On the inevitable intertwining of Systems and Software Requirements

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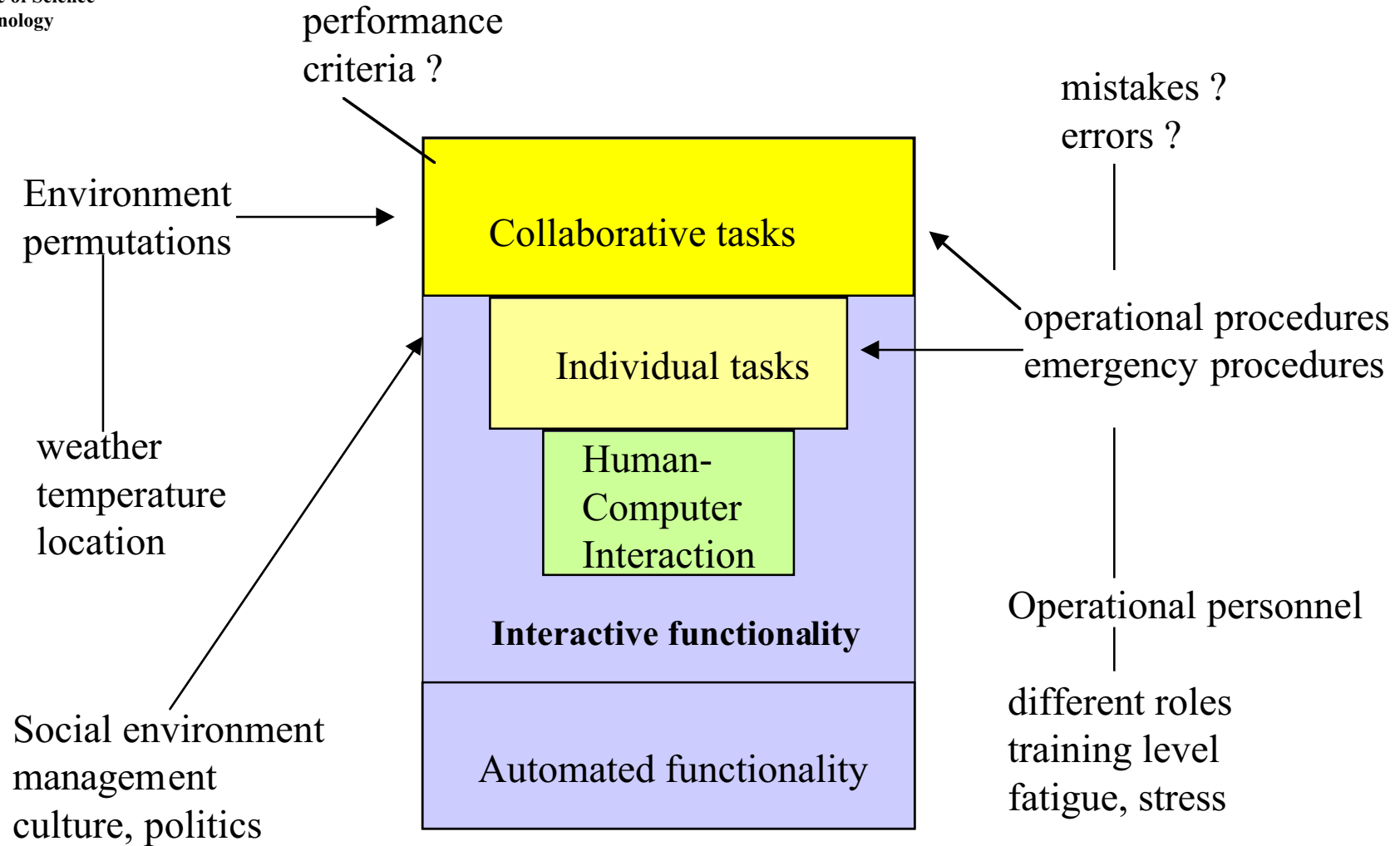
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Requirements & Systems complexity

Determinability of System Requirements
some problems...

- Moving world problem
- users agreeing requirements only when they see them reified in design
- change in the real world so requirements evolve by the time the design
  has been implemented

- Closed world problem
 - can all the domain properties that influence requirements be identified ?
 - and if so can their values be ascertained so their effect can be modelled ?

So specifying a machine (s) to satisfy requirements (r) when placed in a world
 described by domain properties (d) is limited by our ability to model

(a) causal domains
(b) biddable or controllable domains

Systems Requirements
some solutions ?

- Acknowledge that many requirements are socio technical
 i.e. the solution is a human-machine complex

- Adopt iterative requirements refinement and validation by testing
solutions with users

- Investigate probabilistic modelling of behaviour and performance
   in complex domains to
   - help evaluate designs without expensive user testing
   - attempt to predict the domain properties than may pertain in situation (x),
and hence requirements for a machine

- Investigate scenarios as a bridge between reality and abstract models to
   -create models and elicit requirements
   -provide test data to validate models/ requirements specifications

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Some approaches in the SIMP project
EPSRC System Integration programme

- BBN (Bayesian Belief Nets) modelling of domains:
  human operational performance, machine reliability,
  environment factors.

- Scenario based requirements refinement and system assessment
  - taxonomy of scenarios at different levels- strategic, tactical,
    operational, etc
  - investigating the coverage problem- necessary and sufficient scenarios-
    by dependency analysis between scenarios at different levels

- Methods and tools for running scenarios against complex models of system
  to assess performance (and requirements) trade offs.