



## Cognitive Task Analysis Methods

- Hierarchical task analysis (HTA)
- Cognitive allocation of function (extension of HTA)
- Critical decision method (CDM) (an update and extension of the critical incident technique)
- Applied cognitive work analysis (ACWA)

## Error Analysis Methods

- Can we predict human error?
  - Systematic human error reduction and prediction approach (SHERPA) – partly based on HTA as a description of normative, error-free behavior to consider what may go wrong in task performance. At the core of SHERPA is a task and error taxonomy.
  - Task analysis for error identification (TAFEI) - based on the idea of rewritable routines. TAFEI can be used for predicting, representing, and analyzing the dialogue between people and products. TAFEI has two forms of output.
    - Predicted errors from human interaction with a device, based on the analysis of transition matrices.
    - Task flow model based on mapping human action onto state–space diagram.

## Workload and Situational Analysis Methods

- Can we measure mental workload?
- Mental workload is a multidimensional concept incorporating task and performance demands together with operator skill and attention.
- Both mental overload and mental underload are associated with performance decrements
- Task design must keep workload within an optimal performance zone, where workload is neither too high nor too low.
- Measures of mental workload include measures of primary and secondary task performance, and physiological, psychophysiological, and subjective measures.

## Workload and Situational Analysis Methods

- Multiple resources time-sharing model (MRTSM) - developed from Wickens's (1992) multiple resources theory into a practical approach for predicting workload in situations where multiple tasks are performed concurrently.
  - MRTSM distinguishes between perceptual modalities, processing stages, processing codes, and responses. The methodology can predict multiple task performance and overload but it cannot predict mental underload on tasks.
- Multimodal critical path analysis (mmCPA) method has its roots in:
  - CPA - based in project management literature
  - Multimodality of people is based in a human factors literature.

## Workload and Situational Analysis Methods

- Keystroke-level model (KLM) - a simple additive method for calculating response times in computing tasks. Does not take account tasks performed in parallel (i.e. when they use different modalities and draw upon different resources).
- Situational awareness global assessment technique (SAGAT) measures three levels of awareness (i.e., perception of elements, comprehension of the situation, and prediction of future status) by presentation of recall-probe

questions when the task is interrupted. The recall probes are developed using an HTA-type technique so that operator goals can be elicited. From this, questions at each of the three levels of awareness can be developed.

## Conclusions

- Selection of the appropriate set of CTA methods requires that the analyst ergonomist carefully define the purpose of the analysis.
- Most studies are likely to involve a combination of CTA methods.
- A pilot study should be used to determine the methods most likely to yield the kind, and form, of data required.