should be virtually nonexistent. The text should be written in a formal and technical language and avoid colloquialisms. Specific terminology should be used, and vague unsupported claims avoided. In short, the proposal should be written to a high academic standard as befitting a master's level course.

6.4 Grading rubric for the written proposal

The grading rubric for the project report is available in Appendix B. There are seven criteria in the rubric for *content*, and three for *mechanics*. The proposal can either exceed, meet, or fail to meet the standard in each criterion. A holistic assessment is made based on how well the proposal meets these criteria. In general, a passing grade (G) is awarded to proposals who meets all criteria, and a pass with distinction (VG) is given to proposals that exceeds standard on key criteria. Proposals may receive a failing grade if they fail to meet key criteria, or if it receives a score of "No evidence" for any criteria.

6.5 Proposal presentation

The proposals will be orally presented to the class by the individual students. The presentation should be about 15 minutes in length. The focus should be on the specifics of the research proposal (i.e., research statements, method, limitations, and contributions), with only a very brief presentation on the background. The presentation will be followed by a 5-minute Q&A session where the student will answer questions from the audience and the course examiner.

To pass the oral presentation the student must present a clear overview of the topic to the general benefit of the audience, present their research proposal clearly and understandably, and keep within the allotted time frame.

7 Course grade

To receive a passing grade (G) in this course you will need to:

- Be the discussion leader for one seminar
- Actively participate during the other seminars
- Pass the weekly team challenges
- Receive a passing grade on the proposal
- Receive a passing grade on the proposal presentation

The grade of pass with distinction (VG) will be given based on the quality of the written proposal.

7.1 Make-up work

If a student fails any of the course components, they can submit make-up work twice before the next course iteration starts. The specific deadlines and make-up assignments will be presented during the course.

8 Appendix A: Topic reading lists

The readings list is arranged by topic. Within each topic are two main sections; *core* and *extras*. Core are the articles that are covered in the seminar (i.e., "mandatory" reading). Extras are articles on the same topic that are not covered in the seminar, but that may provide a fuller, deeper and further understanding. These may be useful when writing a proposal, or thesis. The *core* section is further subdivided into three sections: theory, methods, and application. Each covers a different aspect of the topic. Not all topics have articles in each subsection, nor are they necessarily evenly distributed.

It is recommended that you read the articles in the order that they are presented for each topic.

8.1 Automation

8.1.1 Core

Theory

1. Dekker, S., & Woods, D. D. (2002). MABA-MABA or Abracadabra? Progress on human-automation coordination. *Cognition, Technology & Work*, *4*(4), 240–244.
2. Parasuraman, R., Sheridan, T., & Wickens, C. D. (2000). A Model for Types and Levels of Human Interaction with Automation. *IEEE Transactions on Systems, Man, and Cybernetics*, *30*(3), 15–26.
3. Parasuraman, R., & Wickens, C. D. (2008). Humans: Still vital after all these years of automation. *Human Factors*, *50*(3), 511–520.

Methods

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Application

4. Kennedy, K. D., Stephens, C. L., Williams, R. a., & Schutte, P. C. (2014). Automation and Inattentional Blindness in a Simulated Flight Task. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 58, pp. 2058–2062). https://doi.org/10.1177/1541931214581433

8.1.2 Extras

5. Woods, D. (1996). Decomposing automation: Apparent simplicity, real complexity. In *Automation and human performance: Theory and …* (pp. 1–25).
6. Bainbridge, L. (1983). Ironies of automation. *Automatica*, *19*(6), 775–779.
7. Kaber, D. B., Riley, J. M., Tan, K., & Endsley, M. R. (2001). On the Design of Adaptive Automation for Complex Systems. *International Journal of Cognitive Ergonomics*, *5*(1), 37-57.
8. Parasuraman, R., & Riley, V. (1997). Humans and Automation: Use, Misuse, Disuse, Abuse. *Human Factors*, *39*(2), 230–253.

9. Sarter, N. B., Woods, D. D., & Billings, C. E. (1997). Automation Surprises. In G. Salvendy (Ed.), *Handbook of Human Factors & Ergonomics* (2nd ed.). Wiley.
10. Madhavan, P., Wiegmann, D. A., & Lacson, F. C. (2006). Automation Failures on Tasks Easily Performed by Operators Undermine trust in Automated Aids. *Human Factors*, *48*(2), 241–256.

8.2 Communication

8.2.1 Core

Theory

11. Conzola, V. C., & Wogalter, M. S. (2001). A Communication–Human Information Processing (C–HIP) approach to warning effectiveness in the workplace. *Journal of Risk Research*, *4*(4), 309–322. https://doi.org/10.1080/13669870110062712
12. Caldwell, B. S. (2005). Analysis and modeling of information flow and distributed expertise in space-related operations. *Acta Astronautica*, *56*(9–12), 996–1004. https://doi.org/10.1016/j.actaastro.2005.01.027

Methods

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Application

13. Keebler, J. R., Dietz, A. S., Baker, A., & Hopkins, J. (2015). Effects of Communication Lag in Long Duration Space Flight Missions: Potential Mitigation Strategies Embry-Riddle Aeronautical University. In *59th Annual Meeting of the Human Factors and Ergonomics Society* (pp. 6–10).
14. Butchibabu, A., Sparano-Huiban, C., Sonenberg, L., & Shah, J. (2016). Implicit Coordination Strategies for Effective Team Communication. *Human Factors*, *58*(4), 595–610. https://doi.org/10.1177/0018720816639712

8.2.2 Extras

15. Lindgren, I., Hirsch, R., & Berggren, P. (2007). It takes three points to define a common ground: breathing apparatus fire-fighters' communication during rescue operations. *Journal of Pragmatics*, *39*, 1482–1502. doi:10.1016/j.pragma.2006.11.008
16. Awad, S. S., Fagan, S. P., Bellows, C., Albo, D., Green-Rashad, B., De la Garza, M., & Berger, D. H. (2005). Bridging the communication gap in the operating room with medical team training. *American Journal of Surgery*, *190*(5), 770–4. doi:10.1016/j.amjsurg.2005.07.018
17. Woods, Z., Hilligoss, B., Duchon, a., Beecroft, N., & Patterson, E. S. (2014). Detecting Differences in Communication During Two Types of Patient Handovers: A Linguistic Construct Categorization Approach. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 58, pp. 1262–1265). doi:10.1177/1541931214581263

18. Houghton, R. J., Baber, C., McMaster, R., Stanton, N. a, Salmon, P., Stewart, R., & Walker, G. (2007). Command and control in emergency services operations: a social network analysis. *Ergonomics*, *49*(12-13), 1204–1225.

8.3 Ethnography in complex systems

8.3.1 Core

Theory

19. Macaulay, C., Benyon, D., & Crerar, A. (2000). Ethnography, theory and systems design: from intuition to insight. *International Journal of Human-Computer Studies*, *53*(1), 35–60. doi:10.1006/ijhc.2000.0376

Methods

20. Hughes, J., Rodden, T., & Andersen, H. (1994). Moving out from the control room: ethnography in system design. In *Proceedings of the 1994 ACM conference on Computer supported cooperative work* (pp. 429–439). ACM. Retrieved from http://portal.acm.org/citation.cfm?id=193065
21. Walker, G. H., Stanton, N. A., Baber, C., Wells, L., Gibson, H., Salmon, P., & Jenkins, D. (2010). From ethnography to the EAST method: a tractable approach for representing distributed cognition in Air Traffic Control. *Ergonomics*, *53*(2), 184–197. doi:10.1080/00140130903171672

Application

22. Mhlaba, J. M., Christianson, L. W., Davidson, S. J., Graves, S. N., Still, B. R., Silas, M. R., … Langerman, A. J. (2016). Field Research in the Operating Room. *Ergonomics in Design: The Quarterly of Human Factors Applications*, (October), 1064804616642916. doi:10.1177/1064804616642916

8.3.2 Extras

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8.4 Expertise

8.4.1 Core

Theory

23. Ericsson, K. A., Krampe, R. T., & Tesch-Romer, C. (1993). The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review*, *100*(3), 363–406.

Methods

24. Ericsson, K. A., & Ward, P. (2007). Capturing the Naturally Occurring Superior Performance of Experts in the Laboratory: Toward a Science of Expert and Exceptional Performance. *Psychological Science*, *16*(6), 346–350.

Application

25. Gray, R. (2004). Attending to the execution of a complex sensorimotor skill: expertise differences, choking, and slumps. *Journal of Experimental Psychology: Applied*, *10*(1), 42–54. https://doi.org/10.1037/1076-898X.10.1.42

8.4.2 Extras

26. Ericsson, K. A. (2004). Deliberate Practice and the Acquisition and Maintenance of Expert Performance in Medicine and Related Domains. *Academic Medicine*, *79*(10), 70–81.
27. Nibbeling, N., Oudejans, R. R. D., & Daanen, H. a. M. (2012). Effects of anxiety, a cognitive secondary task, and expertise on gaze behavior and performance in a far aiming task. *Psychology of Sport and Exercise*, *13*(4), 427–435. https://doi.org/10.1016/j.psychsport.2012.02.002

8.5 Human error

8.5.1 Core

Theory

28. Rasmussen, J. (1990). Human error and the problem of causality in analysis of accidents. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *327*(1241), 449–60.
29. Hollnagel, E., & Amalberti, R. (2001). The emperor's new clothes: Or whatever happened to "human error." In *Proceedings of the 4th International Workshop on Human Error, Safety and Systems Development* (pp. 1–18).

Methods

30. Sharit, J. (2006). Human Error. In G. Salvendy (Ed.), *Handbook of human factors & ergonomics* (3rd ed., pp. 708–760). Hobeken, NJ: Wiley. **[Read pages 708-722 in the e-book]**
31. Kirwan, B. (1998). Human error identification techniques for risk assessment of high risk systems — Part 1: review and evaluation of techniques. *Applied Ergonomics*, *29*(3), 157–177.

Application

8.5.2 Extras

32. Dekker, S. W. A. (2002). The re-invention of human error Lund University School of Aviation. *Aviation*.
33. Lyons, M., Adams, S., Woloshynowych, M., & Vincent, C. (2004). Human reliability analysis in healthcare: A review of techniques. *International Journal of Risk & Safety in Medicine*, *16*, 223–237.

34. Stanton, N. A., Salmon, P. M., Walker, G. H., Baber, C., & Jenkins, D. (2005). *Human Factors Methods: A practical guide for engineering and design*. Burlington, VT: Ashgate. **[Read Chapter 6 in the e-book]**

8.6 Resilience

8.6.1 Core

Theory

35. Sheridan, T. B. (2008). Risk, Human Error, and System Resilience: Fundamental Ideas. *Human Factors*, *50*(3), 418–426.
36. Woods, D. D. (2016). Chapter 2 Essential Characteristics of Resilience Avoiding the Error of the Third Kind, (January 2012).

Methods

37. Righi, A. W., Saurin, T. A., & Wachs, P. (2015). A systematic literature review of resilience engineering: Research areas and a research agenda proposal. *Reliability Engineering & System Safety*, *141*, 142–152.
38. Hoffman, R. R., & Hancock, P. A. (2017). Measuring Resilience. *Human Factors*, *59*(4), 564–581. https://doi.org/10.1177/0018720816686248

Application

8.6.2 Extras

39. Gunderson, L. (2010). Ecological and Human Community Resilience to Natural Disasters. *Ecology and Society*, *15*(2), 18.
40. Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, *16*(3), 253-267.
41. Lundberg, J., & Johansson, B. J. (2015). Systemic resilience model. *Reliability Engineering and System Safety*, *141*, 22–32. doi:10.1016/j.ress.2015.03.013
42. Dekker, S. (2009). RAG – Resilience Analysis Grid, (January), 1–7.
43. Furniss, D., Back, J., Blandford, A., Hildebrandt, M., & Broberg, H. (2011). A resilience markers framework for small teams. *Reliability Engineering & System Safety*, *96*(1), 2–10.

8.7 Situation awareness

8.7.1 Core

Theory

44. Endsley, M. R. (1995). Toward a Theory of Situation Awareness in Dynamic Systems. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *37*(1), 32–64. doi:10.1518/001872095779049543
45. Dekker, S., & Hollnagel, E. (2004). Human factors and folk models. *Cognition, Technology, and Work*, *6*, 79–86.

46. Sheridan, T. B., & Wickens, C. D. (2008). Situation Awareness, Mental Workload, and Trust in Automation: Viable, Empirically Supported Cognitive Engineering Constructs. *Human Factors*, *2*(2), 140–160. doi:10.1518/155534308X284417.

Methods

47. Salmon, P. M., Stanton, N. A., Walker, G. H., Jenkins, D., Ladva, D., Rafferty, L., & Young, M. (2009). Measuring Situation Awareness in complex systems: Comparison of measures study. *International Journal of Industrial Ergonomics*, *39*(3), 490–500. doi:10.1016/j.ergon.2008.10.010

Application

8.7.2 Extras

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8.8 Stress

8.8.1 Core

Theory

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Methods

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Application

8.8.2 Extras

57. Hockey, G. R. J. (1997). Compensatory control in the regulation of human performance under stress and high workload; a cognitive-energetical framework. *Biological Psychology*, *45*(1–3), 73–93.
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8.9 Task analysis

8.9.1 Core

Theory

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Methods

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Application

8.9.2 Extras

66. Kirschenbaum, S. S., Trafton, J. G., & Pratt, E. (2007). Comparative Cognitive Task Analysis. In R. Hoffman (Ed.), *Expertise out of context* (pp. 327–336).
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8.10 Team performance

8.10.1 Core

Theory

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Application

8.10.2 Extras

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75. Rosen, M. A., Salas, E., Wilson, K. A., King, H. B., Salisbury, M., Augenstein, J. S., … Birnbach, D. J. (2008). Measuring Team Performance in Simulation-Based Training: Adopting Best Practices for Healthcare.

Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare, 3(1), 33–41. http://doi.org/10.1097/SIH.0b013e3181626276

8.11 Training

8.11.1 Core

Theory

76. Salas, E., & Cannon-Bowers, J. A. (2001). The science of training: a decade of progress. *Annual Review of Psychology*, *52*, 471–499. https://doi.org/10.1146/annurev.psych.52.1.471
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Application

8.11.2 Extras

79. Hochmitz, I., & Yuviler-Gavish, N. (2011). Physical Fidelity Versus Cognitive Fidelity Training in Procedural Skills Acquisition. *Human Factors*, *53*(5), 489–501.
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8.12 Vigilance

8.12.1 Core

Theory

83. Mackworth, N. H. (1948). The breakdown of vigilance during prolonged visual search. *Quarterly Journal of Experimental Psychology*, *1*(1), 6–21.
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85. Warm, J. S., Parasuraman, R., & Matthews, G. (2008). Vigilance Requires Hard Mental Work and Is Stressful. *Human Factors*, *50*(3), 433–441.

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Application

86. Mackie, R. R. (1987). Vigilance Research-Are We Ready for Countermeasures? *Human Factors*, *29*(6), 707–723.

8.12.2 Extras

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9 Appendix B: Grading rubric for the proposal

Content				
	Exceeds standard	**Meets standard**	**Does not meet standard**	**No evidence**
Abstract	Clearly and accurately summarizes the proposal within the given word limit.	Summarizes the proposal within the given word limit.	Fails to summarize the proposal or exceeds the word limit.	No abstract provided.
Introduction	The stated purpose with the proposal is motivated, clear and well defined, and within the scope of the course.	A purpose is stated and within the scope of the course.	The purpose is unclear or outside the scope of the course.	No purpose.
Background	Provides accurate and detailed background information that covers the seminal and current works as related to the purpose. A comprehensive selection of valid, scientific references is provided.	Sufficient relevant background information is provided for the reader to follow and understand the current work. Some valid, scientific references are used.	Very little and/or inaccurate information is provided. No valid, scientific references used.	No background information provided.
Research statement	The research questions or hypotheses follow from the purpose and reviewed background literature. They are testable, scientifically interesting, and can be feasibly answered.	Research questions or hypotheses are stated and follow from the purpose. The research is feasible.	Research questions or hypotheses are unclear or not connected to the purpose. The research is not feasible.	No research questions or hypotheses
Method	Empirical data collection procedures and analytical strategies are well suited to answer the research aims, and are presented logically and clearly, with detailed easy-to-follow steps that allow scientific replication.	Empirical data collection procedures and analytical strategies are appropriate to answer the research aims. They are presented in an understandable way but may lack in detail or clarity.	Empirical data collection procedures and analytical strategies are either inappropriate for the research aims or the presentation is confusing and lacking critical information.	No data collection procedures or analytical strategies provided.
Limitations	Critically examines the limitations in the design of the project and suggests improvements for future studies. Both planned and unavoidable limitations are examined.	Recognizes project limitations but lacks suggestions for improvement. Misses critical limitations.	Limitations are either not recognized or inadequately described.	Limitations are not described.
Contributions	Clearly and accurately outlines the potential results in relation to the research questions or hypotheses. Presents logical and rational arguments for the likely contributions this research will provide.	Outlines the potential results and connects them to the stated research questions or hypotheses. Outlines the contributions the research is likely to make.	Does not discuss potential results and/or does not connect to the stated research questions or hypotheses. The contributions of the proposal are unclear or not motivated.	Section is absent.
Mechanics				
Language (technical)	No errors in grammar, punctuation, capitalization, word usage, or spelling. Formal, technical language is used consistently and throughout the report.	Few errors. Does not hinder comprehension. Some informal or non-technical language is used.	Many errors or few but critical errors that hinder comprehension. Large sections are written in informal language.	Not applicable.

Language (usage)	The language is clear and precise. Each paragraph has a main idea that is developed and supported by detail sentences. The sequence and progress of ideas and information is logical and cohesive.	The language is overall clear but contains unclear sections or sentences. Each paragraph has a main idea. The sequence and progress of ideas and information is not fully developed and contains some unsupported leaps.	The language is not clear or precise. Paragraphs lack main idea or supporting sentences. No evidence of structure or organization of ideas and information.	Not assessable.
References	All references in text as well as the bibliography are done in the correct format as per the chosen guideline (e.g., APA).	References in text and the bibliography are mostly correct according to the chosen standard with only minor deviations.	References and bibliography are not correctly or coherently formatted.	Absent.