PSYCHOLOGY OF DECISION MAKING IN PHA

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OVERVIEW

- PHA teams do not always make decisions rationally
- Psychological factors influence decisions
  - Can hinder rationality
- Heuristics and cognitive biases play a major role
  - Often unrecognized
  - Erroneous decisions can result
- Psychological factors must be managed

KEY DECISIONS MADE IN PHA

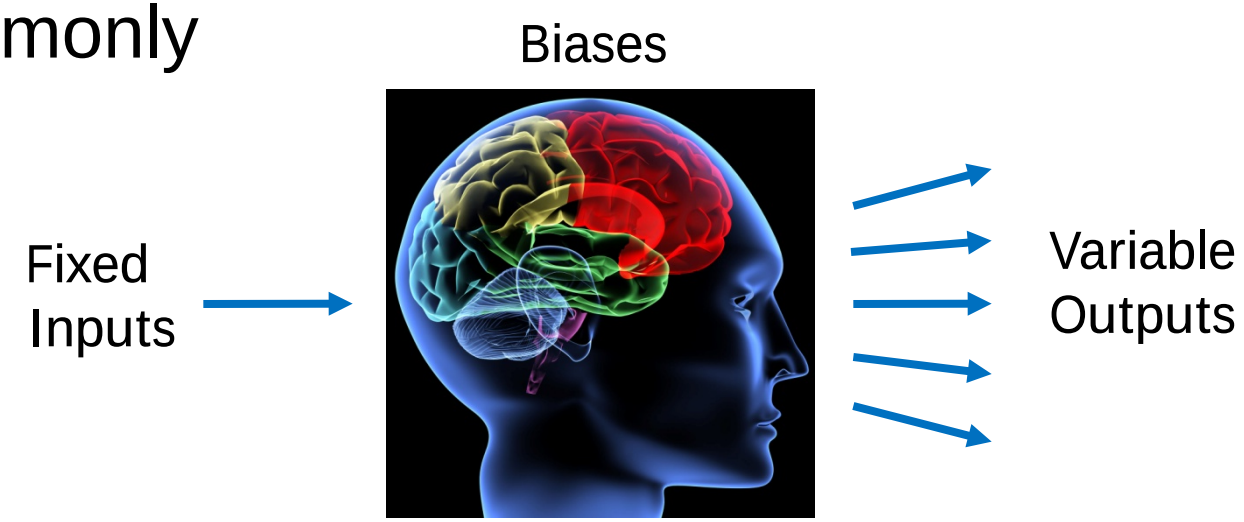
- Which aspects of design intent to study?
- What design representations should be consulted?
- Which deviations from design intent should be addressed?
- Which initiating events are credible as causes of hazard scenarios?
- What multiple failures are credible?
- What consequences occur for hazard scenarios?
- What safeguards are present, which can be credited for each hazard scenario, and how much credit should be taken?
- What enablers apply to hazard scenarios?
- What is the severity and likelihood of hazard scenario consequences?
- What human factors issues affect hazard scenario risks?
- What siting issues affect hazard scenario risks?
- What recommendations are possible to reduce risk?

IMPORTANCE OF DECISIONS

- Decisions influence:
  - Completeness of scenario identification
  - Risk tolerated for a process
- Decisions are affected by psychological factors

COGNITIVE BIASES

- Unconscious, automatic influences on human judgment and decision making. Can:
  - Cause reasoning errors
  - Distort perceptions, interpretations, and judgments
  - Produce irrational decisions
- Occur commonly



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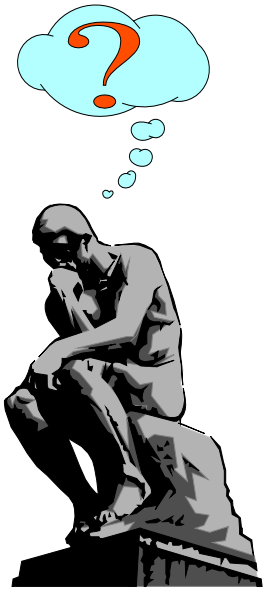
HEURISTICS

- Simple rules governing judgment or decision making
- Used by people when facing complex problems or incomplete information
- Benefits
  - Speed decision making
  - Simplify the process
  - Reduce cognitive effort
- Frequently used
- Can lead to systematic errors and erroneous decisions



EXAMPLES OF COGNITIVE BIASES

- Affect
- Anchoring
- Availability
- Bandwagon effect
- Confirmation and other forms of bias
- Conformity and peer pressure
- Culture
- Deference to authority
- Framing effect
- Group polarization
- Groupthink
- Habits
- Memory
- Mindsets
- Oratorical skill
- Representative heuristic
- Satisficing

ANCHORING

- Tendency to rely too heavily on the first piece of information offered
- Anchor is used to make subsequent judgments
  - Adjust away from the anchor
  - Bias towards the anchor

ANCHORING – EFFECTS ON PHA

- Facilitator suggestions may serve as anchor points for the team and bias their views
  - Deviations to consider
  - Credibility of scenario causes
  - Scenario risk estimates
- Facilitator should not express views until the team has expressed their views
- Team members may also offer anchors
  - Use objective data and information to validate team suggestions

AVAILABILITY HEURISTIC

- Ease with which a particular idea can be brought to mind
- People make a judgment based on how easily they can think of a similar example

AVAILABILITY HEURISTIC– EFFECTS ON PHA

- Selection of parameters in HAZOP studies
  - Novice team members may have no examples to call upon
  - Experienced team members will be limited by their experience
- Identification of single and multiple failures
  - Team members may dismiss the possibility of multiple failure events
    - Cannot easily think of examples

AVAILABILITY HEURISTIC– EFFECTS ON PHA (CONTD.)

- Estimation of scenario likelihoods
  - Events that can be brought easily and vividly to mind produce overestimates
  - More routine events that are harder to bring to mind tend to produce underestimates

SATISFICING

- People make judgments that are good enough for their purposes
  - Could be improved
- People search for one good reason for making a decision
  - Stop searching for further information when one has been found
- Occur because of limits imposed on decision makers
  - Lack of sufficient cognitive resources
  - Cognitive limitations
  - Time limitations

SATISFICING – EFFECTS ON PHA

- Virtually all decisions in PHA studies may be impacted adversely by satisficing
- Principal reasons:
  - Time pressures
  - Ability of team members to maintain concentration for extended time periods
    - Performing an activity that often is viewed as boring and repetitive

SATISFICING – EFFECTS ON PHA (CONTD.)

- No acceptable minimum level of performance for a PHA study
  - Perfection is the goal
  - Will never be achieved
- Emphasize consequences of not achieving the goal
  - Team must believe their own best interests are invested in the study outcome

MITIGATION OF COGNITIVE BIASES

- Difficult to detect and override
  - Used unconsciously and automatically
- Even those aware of their existence are unable to detect bias in their decisions
- Mitigation poses challenges

WAYS TO ADDRESS COGNITIVE BIASES IN PHA

- Ensure awareness by PHA facilitator and team members
  - Detect bias in others
- Encourage teams to look not just for evidence to confirm expressed views
  - Also evidence to the contrary
- Focus team attention on differences between situations
  - Rather than similarities
- Create an environment in which dissenting views are sought and respected
- Employ a devil's advocate
  - Challenge positions of team members

CONCLUSIONS

- PHA practitioners need to understand the impact of cognitive biases
  - Can seriously impact the quality of study results
    - Hazard scenarios may be missed
    - Risks may be estimated incorrectly
    - Important recommendations may be omitted
- Guidelines are available to minimize adverse impacts