

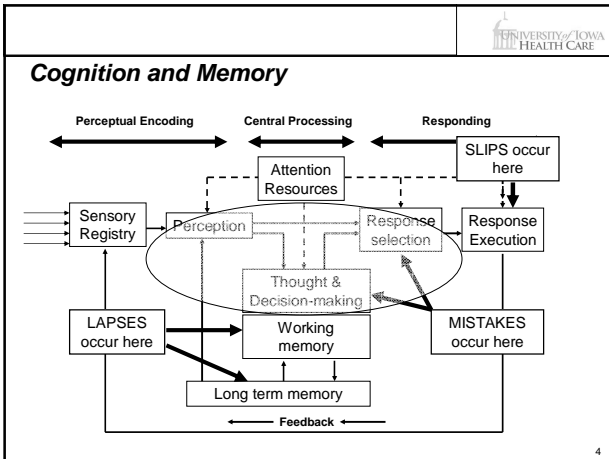

<p>Human Factors Engineering and Patient Safety Part II Decision Models, Mistakes, and Intuition</p> <p>Thomas Persoon, MS Senior Management Engineer Office of Operations Excellence University of Iowa Health Care</p>	
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<p>Disclosure</p> <ul style="list-style-type: none">● Within the past twelve months I have not had any financial relationships with the manufacturers of health care products, or any other products or publications mentioned in this presentation.	
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<p>Human Error Classification</p> <ul style="list-style-type: none">● Slip: A failure in the execution of an action sequence<ul style="list-style-type: none">– Externally observable● Lapse: A failure of memory<ul style="list-style-type: none">– Often covert, not observable● Mistake: A failure in judgment or decision-making	
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Feedback control

- Feedback control – stored problem-solving routines don't work, brain needs to work "on-line" and consciously process additional information to find solution
- Knowledge-based errors happen when this control mode is in use
- These knowledge-based errors are often decision errors

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Analytic Decision Model

- Define and analyze the problem/decision
 - Specific criteria
- Determine alternative solutions
- Evaluate solutions/options based on a set of common criteria
- Compare solutions/options
- Select most favorable solution/option
- Implement

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What is the problem with the analytic model?

- People don't actually use it
- Not suited for rapid decision-making or decision-making under stress
 - Great tool for buying a new house or car
 - Not as great under "battleground" conditions

This session's objectives

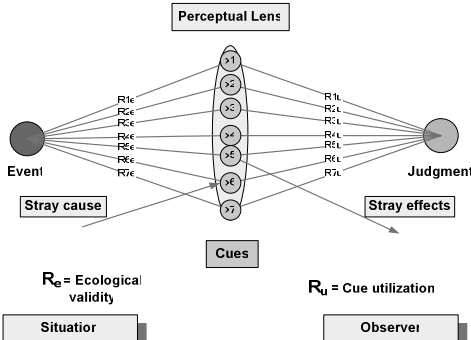
- Describe and understand the Recognition-Primed Decision (RPD) model, including some of its historical components
- Understand how mistakes occur, using the RPD model
- Discuss some strategies for preventing or mitigating mistakes in the health care environment

6 applicable models

- Brunswik's Lens
- Schon's Reflective Practitioner
- Dreyfus model of skills acquisition
- Rasmussen's SRK model of cognitive control
- Endsley's situation awareness concept
- Klein's Recognition-Primed Decision model

These models are complementary and congruent!

Brunswik Lens Model (Cooksey Adaptation)



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Cue example

- What is smoke?
- Ecological validity – you have smoke if something is on fire
 - Probability of smoke = fire
- Functional validity – if I sense smoke, is there a need to take action because there is a fire?
- Cue utilization – Do I recognize the cue and take action?
 - Probability of smoke => action taken

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Schon's Reflective Practitioner model

- Effective professional practice is characterized by the professional having a "conversation with the situation".
- Recognition that situation is dynamic (changing)
- "Conversation" involves
 - Recognizing and receiving cues
 - Querying the system to establish ecological validity of cues
 - Querying the system to test the effectiveness of the proposed response

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Characteristics of the reflective practitioner

- Lets the situation unfold in its own time frame
- Asks open-ended questions; listening is most important
- View themselves in the video – then replays it to learn more

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What is competency?

Incompetence: No-can-do
Competence: Know: Knowledge required to perform at the desired level
Can: Ability to perform the tasks required
Do: Does the tasks in practice with the expected knowledge and outcomes

Errors DO NOT equate to incompetence

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The Dreyfus Model of Skills Acquisition

- Novice
- Advanced Beginner
- Competent
- Proficient
- Expert
- Master

Errors are made at each level, they are just different

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The Dreyfus Model of Skills Acquisition

- Novice: medical student
 - Context free rules (cookbook approach), relatively inflexible behavior, beginning to gain experience
 - *Unconsciously Incompetent; Doesn't know enough to know that they don't know enough; wants to make decisions, get in on the action*
- Advanced beginner: A graduating medical student and intern
 - *Episodic knowledge, beginning to link knowledge with experience, beginning to know when to apply and break rules, sees similarities across contexts*
 - *Consciously Incompetent; Knows enough to know they know they don't know enough; terrified of independent high stakes decision making*

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The Dreyfus Model of Skills Acquisition

- Competent: A graduating resident
 - *Knows what to do and, when, why and how to do it; can determine what is and is not important; Has a model that can be used as a starting point in most situations; Not yet fast, fluid or flexible*
 - *Consciously Competent; good knowledge, clear reasoning, good choices, safe*
- Proficient: The first years of independent practice, for some their career
 - *Readily formulates plans for care; anticipates "most likely" occurrences; recognizes departures from the expected course and modifies plans accordingly*
 - **Intuitive pattern recognition**
 - *Unconsciously Competent; fast, fluid, flexible, knowledgeable, accurate*

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The Dreyfus Model of Skills Acquisition

- Expert: Someone you call when you have a tough case.
 - *Anticipates the unusual; Has a repertoire of skills based upon experience, knowledge not easily available in textbooks (tacit knowledge)*
 - *Fluid performance, an accomplished implementer of plans, "knowledge-in-action"*
- Reflective Practitioner
 - *Proficiency with insight; judgment after reflection*

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The Dreyfus Model of Skills Acquisition

- Master: An expert who enjoys surprises
 - Publicly engages in learning from personal failures
 - Connects learning with the redesign of personal daily work
 - Embedded in context of each case.
 - Not dependent on rules
- A Wise Practitioner
 - An expert with the insight, judgment and understanding to share his limitations

Where are you in the Dreyfus model?

- Understanding where a person fits into the Dreyfus model helps understand how well they will perform in a situation requiring decision-making
- Hypothesis: Decision-making can be improved
- If the hypothesis is true
 - Do you let improvement happen by chance over time?
 - Do you explicitly train people in good decision-making techniques?

Rasmussen's SRK model

3 levels of cognitive control

- Skill-based
 - Reacting to the raw perceptual elements at an automatic, subconscious level
 - Pure stimulus-response at the neurological level
 - Requires minimal attention resources
- Example
 - Riding a bicycle
 - Steering a car

Rasmussen's SRK model

- Rule-based
 - Familiar with the task but no extensive experience
 - Recognizes cues
 - Translates cues into signs
 - Applies rules from past experience
- Example
 - Driver trainee learning to drive in snow

Rasmussen's SRK model

- Knowledge-based
 - Novel situation; no rules stored from previous experience
 - Performs analytical processing using conceptual information
 - Runs mental models as cognitive simulations in forming an action plan
- Example
 - Capt. Sullenberger landing USAir Flight 1549 in the Hudson River

Rasmussen's SRK model

- An individual can switch between the SRK modes based on familiarity with the task
- Allows "multi-tasking" – i.e. driving a car while trying to decide how to avoid an unexpected detour
 - Novice has to pull off road and look at map
 - Proficient/expert pictures the alternate route and makes rapid decisions about route change
- Limitations on attention resources

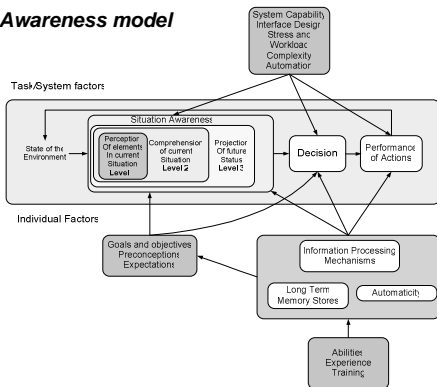
Endsley's situation awareness concept

- Situation awareness is a state of knowledge pertaining to a dynamic environment
- 3 levels
 1. Perception of environmental elements
 - USAir Flight 1549: loss of power, low altitude over populous area
 2. Comprehension of current situation
 - Airspeed vs distance from nearest runway
 3. Projection of a future state
 - Unpowered landing – ground vs water?

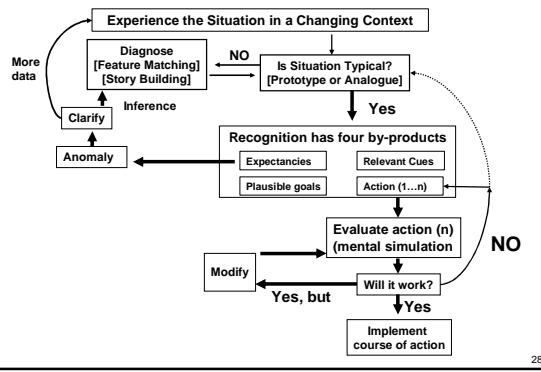
Endsley's situation awareness concept

- Situation awareness incorporates elements of space and time
 - Team as well as individual awareness
 - What am I doing, what are others doing
- Incorporates concepts of working memory and long term memory
- Distinguishes between "state" of situation awareness and "process" of gaining awareness

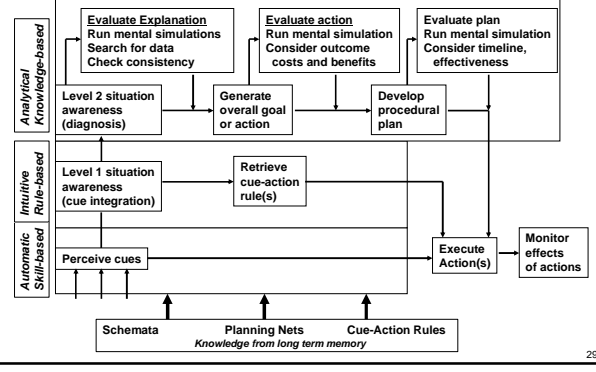
Situation Awareness model



Recognition-primed decision model (RPD)





Integrated information processing model




What does this all mean?

- Errors can occur at any step in the process
- Knowing how the process works allows us to understand the causes of errors
- Understanding the causes of errors allows us to make intelligent interventions

	
<p><i>Improving Patient Safety</i></p> <p>Preventing mistakes (errors in judgment)</p>	
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<p><i>Strategies to reduce mistakes</i></p> <ul style="list-style-type: none"> ● Increase situation awareness ● Improve cue utilization ● Develop and refine intuitive decision making 	
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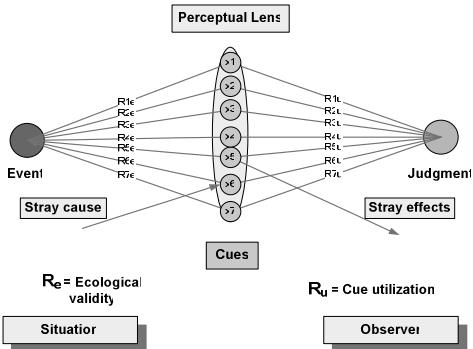
	
<p><i>Improving situation awareness</i></p> <ul style="list-style-type: none"> ● View the situation as a team activity ● Improving the situation awareness of the team improves the awareness of the individuals ● Team situational awareness – SBAR 	
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SBAR

- **Situation**
 - What is going on?
 - **Background**
 - How did we get here?
 - **Assessment**
 - Here's what I think the problem is
 - **Recommendation**
 - Here's what I think should be done
- Reference (need IHI username/password)
- [Institute for Healthcare Improvement: SBAR Technique for Communication: A Situational Briefing Model](#)

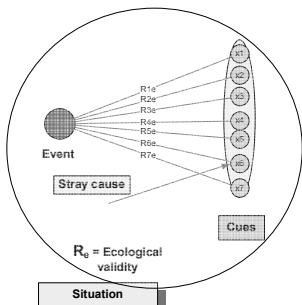
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Brunswik Lens Model (Cooksey Adaptation)



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Improve the lens

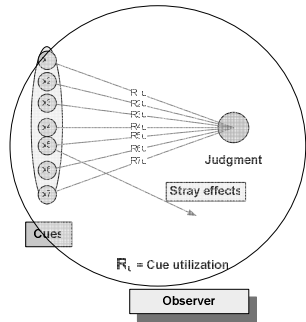


- **Strengthen ecological validity**
 - Offer evidence-based tests
 - Provide well-defined reference ranges
 - Population specific
- **Reduce stray causes**
 - Avoid information overload
 - Design "pull" information systems

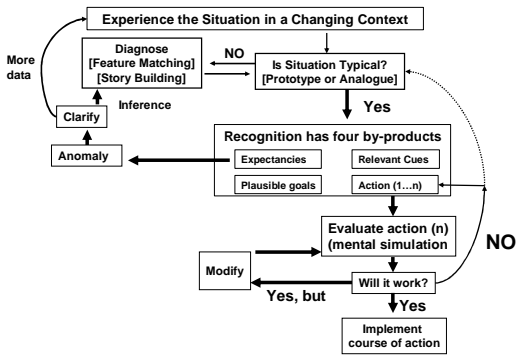
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Improve the lens

- Strengthen cue utilization
 - Choose “critical value call” ranges carefully
 - Carefully utilize information system features
- Reduce stray effects

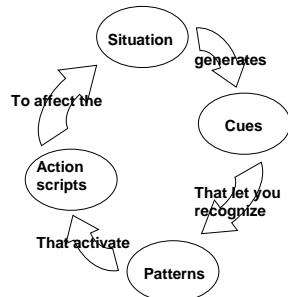


Recognition-primed decision model (RPD)

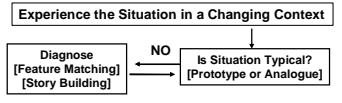


RPD relies heavily on “intuition”

- Intuition is the way we translate our experiences into judgments and decisions
- Uses patterns to recognize what is going on and to recognize the typical action script with which to react



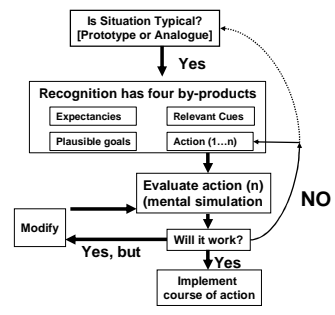
Recognition-primed decision model (RPD)



- Recognizing the **changing context**
 - Concept of delta checks
- Reinforcing pattern recognition
 - Format of report
- Helping to build the story
 - Is feature matching and story-building easy?
- Facilitating the conversation with the situation

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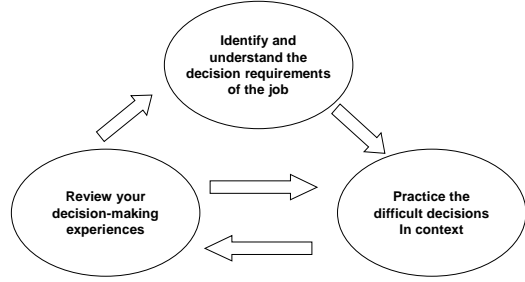
Recognition-primed decision model (RPD)



- Identifying problems
- Learning to make the decision
- Becoming an intuitive decision-maker

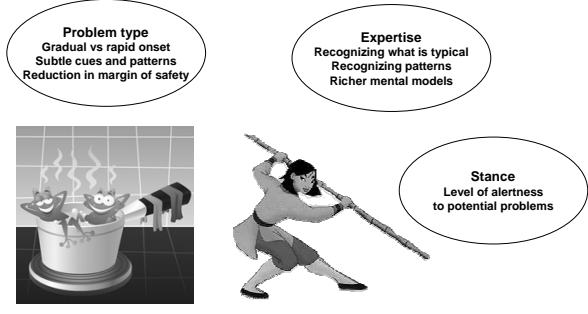
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Basic elements of Intuition Skills Training



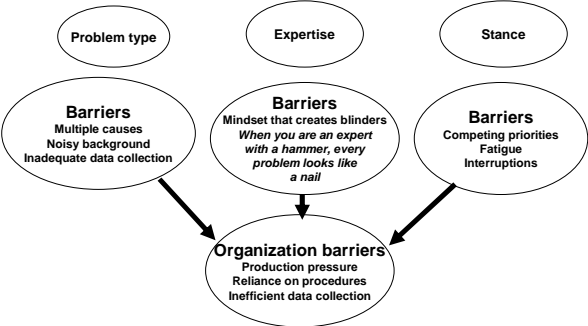
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Elements of the problem detection process



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Barriers to effective problem detection



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Identifying and understanding decision requirements

Decision requirements table		
Identify a critical, difficult, and frequent decision or judgment		
What makes this decision difficult?	What kinds of errors are often made?	How would an expert make this decision differently from a novice?

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Practice decision-making in context

- Case study
 - Solo activity
 - Quiet environment
 - No competing tasks
 - Information resources available
 - No time pressure
- Decision games
 - Team activity
 - Done in a “near-live” environment
 - Competition for attention resources
 - Information resources limited
 - Short deadline

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Traditional case studies vs decision game

- Case study
- Instructor knows the “right” answer
- Focus on recognizing the cues and following the pathway to the right answer
- Goal is to get the right answer
- Decision game
- Better or poorer answers
- Instructor is a facilitator
 - Subject matter expert (SME)
 - Trained as a facilitator
- Goal is to practice decision-making in context

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Creating decision games

- Identify a personal example
- Give the game a descriptive name
- Describe the history of events leading up to the decision
- Create a scenario that is an account of the dilemma; includes
 - Situation
 - Environment
 - Resources
- Prepare visual representations
 - Diagrams
 - Physical objects

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Decision games

- Leadership
 - If unit leaders are part of the decision, leaders must be players in the game
- Facilitator/SME
 - Subject Matter Expert to guide the game
 - Trained in small group facilitation
 - Role is not to lead group to a decision, but to help them discover how to make the decision
 - Conducts feedback session after game is completed
- Virtual games

Other tools to gain decision-making experience

- Pre-mortems
 - Imagine a fiasco
 - Generate reasons for failure
 - Consolidate the lists
 - Revisit the plan
 - Periodically review the list
- Decision post-mortems
 - Storytelling
 - Communities of practice
 - Quality Quadrant

Quality Quadrant

Kudos to	What worked well
Problems/Opportunities	Suggestions for Improvement

"In-situ" simulation – the next step

- Actual physical location
- Realistic scenario
- Simulated patient (human or mechanical)
- Often video-recorded
- Post-mortem analysis with entire team
 - Facilitator-led
 - Discussion of decisions and actions

Stance

- Stance is the mental state that allows one to better recognize and interact with a situation
- Good decision-making requires an ACTIVE stance
- Keys to maintaining an active stance:
 - Reduce fatigue
 - Reduce distractions
 - Expect the unexpected
 - If your reaction to an event is surprise, it is a cue to start asking more questions
 - "Something is wrong with this picture"
 - ask WHAT and WHY?

Questions?

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