Decision Making in Uncertainty
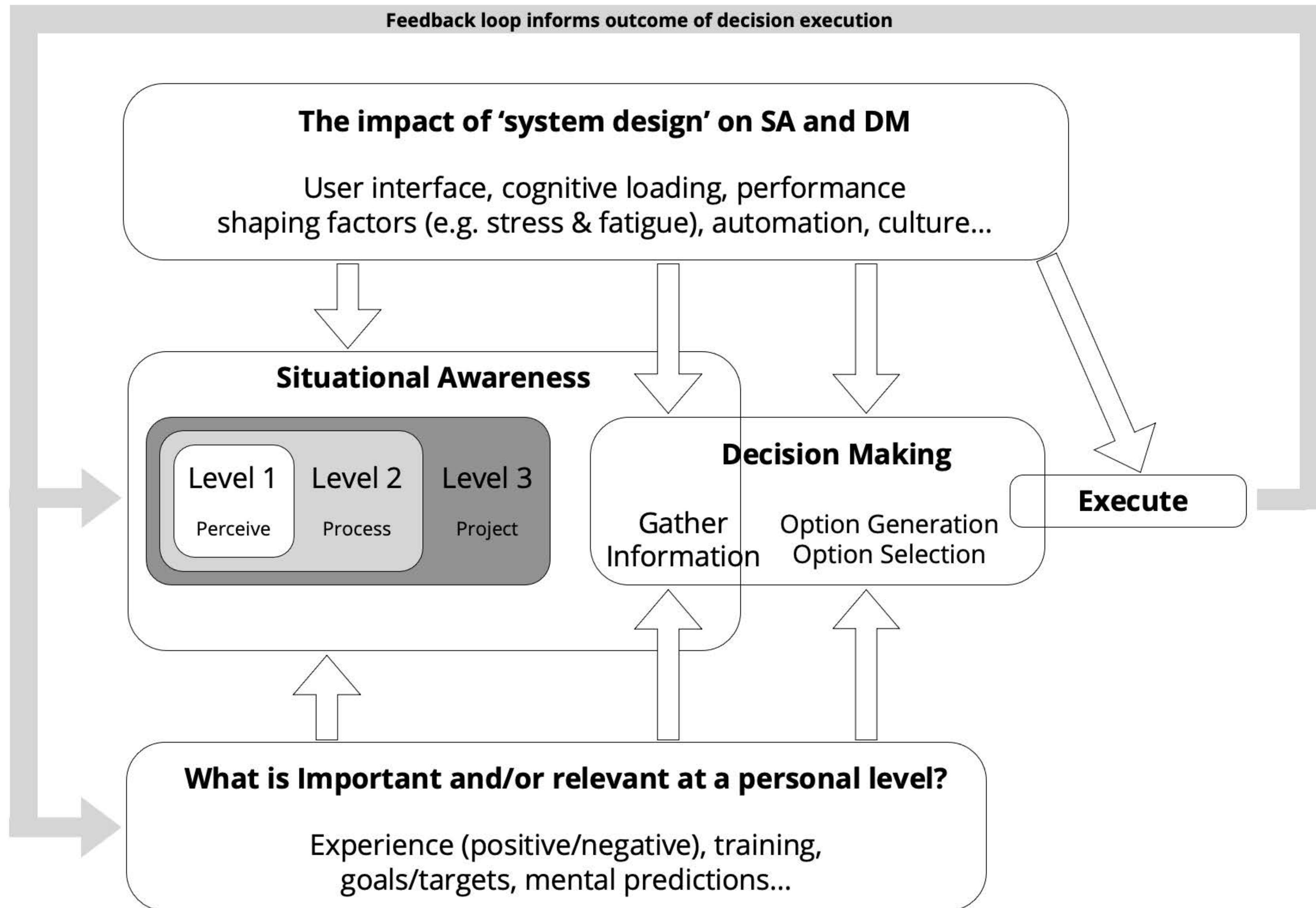
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"The job of any human is to be able to predict with 100% accuracy what is going to happen next. Sadly though, this is an utterly impossible task so instead the human has to make a probability/possibility trade-off where they gamble on the million and one things that can possibly happen next against the one or two things that will probably happen next."

Duncan MacKillop

Feedback loop informs outcome of decision execution

The impact of 'system design' on SA and DM

User interface, cognitive loading, performance shaping factors (e.g. stress & fatigue), automation, culture...

Situational Awareness

Level 1	Level 2	Level 3
Perceive	Process	Project

Decision Making

Gather Information

Option Generation
Option Selection

Execute

What is Important and/or relevant at a personal level?

Experience (positive/negative), training, goals/targets, mental predictions...

Based on Endsley, M. (1995). Toward a theory of situation awareness in dynamic systems, 37(1).
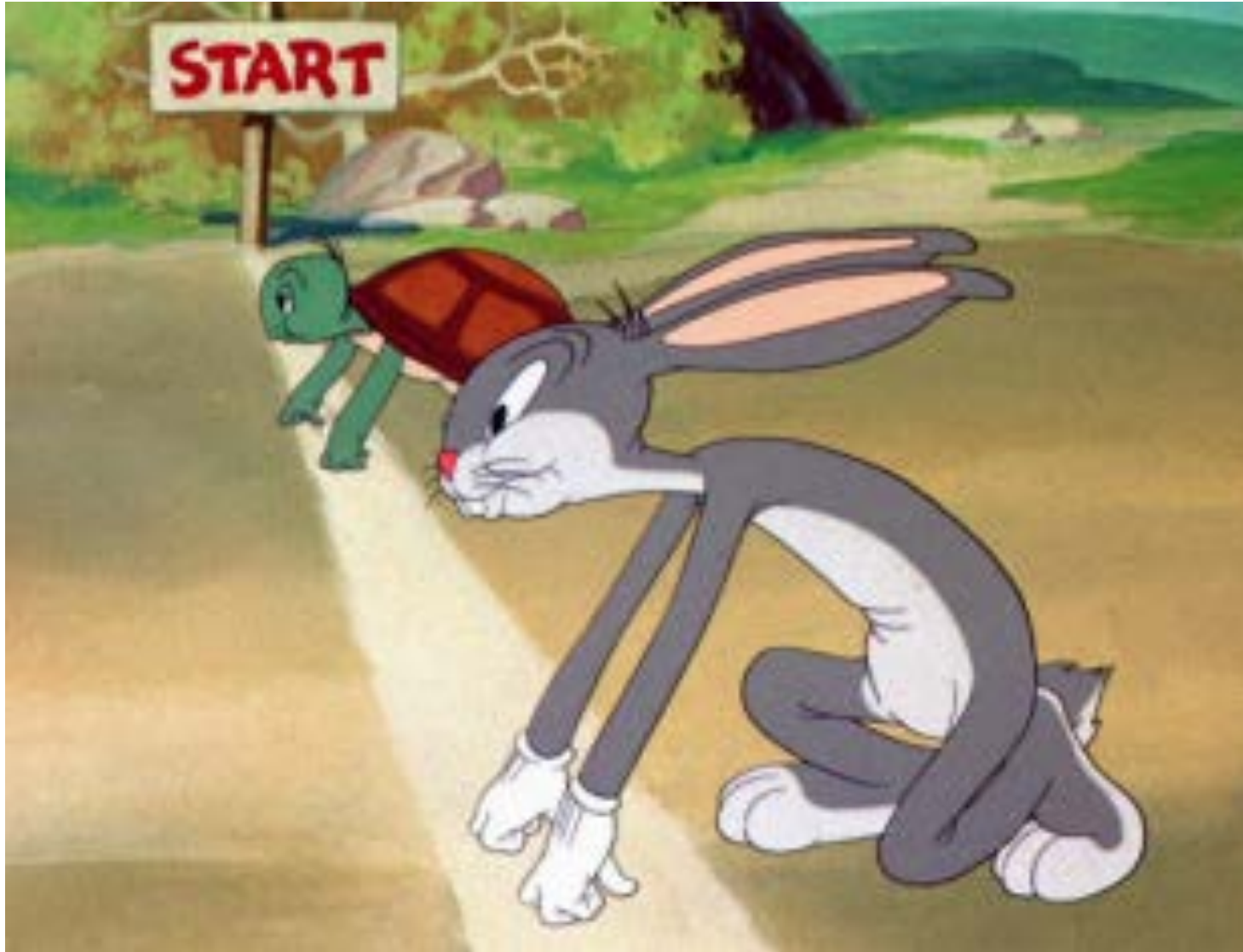
the human diver

Situational Awareness

The ability to **FOCUS** on what is important and / or relevant...

...whilst being conscious of, and taking into account, the limitations of focussed attention

Decision Making

- System 1 / System 2
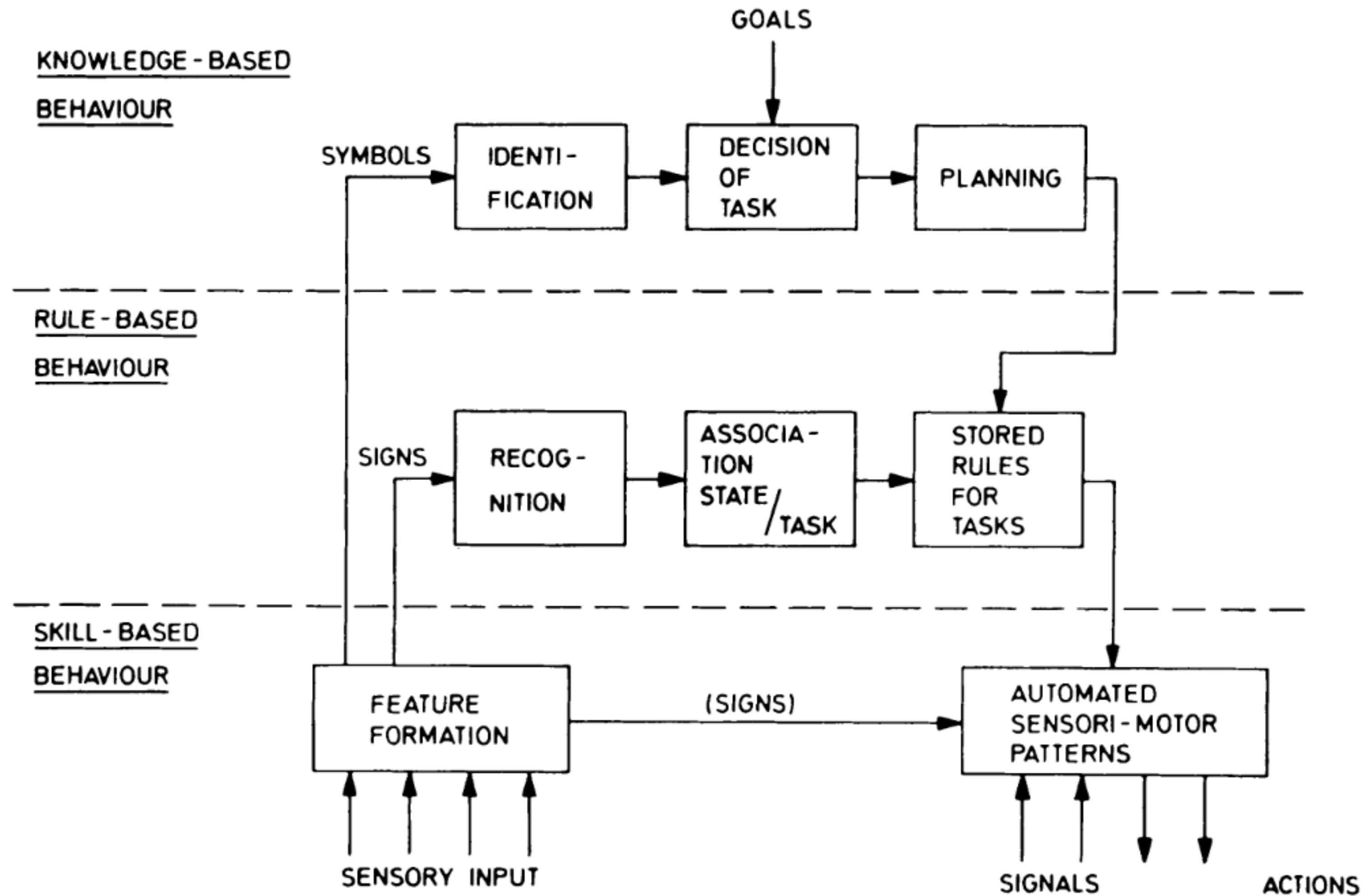- Naturalistic Decision Making
- Mental Models/Heuristics

Fig. 1. Simplified illustration of three levels of performance of skilled human operators. Note that levels are not alternatives but interact in a way only rudimentarily represented in diagram.

Rasmussen, J. (1983). Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models.

Intuition can be correct but only if…

- There is regularity in the world…
- You undertake lots of practice…
- You get immediate feedback…

MIND THE GAP

Otherwise we fill the gaps with made-up stuff!

"Intuition is thinking that you know without knowing why you do. In general, confidence is a very poor cue to accuracy. Because intuitions come to your mind with considerable confidence and there is no guarantee they're right."

Thinking. Fast and Slow. Kahneman.

Improving Decision Making in Uncertainty

Incompetent and Unaware
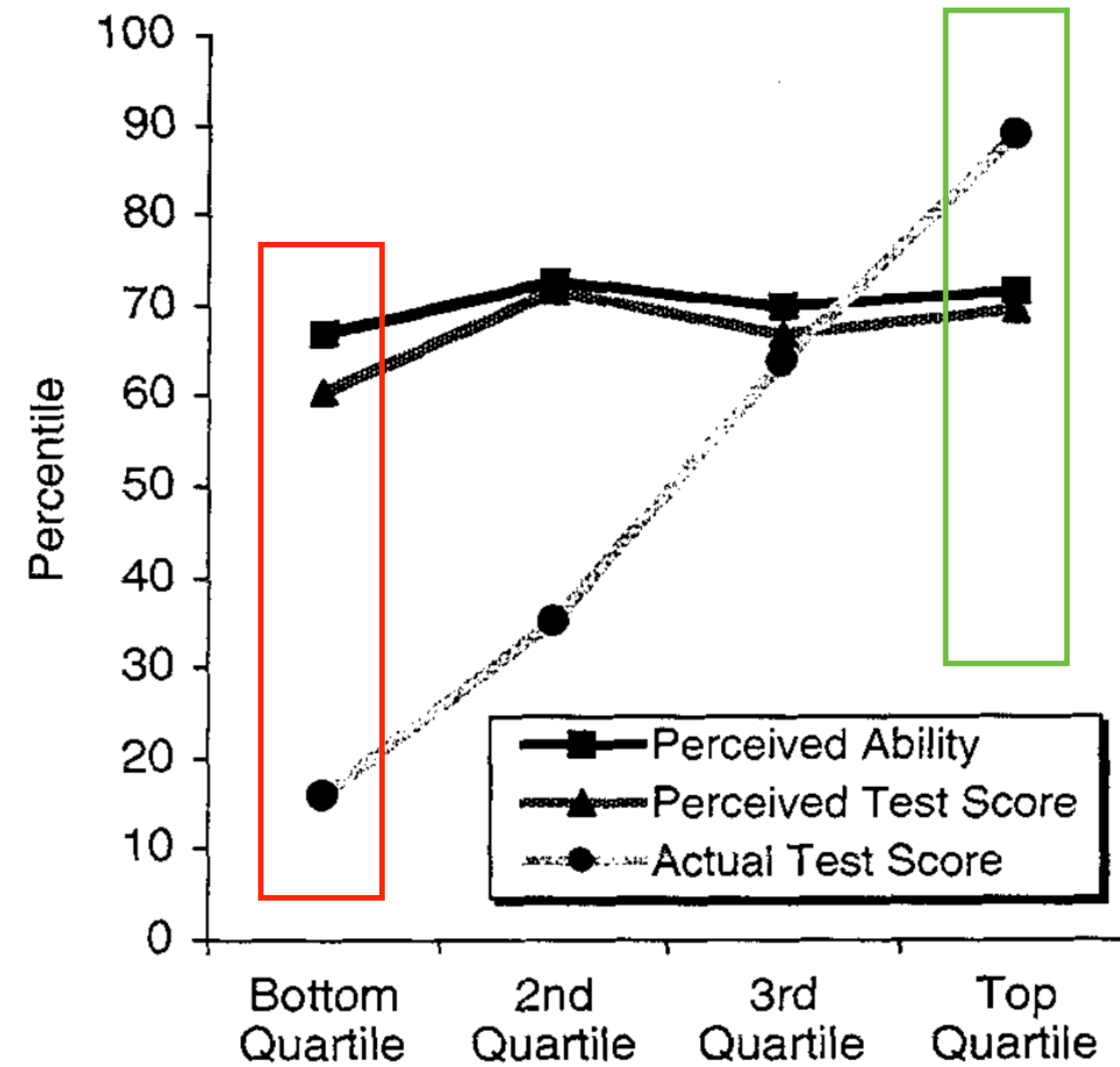
the human diver

Figure 3. Perceived grammar ability and test performance as a function of actual test performance (Study 3).
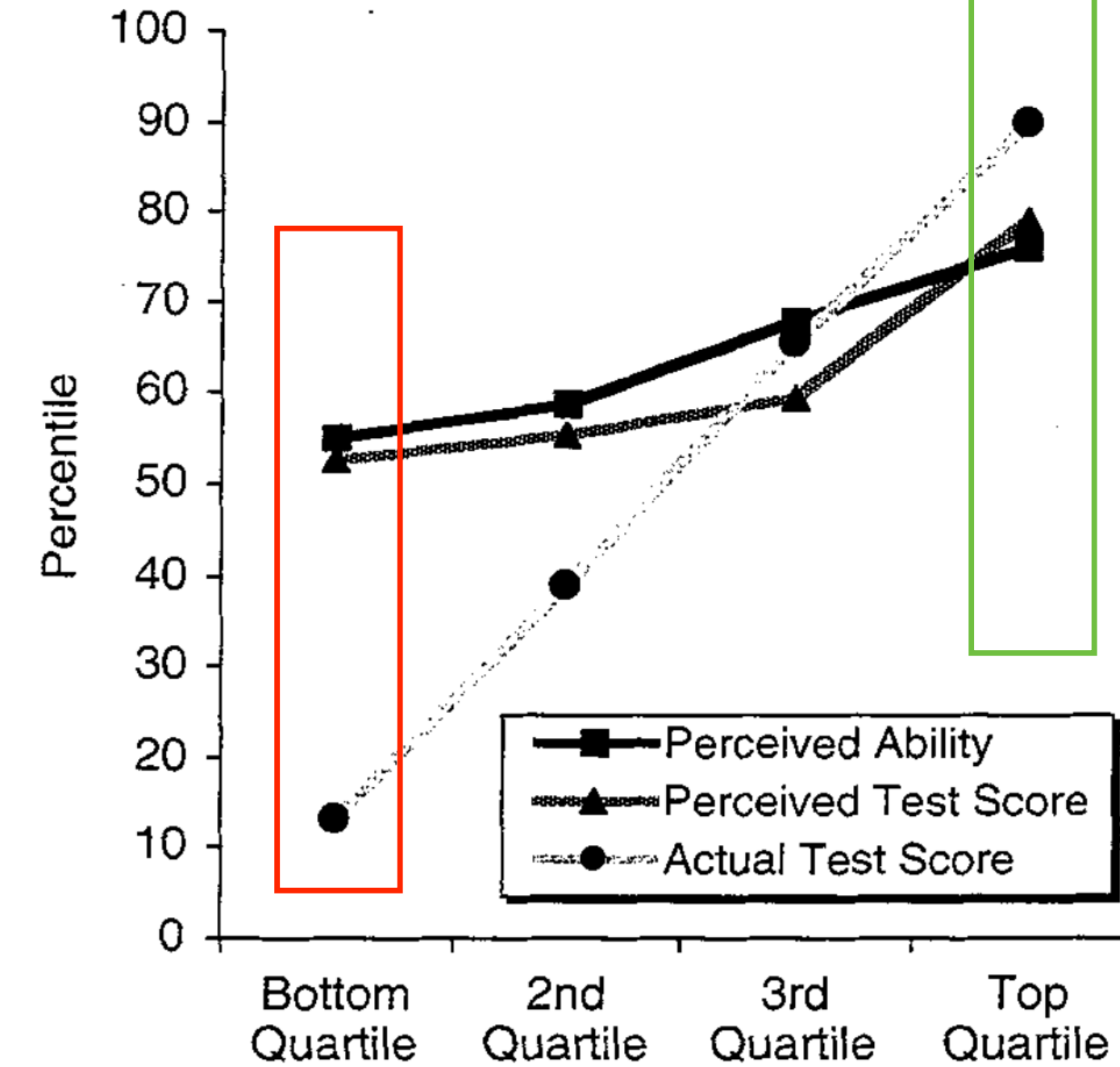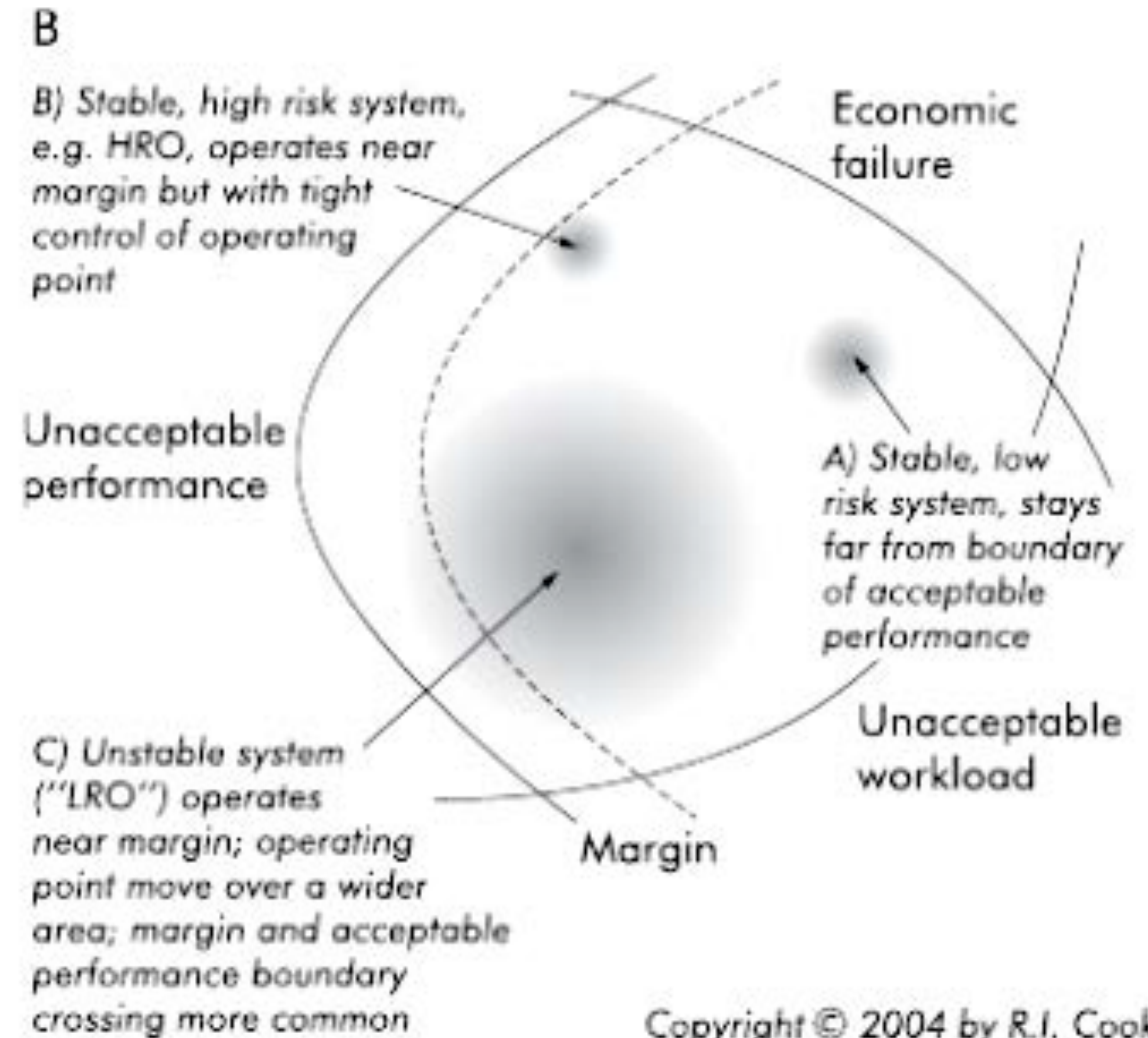
Grammar

Figure 4. Perceived logical reasoning ability and test performance as a function of actual test performance (Study 4).

Logical Reasoning

Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. Dunning, Kruger. 1999

Minimising Uncertainty and its Effects

• Standards, Protocols and Processes

B

B) Stable, high risk system, e.g. HRO, operates near margin but with tight control of operating point

Economic failure

Unacceptable performance

A) Stable, low risk system, stays far from boundary of acceptable performance

C) Unstable system ("LRO") operates near margin; operating point move over a wider area; margin and acceptable performance boundary crossing more common

Margin

Unacceptable workload

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Cook, R, & Rasmussen, J. (2005).
"Going solid": a model of system dynamics and consequences for patient safety.

Minimising Uncertainty and its Effects

- Standards, Protocols and Processes

- Pre-Job Briefs

- Post-Job Debriefs

- Well-designed Checklists/Tools (reduce System 1 errors)

- Telling 'stories'

- Red Teaming
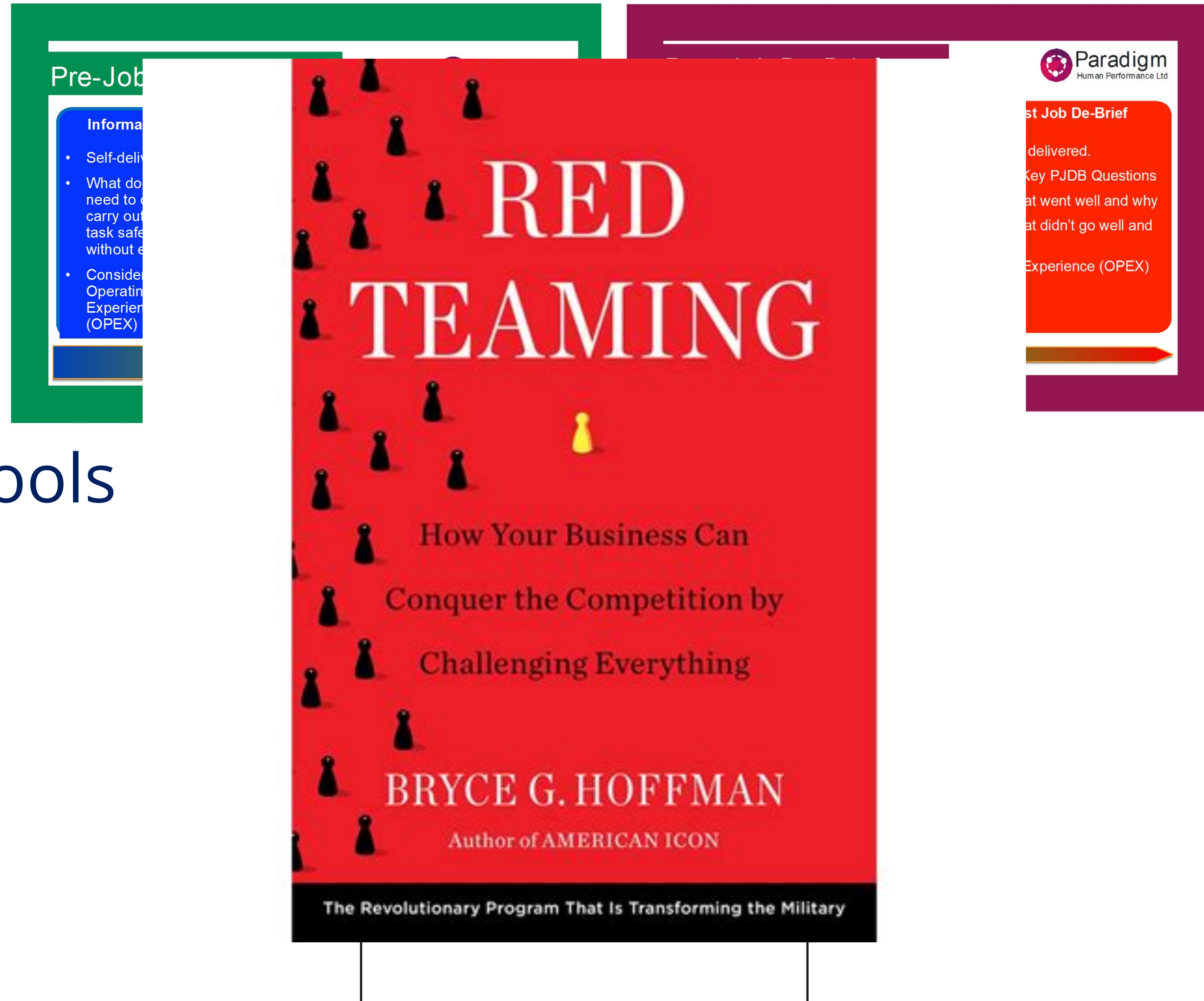
Beware of Outcome Bias

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Questions?

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