

Human Factors Considerations in Diversity

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Different Aspects

- Human Factors in the design process of diverse components
 - e.g. teams developing diverse software versions
- Human Factors in operational diversity
 - e.g. human as a back-up of an automatic system
- Human Factors in maintenance of diverse systems
 - e.g. improved reliability of a diverse sensor system -> transparent to the user?

Operational Diversity

- Humans are an integral part of operational redundancy and diversity
- Redundant checking
 - e.g. double-checking of maintenance results
- Human as a diverse channel
 - e.g. human monitoring different parameters than other sensors
- Human as part of a diverse channel
 - e.g. human triggering a diverse hardware shutdown after failure of an automatic software shutdown

Important Aims

- Understand redundancy & diversity in terms of human involvement
- Understand implications to potential human sources of redundancy and diversity when introducing new technology
- Understand effects of maintenance of diverse systems on humans: how does this affect diversity?

Example: Operational Diversity

- Therapy machine in one room, physician in other room operating machine, audio link to patient
- 2 diverse sensors reading two different attributes
 - Independent triggering of software shutdown
- Human monitoring sensors' readings
 - Independent triggering of software shutdown
- Human attending to vocal exclamations of patient
 - Independent triggering of software shutdown
- Human triggering hardware shutdown in case software shutdown in any of the above cases should fail.

Example: Maintenance (1)

- Maintenance of software shutdown -> increased reliability
- Potential effect: human relying more on software shutdown
- Potential implication for assumptions about diversity of software and hardware shutdown

Example: Maintenance (2)

- Maintenance of sensors: shift in sensitivity range to catch more failures
- Potential effect: sensors exhibit a different failure behaviour, human operator may not be attentive in those cases where sensors now fail when previously they did not
- Potential implications for assumptions about sensor-human diversity

Considerations for MDS Work

- Investigate nature and use of diversity in socio-technical systems: taxonomy?
- Classification of maintenance-induced changes?
- Investigate impact on diversity
- Link to management of change process

