Working with the human element

Decision support systems and the human factor

E-Navigation Underway Conference 2013
29-31 January 2013
Godafoss grounded at Kvernskjærgrunnen, 18 February 2011
18 February 2011

Pearl Seaway’s route

Norway

Sweden
Normal WO for course change 8 deg. to starboard
“The master incorrectly understood how the voyage was to continue through and out of Løperen. The master’s decisions and interpretation of the surroundings remained uncorrected and led to the grounding of Godafoss at Kvernskjær beacon at 19:52 at a speed of 14 knots, resulting in acute oil pollution.”

(Accident report, AIBN, 2012)
“The master incorrectly understood how the voyage was to continue through and out of Løperen. The master’s decisions and interpretation of the surroundings remained uncorrected and led to the grounding of Godafoss at Kvernskjær beacon at 19:52 at a speed of 14 knots, resulting in acute oil pollution.”

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“Human error”
“Human error” contribution to accidents

84-88% of tanker accidents

79% of towing vessel groundings

89-96% of collisions

75% of allisions – ship/structure accidents

75% of fires and explosions

Various studies by TSB Canada, Cormier, UK P&I Club and Bryant. [http://www.wmu.se.fortet.funcform.se/o.o.i.s/71](http://www.wmu.se.fortet.funcform.se/o.o.i.s/71)
• Human error is not a cause of failure. It is the effect, or symptom, of deeper trouble.

• Human error is not the conclusion of an investigation. It is the starting point.

• Human error is not random. It is systematically connected to feature’s of peoples tools, tasks and operational environment.

(Dekker, 2002)

Human error?
It sounds to me as serious design error!

(Donald Norman, 2002)

Humans do make errors, it is part of the human condition!
Information overload and stress leads to cognitive tunneling.
SA
Situation Awareness
Level 1, 2, 3

Perception
Analogue & digital data

Time

Integration

Motion & vibrationes
Factors contributing to failure

- Situations requiring rapid response
- Challenge of managing concurrent tasks
- Equipment failure and design flaws
- Misleading or missing **cues** normally present
- Plan continuation bias
- Stress
- Shortcomings in training and/or guidance
- Social/organizational issues

Dismukes, Berman, Loukopoulos
Some Human Factors methods used at Chalmers:

• Collecting user needs (field studies, context analysis)
• (Prototype development)
• Usability testing i simulator ("System simulation")
• Usability testing at sea
Field study onboard the Swedish icebreaker *Frej*, April 2011 in the northern Sea of Bothnia
First-year ice:
Norra Kvarken April 2011: 30-55 cm thick ice (< 1 m)
Found user needs:

1. Ability to transmit high resolution ice-route to addressed ships
2. Ability to see ships’ past-tracks, color coded based on propulsion effect used (difference from “normal” effect use)
Usability test at Chalmers simulator facility
Method: "System simulation" (qualitative, exploratory approach, observation (ethnography), data collection and analysis tool
Professional VTS operator with experience from The Sound VTS

Researcher/observer
Two bridges: one tanker, one cruising ship, each manned with one experienced captain and one Sound pilot
Timeline with VHF calls on four channels and individual reports from observers

Observer reports from current time

Links for VHF communication

Photo from current time

Current simulation time

Analysis tool: VSL Site Explorer™

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Findings:

1. Use of *Intended* and *Suggested routes* showed some new interesting behavior that needs further investigation. The services received positive response from involved professionals.

2. Concern was expressed about screen cluttering on the VTS screen showing all ships intended routes.
User tests at sea:
Testing route exchange during a SAR exercise, Denmark May 2011
Findings:

1. Users found the system tested very beneficial decreasing cognitive workload and risks of misunderstandings.

2. The prototype system is now used by the Danish Home Guard SAR organization.