


What is Information Overload

Human Factors in Presentation of Data

VTS-ENAV1-11

A photograph of an offshore oil platform in the middle of a storm. The sea is dark and turbulent, with large white waves crashing against the platform's structure. The sky is dark and cloudy, with several bright lightning bolts visible. The platform itself is a complex of metal structures, pipes, and walkways, with some equipment visible on the deck.

Thomas Porathe
Professor, Interaction design
Department of Product design
Norwegian University of Science and
Technology
Trondheim, Norway

thomas.porathe@ntnu.no

 NTNU

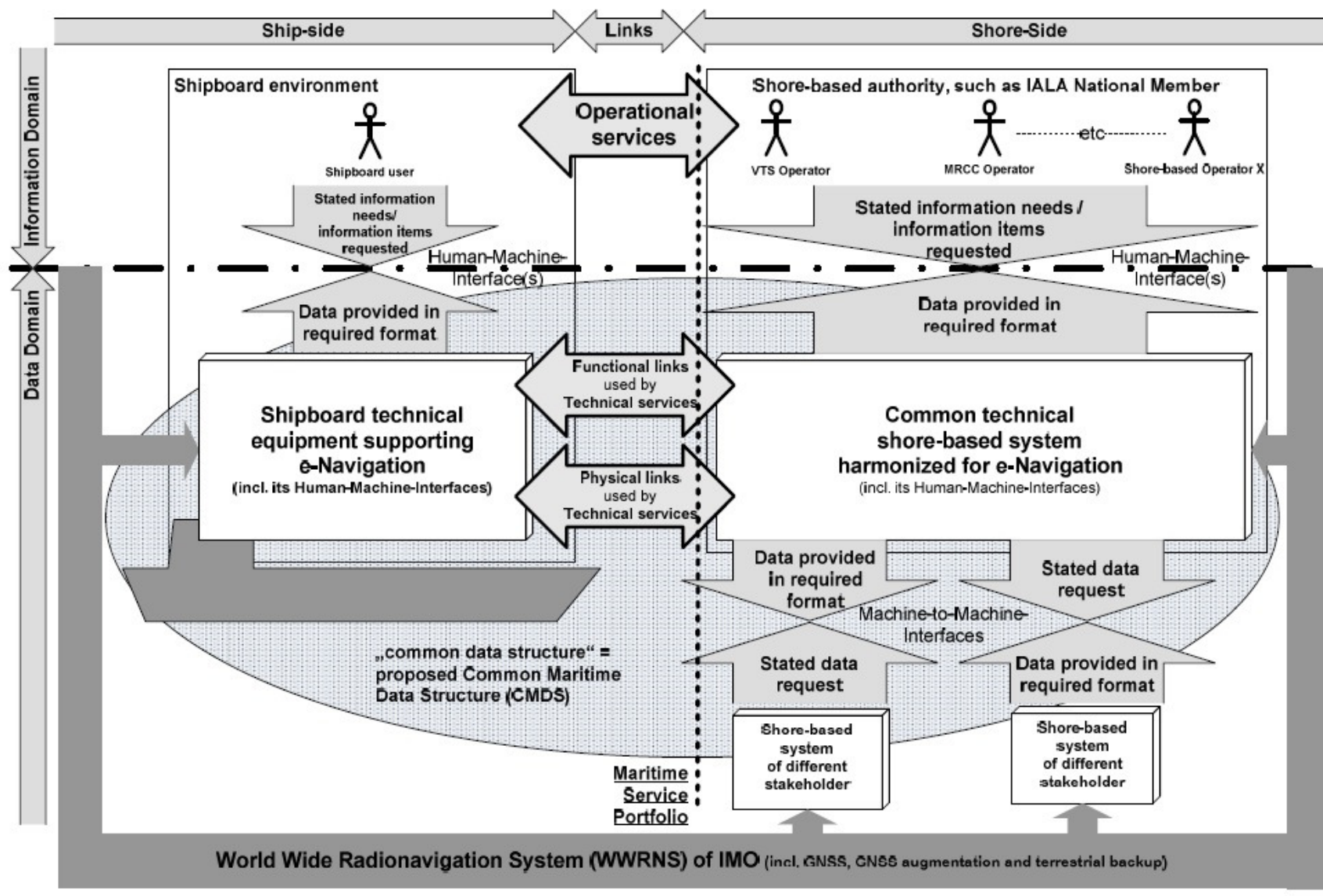


Yesterday



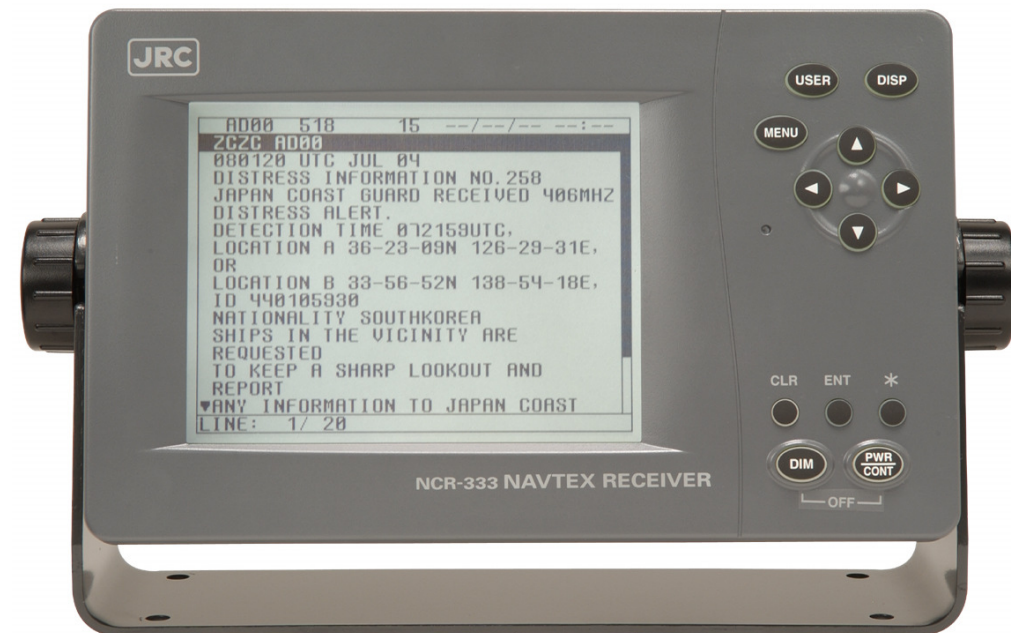
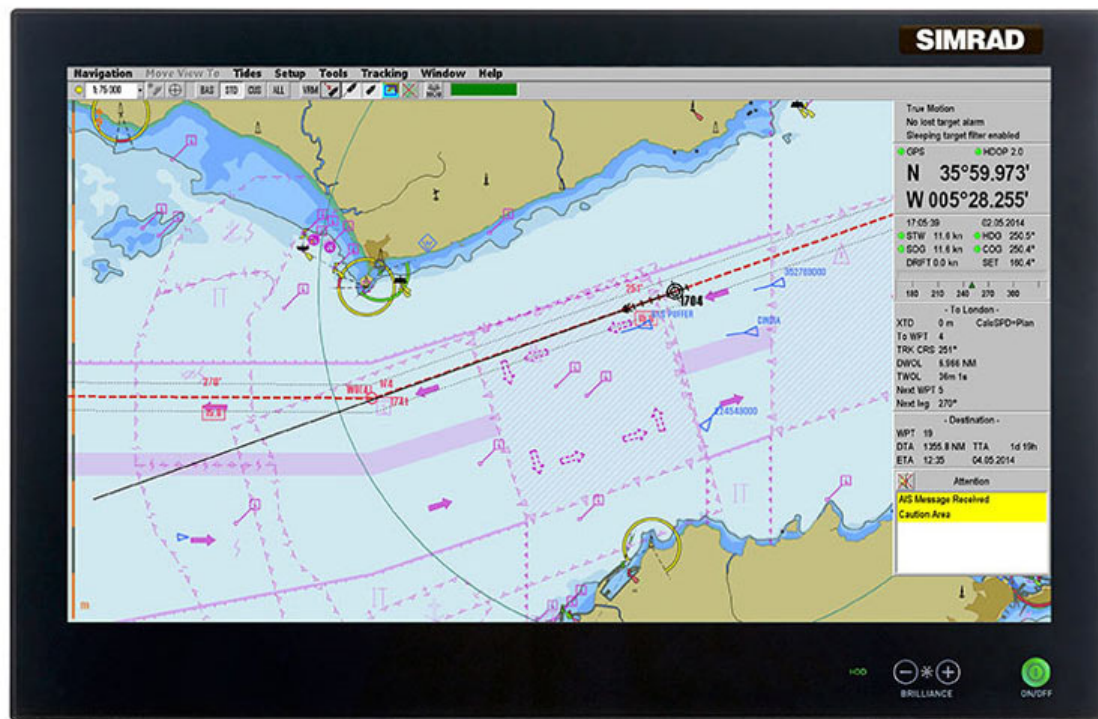
Today

thomas.porathe@ntnu.no



Tomorrow

| MSPs | Information items |
|-------|--|
| 1 INS | <ul style="list-style-type: none"> • The position, identity, intention and destination of vessels; • Amendments and changes in promulgated information concerning the VTS area such as boundaries, procedures, radio frequencies, reporting points; • The mandatory reporting of vessel traffic movements; • Meteorological and hydrological conditions, notices to mariners, status of aids to navigation; • Maneuverability limitations of vessels in the VTS area that may impose restrictions on the navigation of other vessels, or any other potential hindrances: or • Any information concerning the safe navigation of the vessel. |
| 2 NAS | <ul style="list-style-type: none"> • Risk of grounding; • Vessel deviating from the recommended track or sailing plan; • Vessel unsure of its position or unable to determine its position; • Vessel unsure of the route to its destination; • Assistance to a vessel to an anchoring position; • Vessel navigational or maneuvering equipment casualty; • Inclement conditions (e.g. low visibility, high winds); • Potential collision between vessels; • Potential collision with a fixed object or hazard; • Assistance to a vessel to support the unexpected incapacity of a key member of the bridge team, on the request of the master. |
| 3 TOS | <ul style="list-style-type: none"> • vessel movements need to be planned or prioritized to prevent congestion or dangerous situations; • special transports or vessels with hazardous or polluting cargo may affect the flow of other traffic and need to be organized; • an operating system of traffic clearances or sailing plans, or both, has been established; • the allocation of space needs to be organized; • mandatory reporting of movements in the VTS area has been established; • special routes should be followed; • speed limits should be observed; • the VTS observes a developing situation and deems it necessary to interact and coordinate vessel traffic; • nautical activities (e.g. sailing regattas) or marine works in-progress (such as dredging or submarine cable-laying) may interfere with the flow of vessel movement. |
| 4 LPS | <ul style="list-style-type: none"> • berthing information; • availability of port services; • shipping schedules; • meteorological and hydrological data. |
| 5 MSI | <ul style="list-style-type: none"> • National Hydrographic Offices, for navigational warnings and chart correction data; • National Meteorological Offices, for weather warnings and forecasts; • Rescue Co-ordination Centres (RCCs), for shore-to-ship distress alerts; • The International Ice Patrol, for Oceanic ice hazards. |

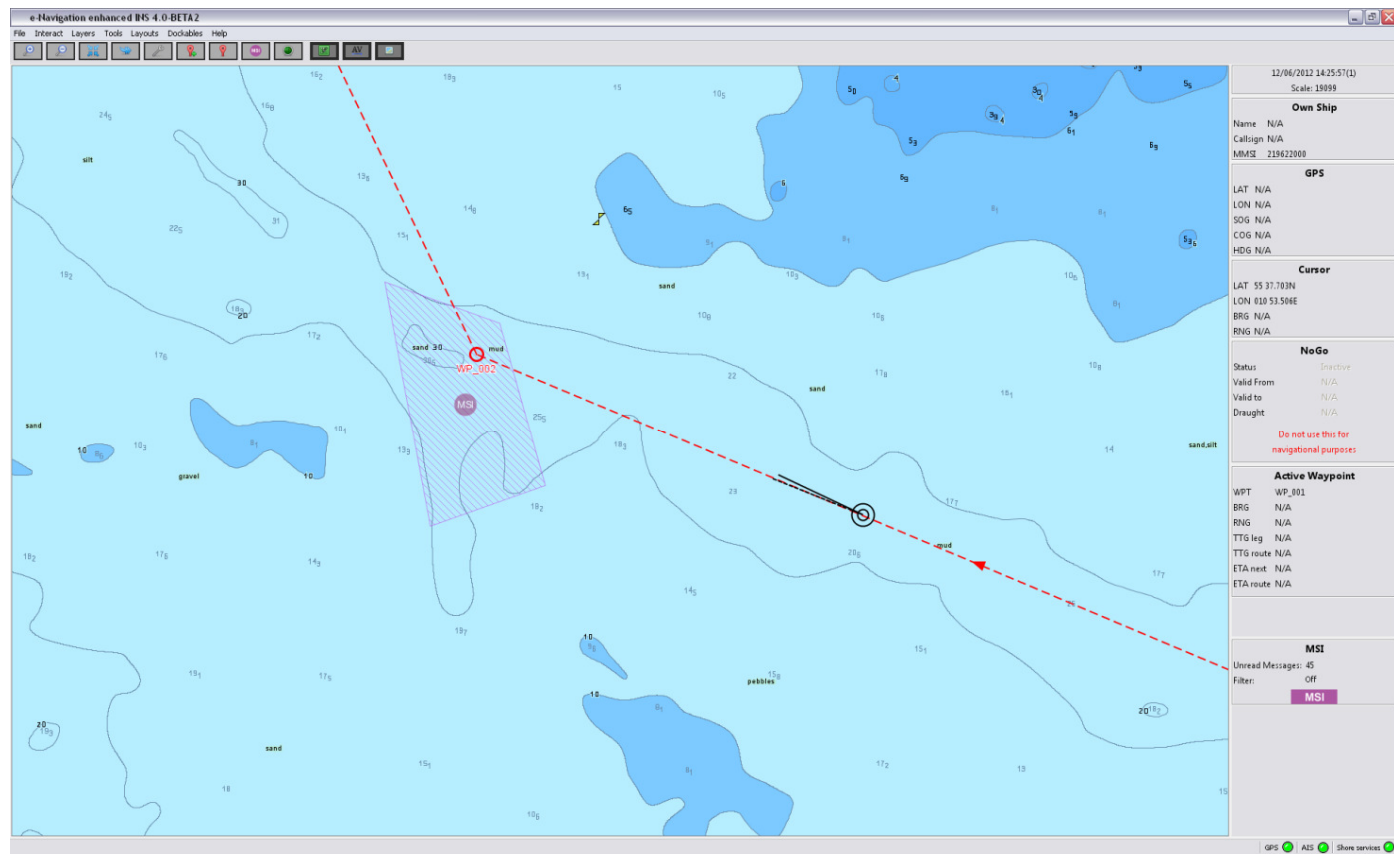


Unintegrated presentation of MSI/Nav warnings

thomas.porathe@ntnu.no

NTNU

If we do it right:



Integrated presentation of MSI/Nav warnings

thomas.porathe@ntnu.no

If we do it wrong:

Effects of information overload

Decision-making performance decreases when more info is provided. (Wright, 1974)

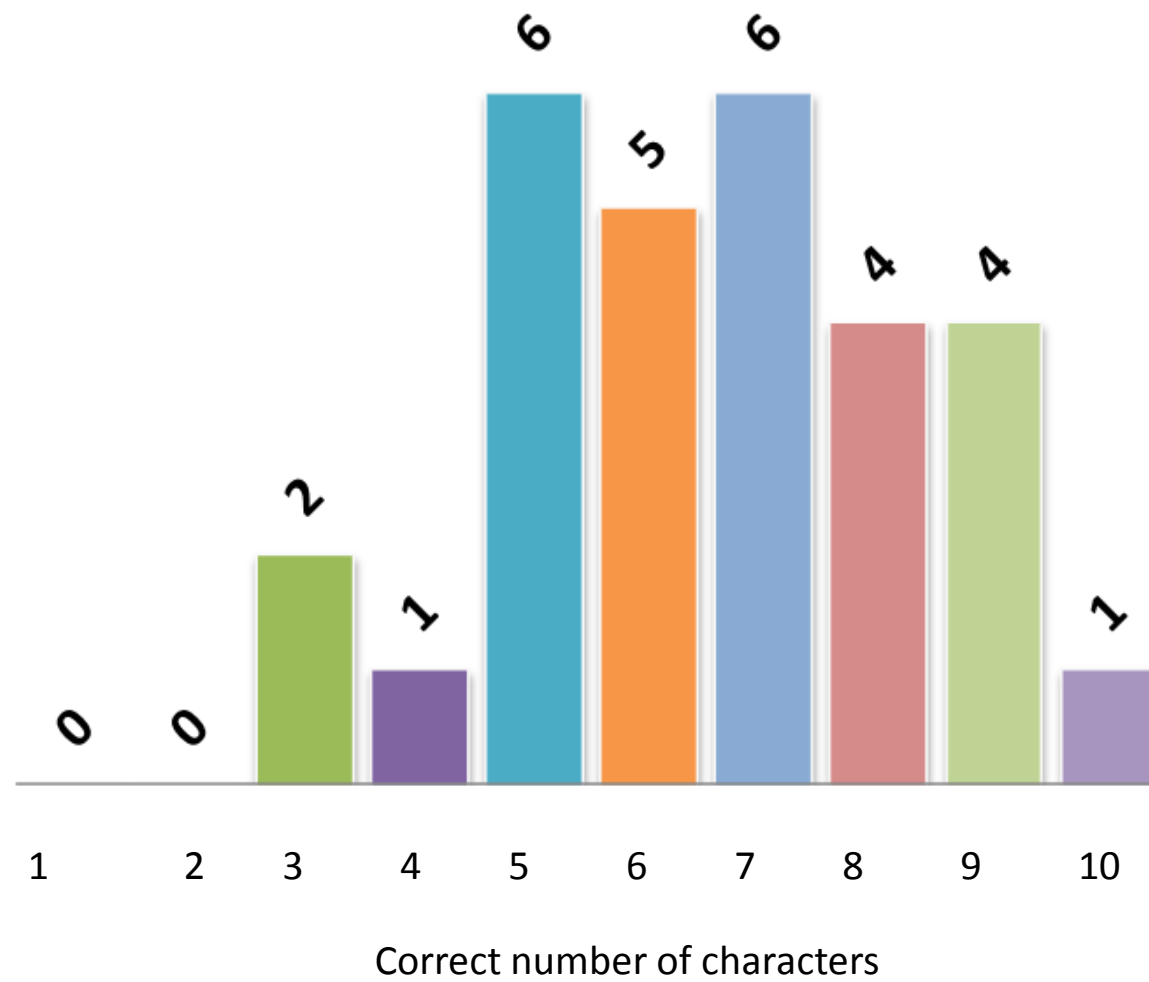
Memorize for 2 seconds these 10 characters

P 7 S 2 L 8 M C P 5

Now, write down what you remember

Correct answer

P 7 S 2 L 8 M C P 5

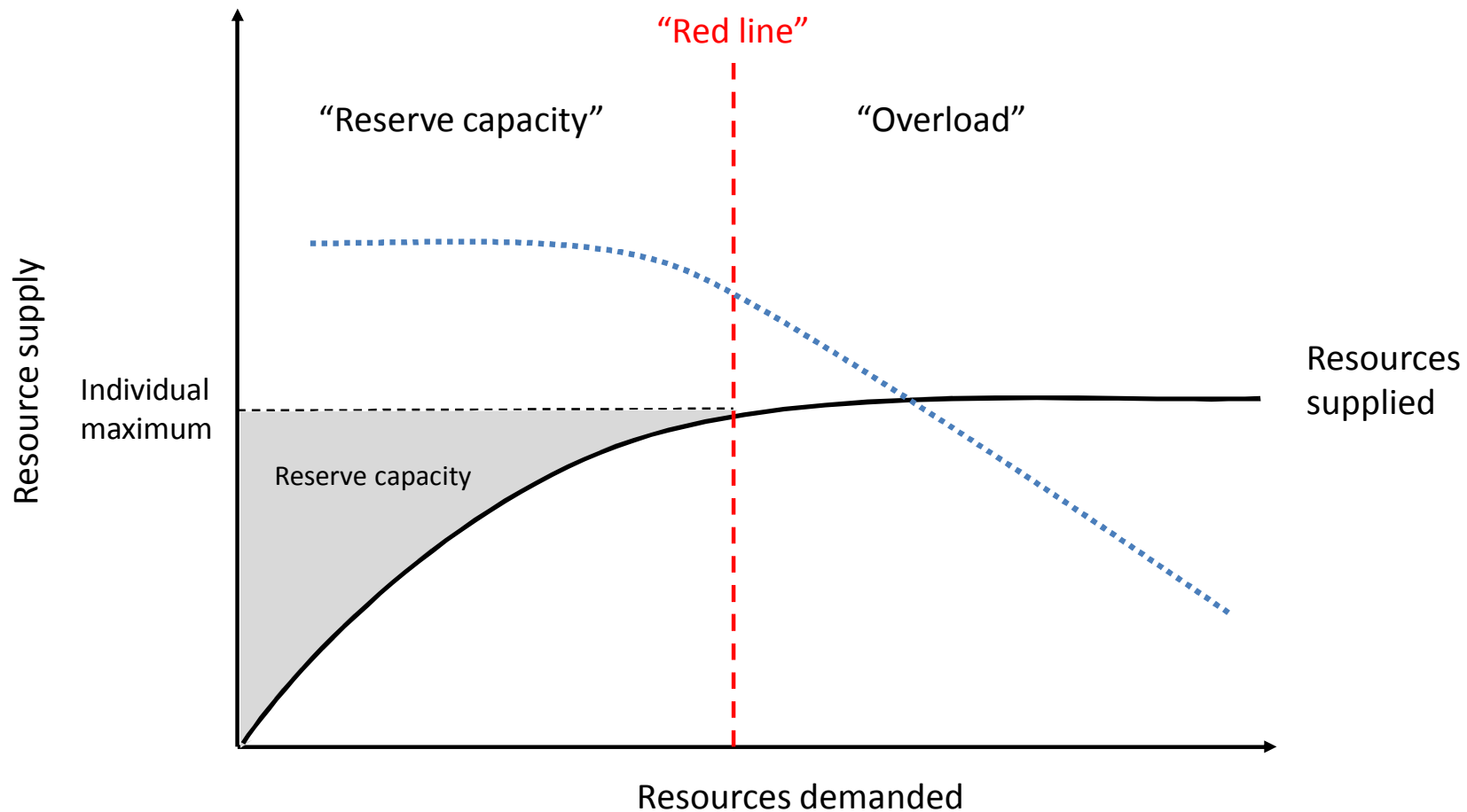


Miller, George A. (1956)

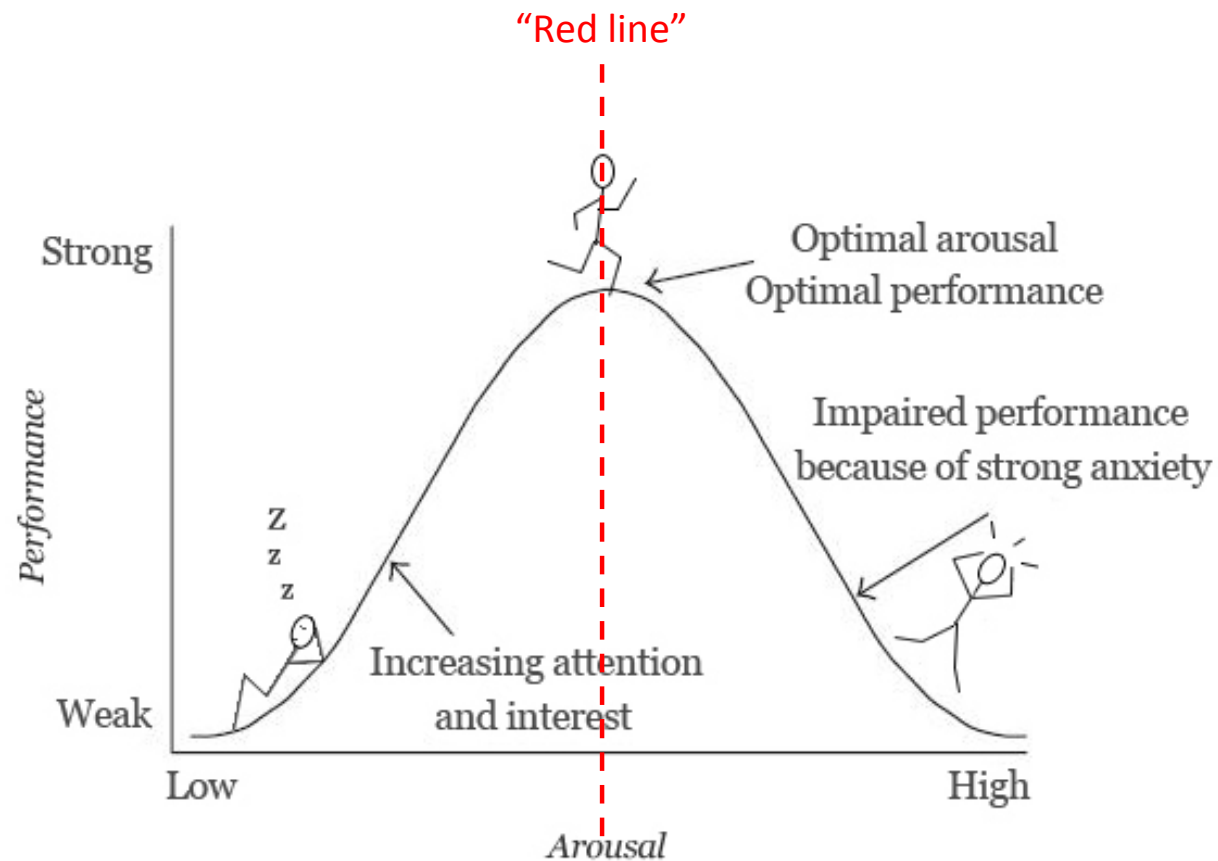
The Magical Number Seven, Plus Minus Two: Some Limits on Our Capacity of Processing Information,

The Psychological Review, vol. 63, pp. 81-07

Task resource demand vs resources supplied and performance

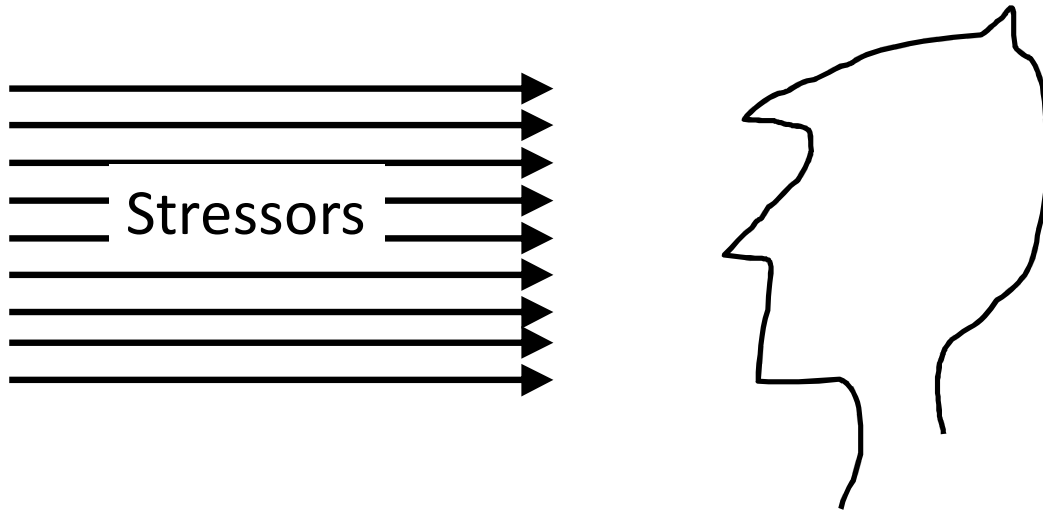


Christopher D. Wickens, Justin G. Hollands, Raja Parasuraman, & Simon Banbury. (2012). "Engineering Psychology & Human Performance (4th Edition)". Pearsons. p. 348

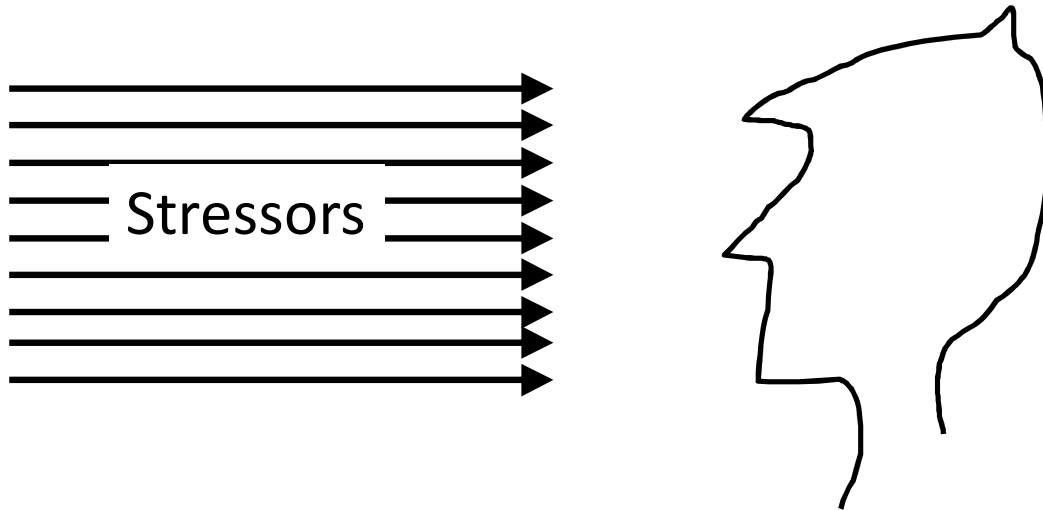


The Yerkes–Dodson law

Stress Component Effects (passing “Red line”)

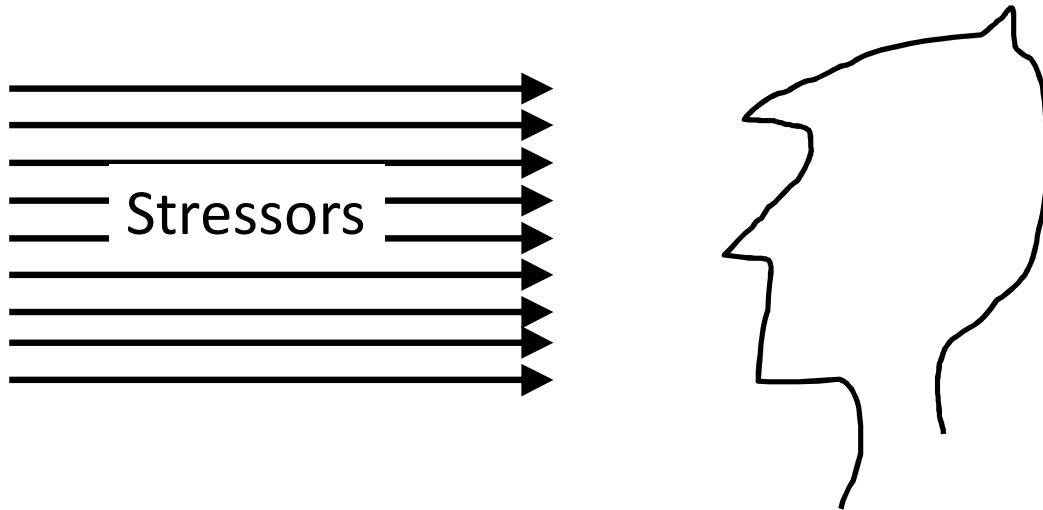


Stress Component Effects (passing “Red line”)



- Selective attention (“tunnelling”)
- Selective attention (distraction)
- Working memory loss
- Preservation (confirmation bias)
- Coping

Stress Component Effects (passing “Red line”)



Coping techniques

- Recrute ressources (“try harder”)
 - Remove stressors
 - Strategic adaptation (change goals)
 - Do nothing
-
- Selective attention (“tunnelling”)
 - Selective attention (distraction)
 - Working memory loss
 - Preservation (confirmation bias)
 - Coping

Stress Remediation

- Environmental solutions (e.g. remove noise)

Stress Remediation

- Environmental solutions (e.g. remove noise)
- Personal solutions (e.g. training)

Stress Remediation

- Environmental solutions (e.g. remove noise)
- Personal solutions (e.g. training)
- Design solutions:
 - Decluttering (attention narrowing)
 - Organisation of information (unsystematic scanning)
 - Move from digital to graphic presentation (time stress)
 - Minimize need to keep info in memory
 - Compatibility between response and mental model (Ecological Interface Design)
 - Design of emergency procedures
 - Avoid arbitrary symbols

Stress Remediation

- Environmental solutions (e.g. remove noise)
- Personal solutions (e.g. training)
- Design solutions:
 - Decluttering (attention narrowing)
 - Organisation of information (unsystematic scanning) **EXAMPLE**
 - Move from digital to graphic presentation (time stress)
 - Minimize need to keep info in memory
 - Compatibility between response and mental model (Ecological Interface Design)
 - Design of emergency procedures
 - Avoid arbitrary symbols

Memorize for 2 seconds these 11 characters

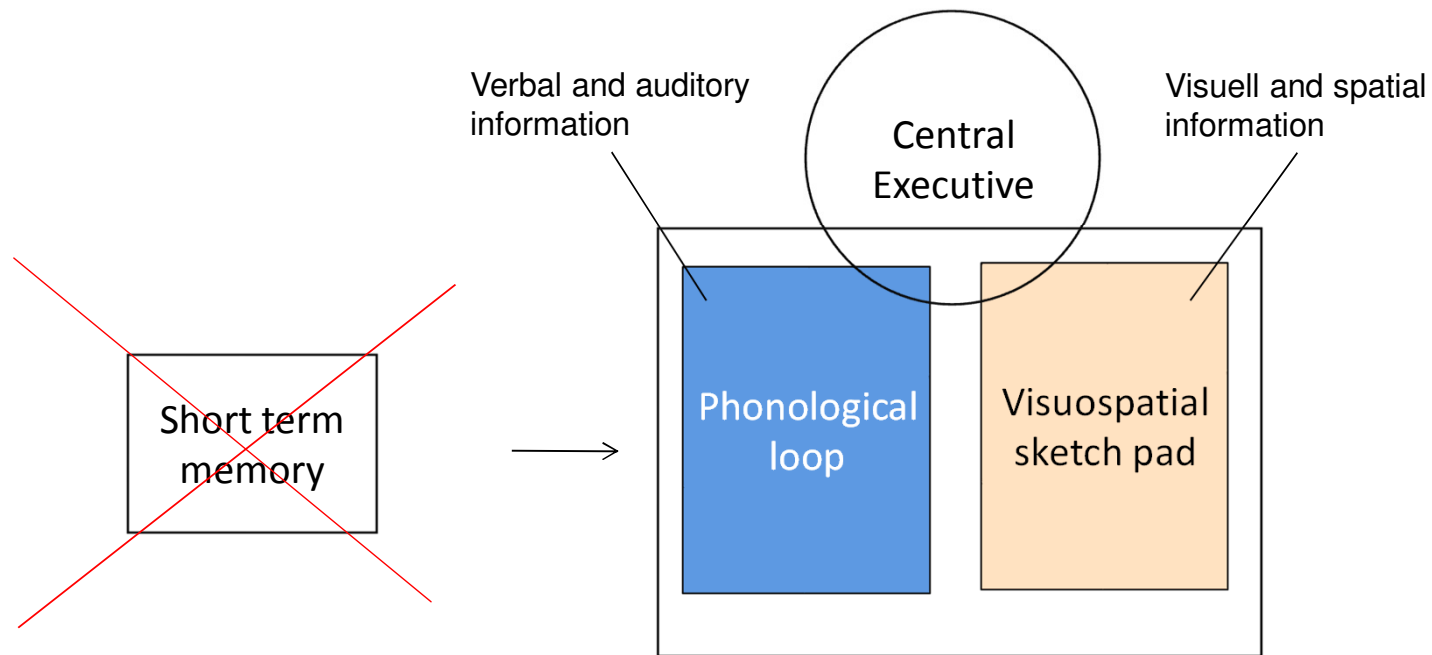
thomas.porathe@ntnu.no

eNAV IALA IHO

”Chunks” (Miller, 1956)

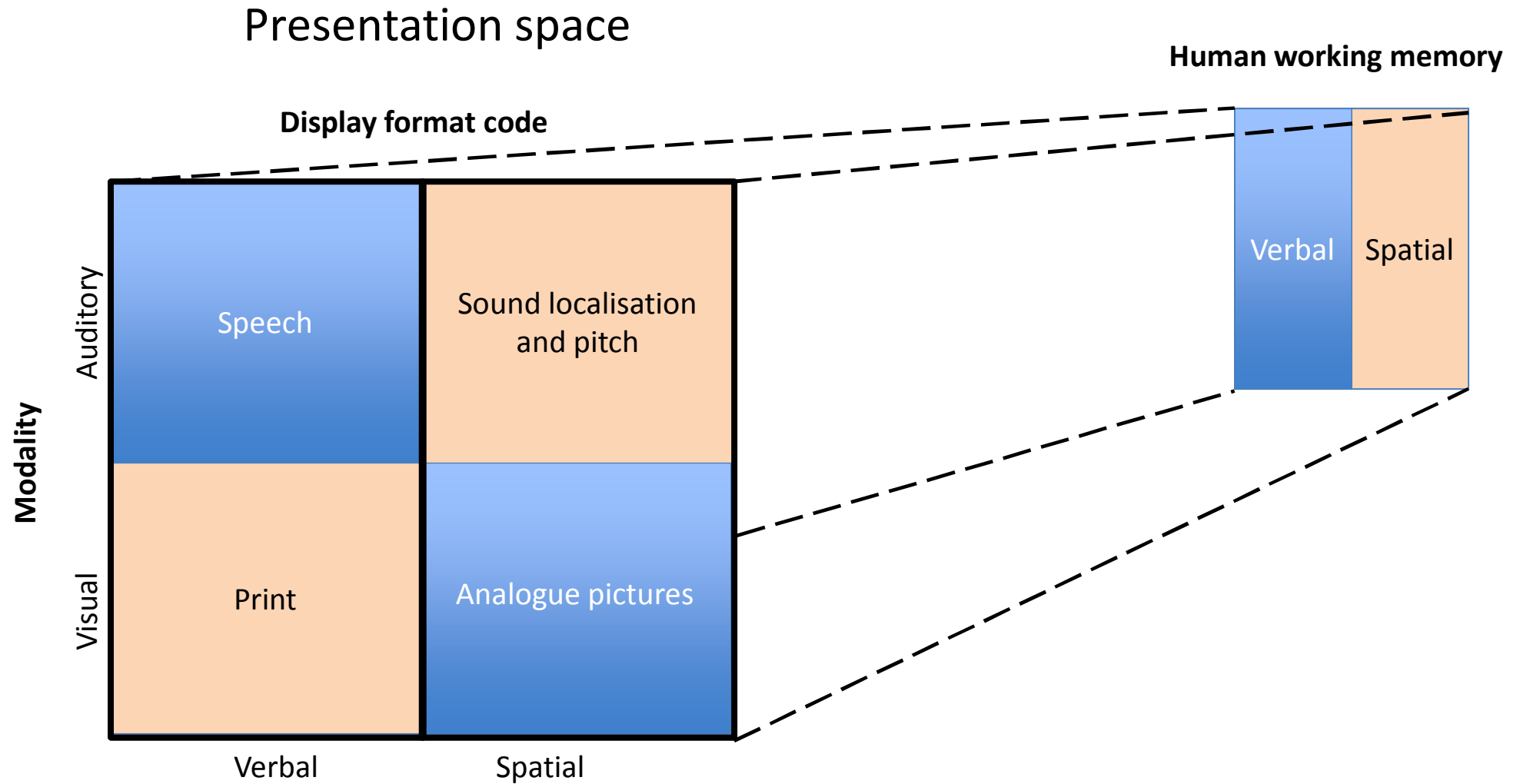
Integration

Miller, George A. (1956) The Magical Number Seven, Plus Minus Two: Some Limits on Our Capacity of Processing Information, *The Psychological Review*, vol. 63, pp. 81-07



Working memory model (Baddeley & Hitch, 1974)

Baddeley, A.D., & Hitch, G. (1974). Working Memory. In G. Bower (Ed.) Recent advances in learnings and motivation (vol. 8). New York: Academic Press

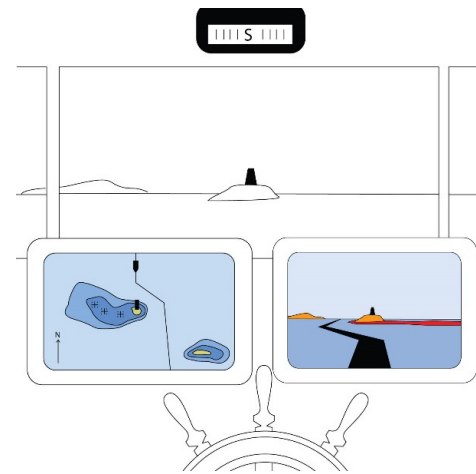


Wickens et al. (2013) Engineering Psychology and Human Performance (4th ed.). Pearson, p. 202

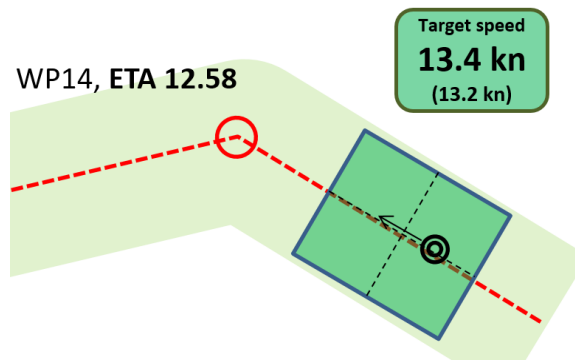
*e-navigation is the harmonized collection, integration, exchange, **presentation** and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.*

Trondheim e-Navigation Lab

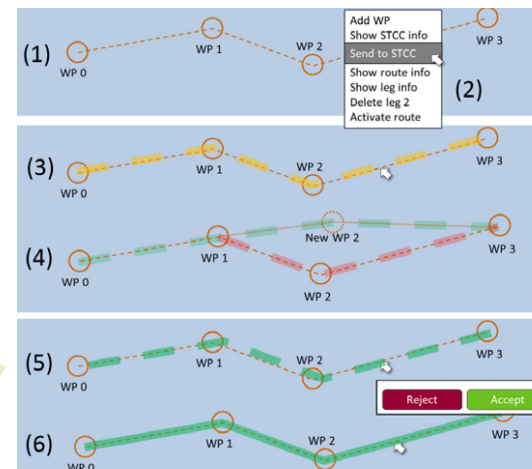
Information Design and Portrayal
Maritime Human factors
Work Load Analysis



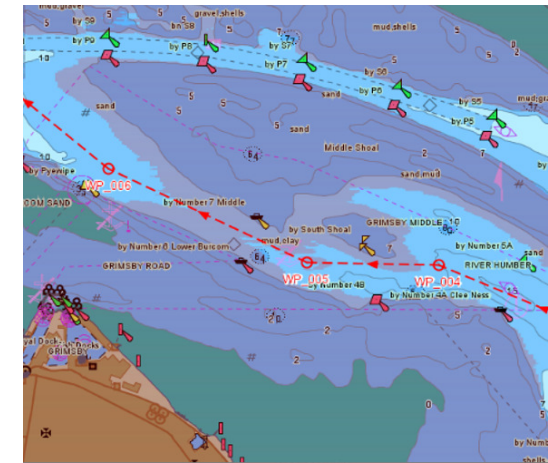
Egocentric navigation
in 3D charts



Moving Have –visualisation
of own ship voyage plan



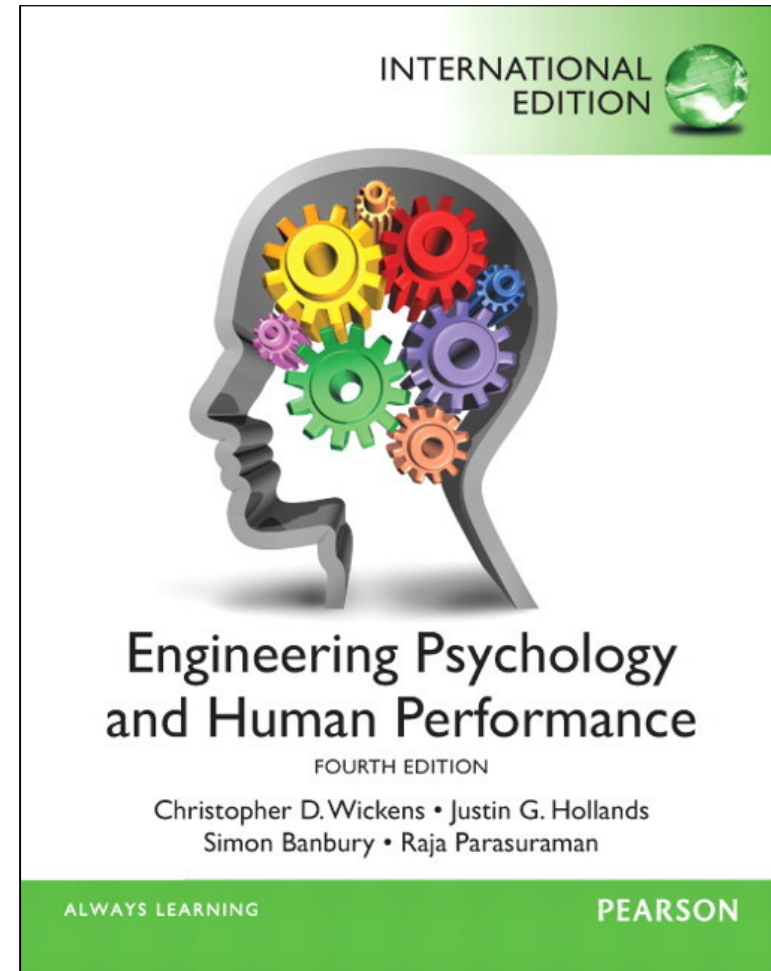
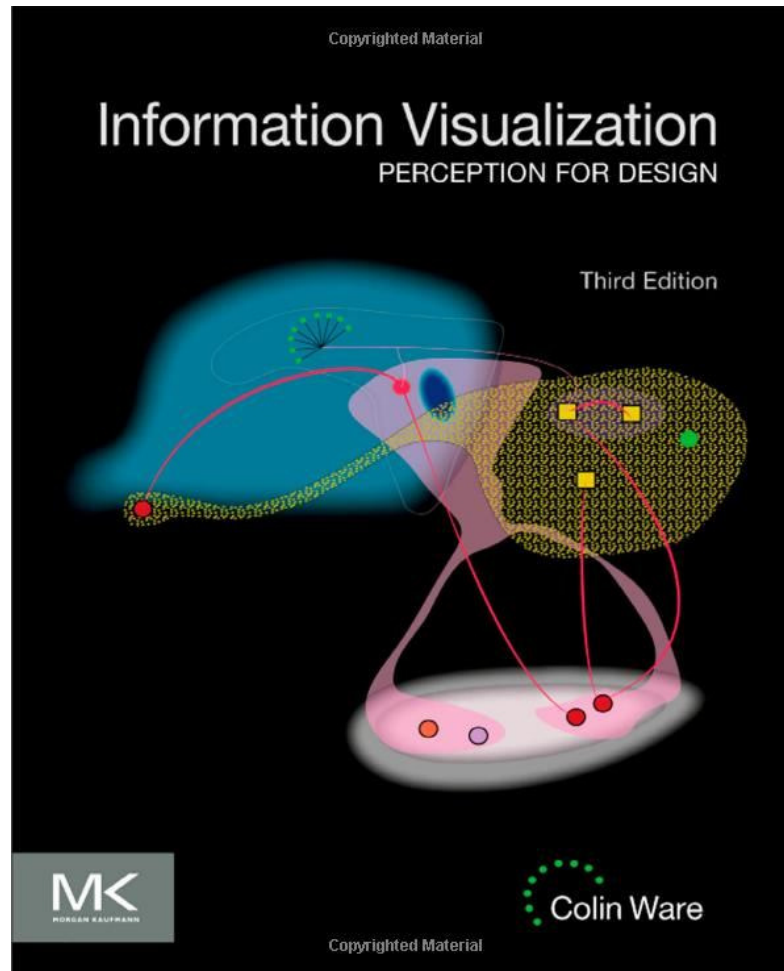
Portrayal of route exchange
procedures



Dynamic NoGo areas

Trondheim e-Navigation Lab

Information Design and Portrayal
Maritime Human factors
Work Load Analysis



thomas.porathe@ntnu.no