Dual-Process Theories: Questions and Outstanding Issues

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Outline

- Why do we need Dual Process Theories?
  - Integrate with each other, cognitive theories
- Integration with existing models, paradigms
  - Predictive power, verify assumptions
  - Representing the problem space
  - Start and stop rules for “System 2”
- Distributed role for “Systems 1 and 2”
- Need for Dual Process Theories?

Why do we need DPT?

- Confirmation bias
- Belief bias
- Base-rate neglect
- Pseudodiagnosticity
- Positive testing
- Framing
- Explanation-based reasoning
- Illusory correlation
- Gambler's fallacy
- Hindsight bias
- False consensus
- Conjunction fallacy
- Anchoring
- Fundamental attribution error

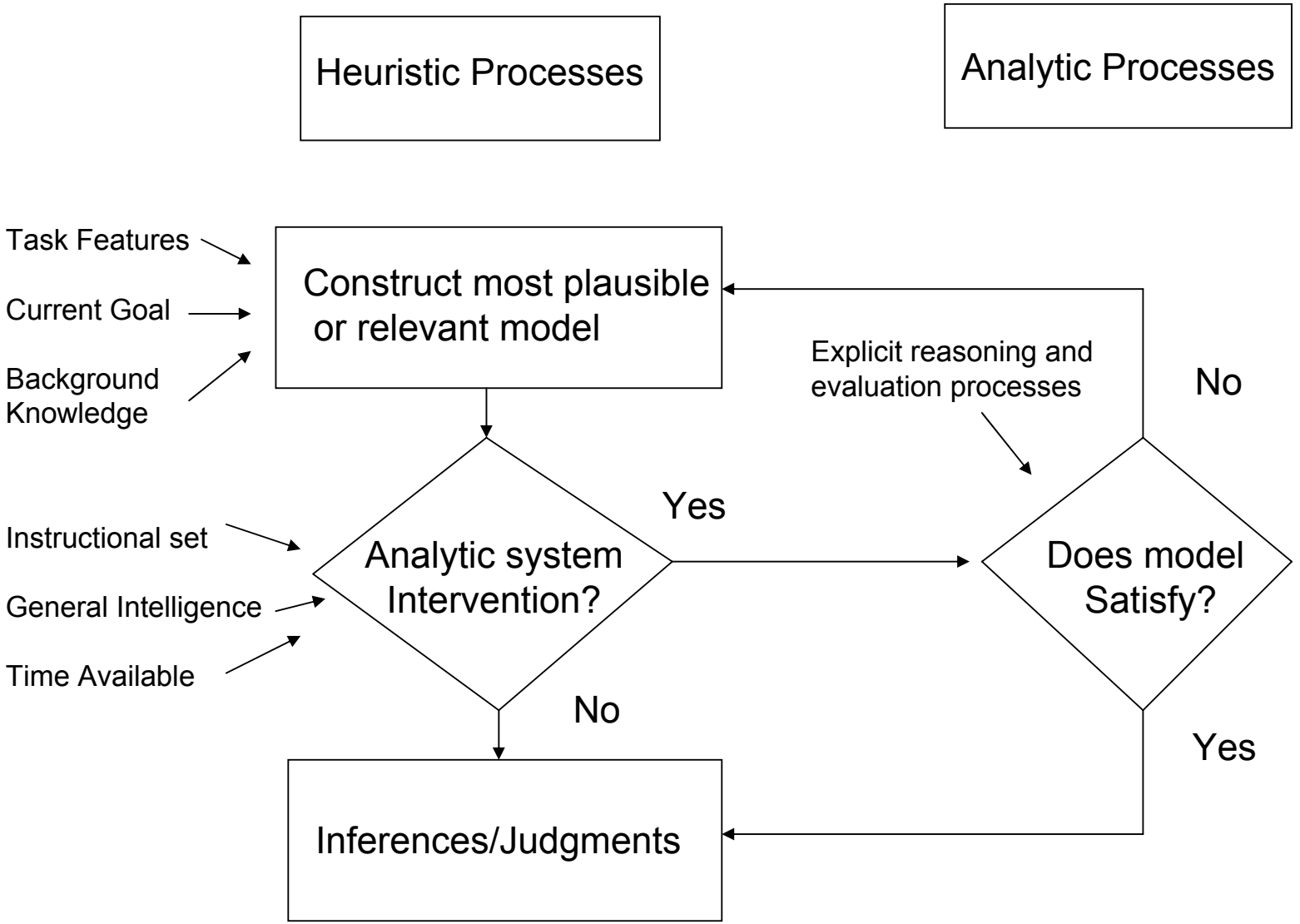
Need for Integration

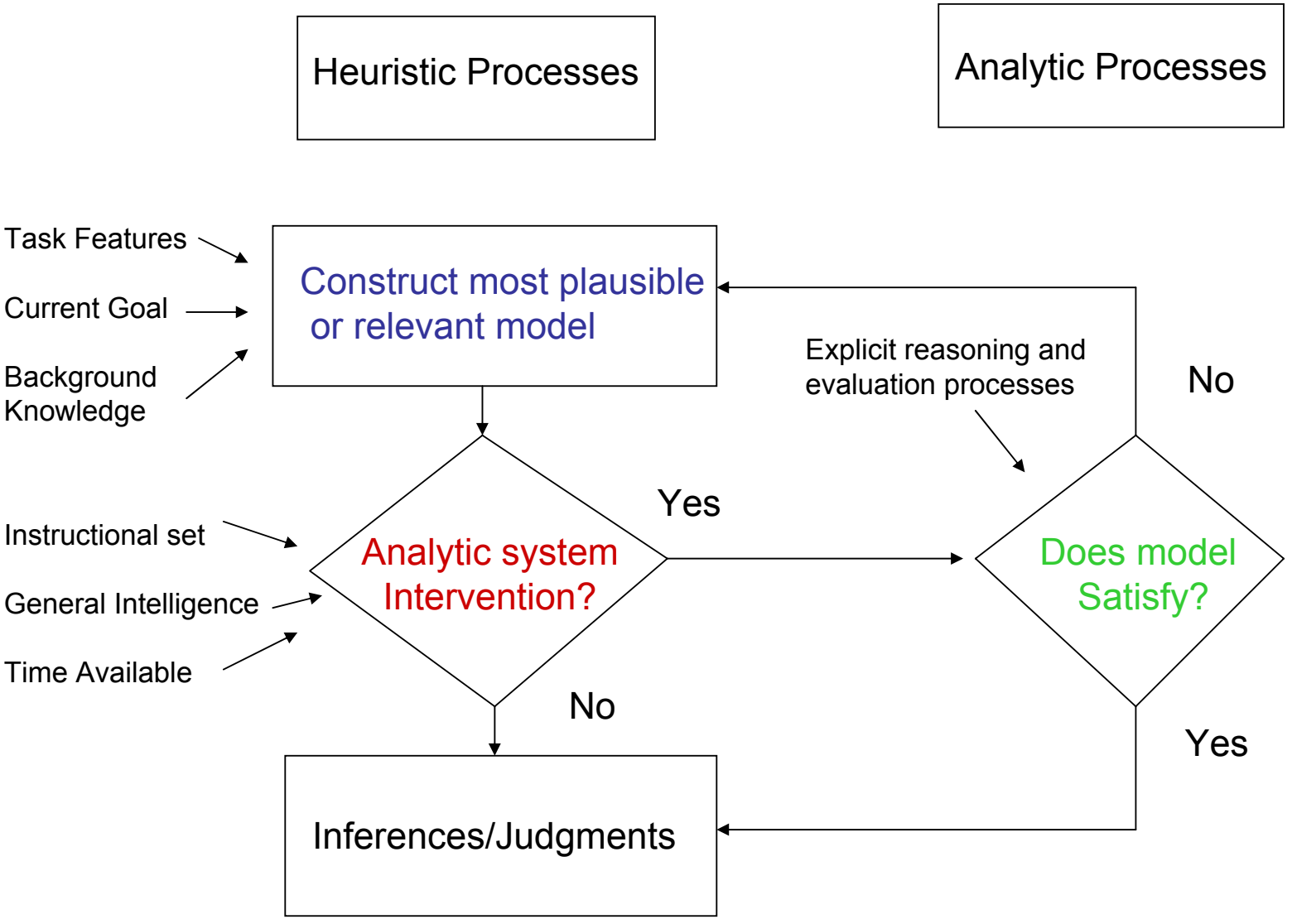
- Shopping list approach impedes general theory (Krueger & Funder, 2004)
  - Unique explanations, seldom integrated with each other much less broader theories of cognition
- Dual Process Theories
  - Integrate explanations with each other
  - Less integration with cognitive theory
    - Descriptions of processes and representations vs principles
    - Lack sufficient precision for prediction
- Intermediate Level of Theorising
  - Link to theoretical frameworks in Cognition
  - Paradigms for investigation

Heuristic Analytic Theory

(Evans, in press)

- Assumptions
  - Heuristic precede analytic
    - Formulate model
  - Analytic processes
    - Engaged if model does not satisfy


Heuristic Processes
Analytic Processes
Task Features
Current Goal
Background Knowledge
Construct most plausible or relevant model
Explicit reasoning and evaluation processes
No
Yes
Instructional set
General Intelligence
Time Available
Analytic system Intervention?
Does model Satisfy?
No
Yes
Inferences/Judgments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A problem of widgets

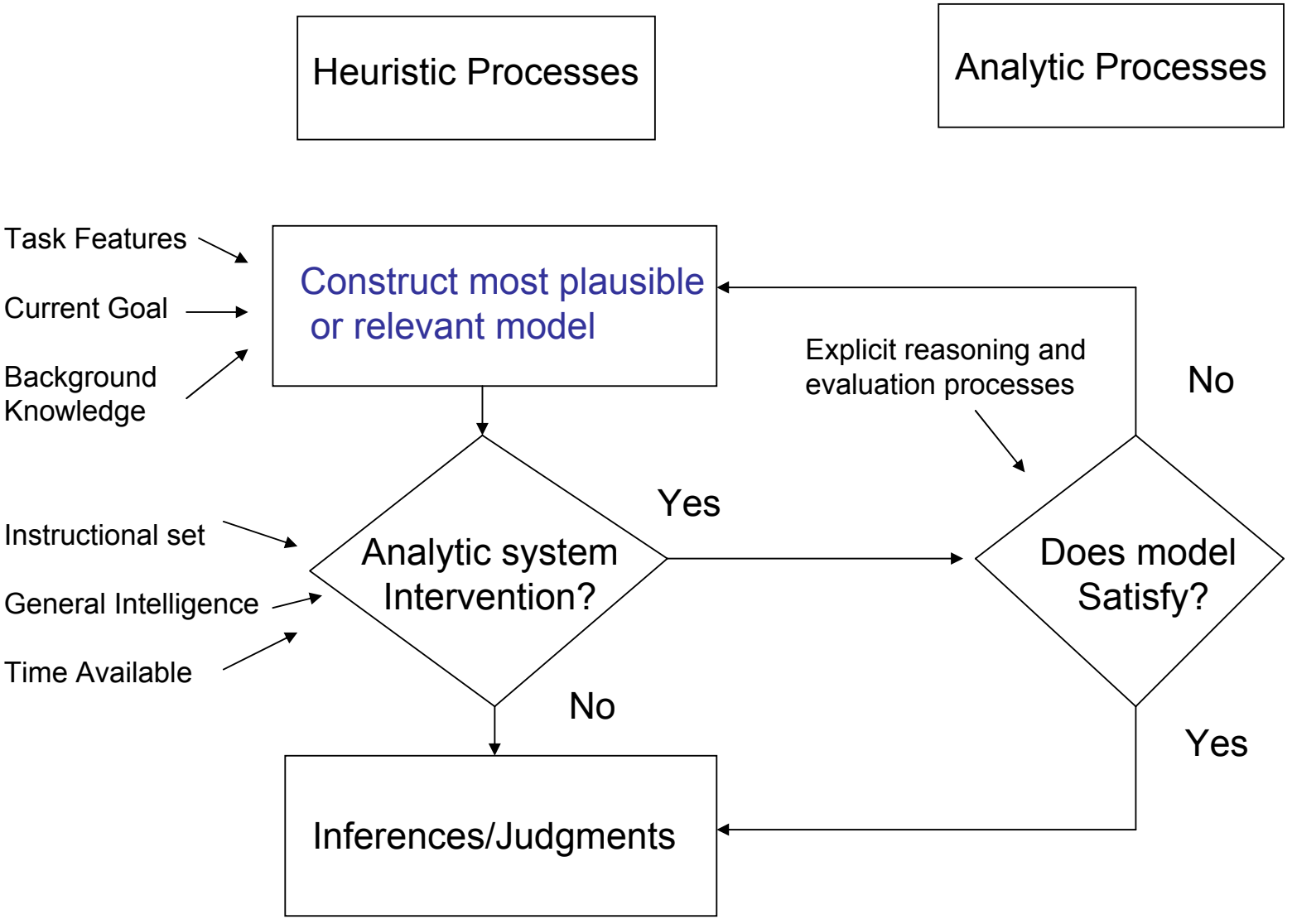
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
____ minutes

If it takes 5 machines 2 minutes to make 10 widgets, how long would it take 100 machines to make 100 widgets?
____ minutes

Heuristic Analytic Theory

(Evans, in press)

- Assumptions
  - Heuristic precede analytic
    - Formulate model
  - Analytic processes
    - Engaged if model does not satisfy
- Predictive Power
  - Which cues are pragmatically relevant?
    - Link between representation and process
  - Start and stop rules for System 2
    - Characteristics of problems, situations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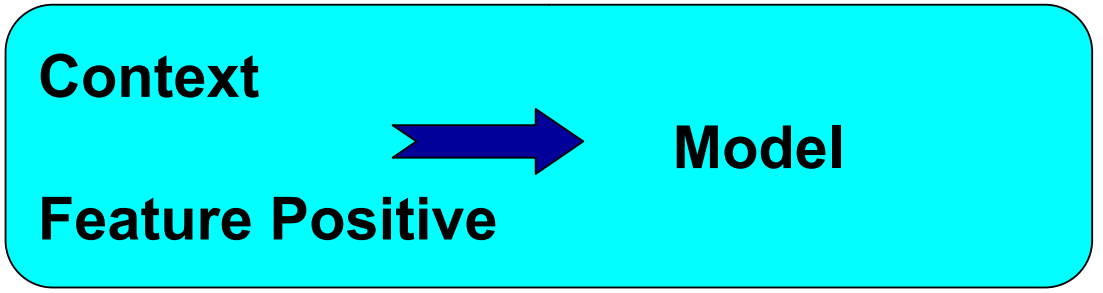
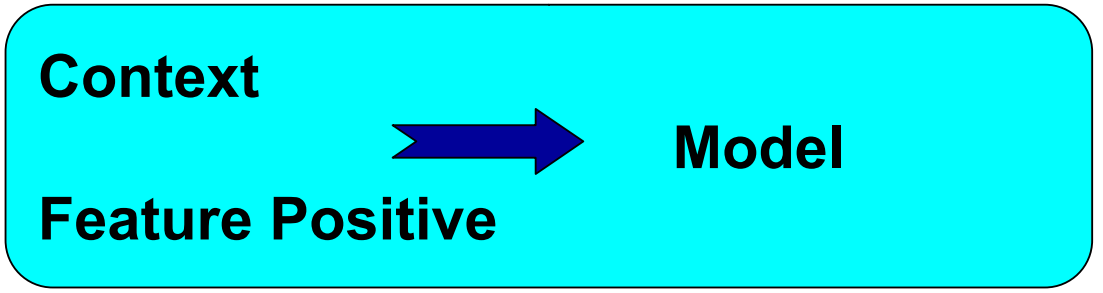
Principles of Model Building

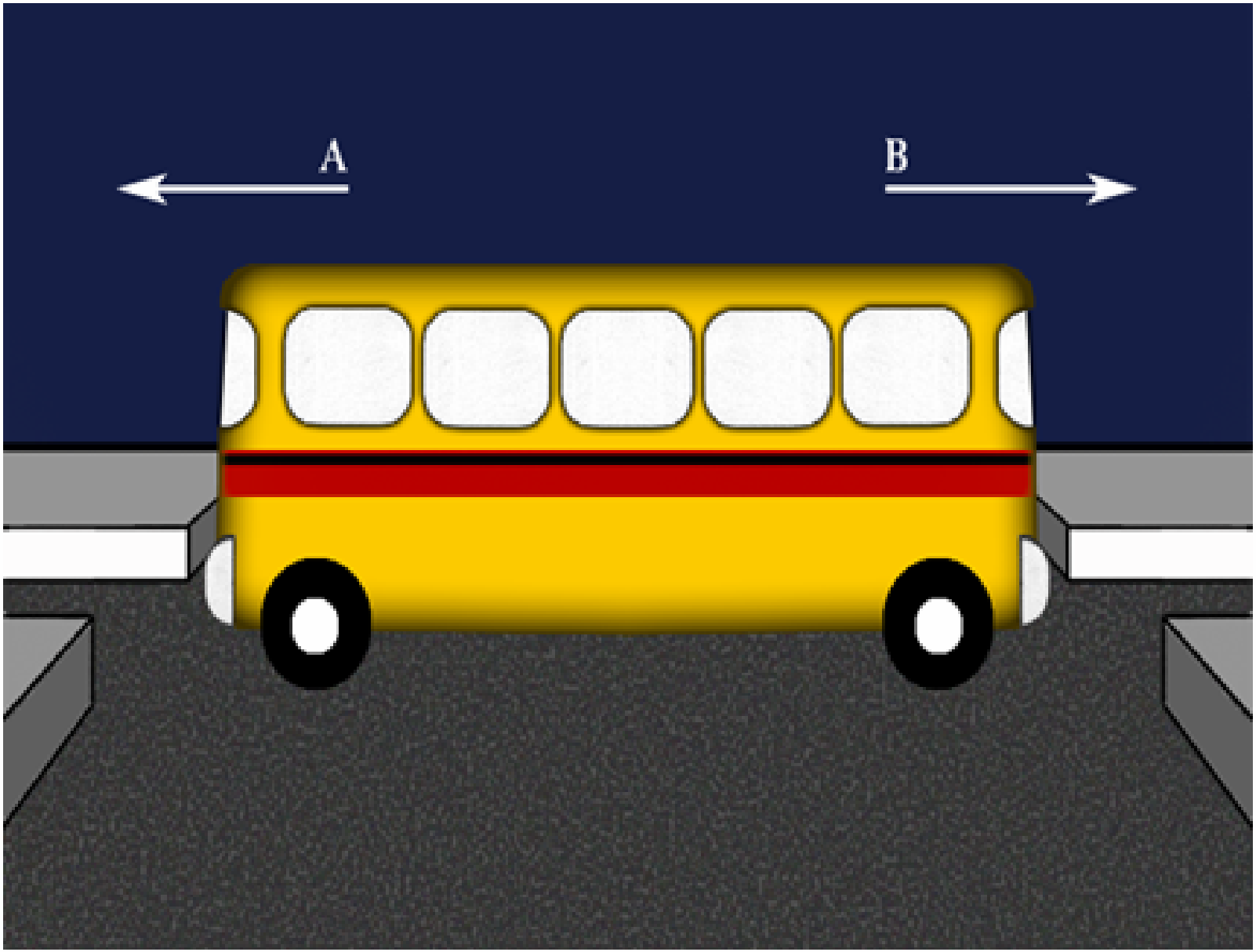


- Derive meaning
  - Contextualization, e.g.,
    - Priming
      - Conditional reasoning (many)
      - Analogical reasoning (Fugelsang et al, in press)
      - Anchoring and adjustment (Chapman & Chapman, 2002)
    - Categorization/ Stereotyping
    - Emotion
    - Pattern recognition, extraction

Principles of Model Building

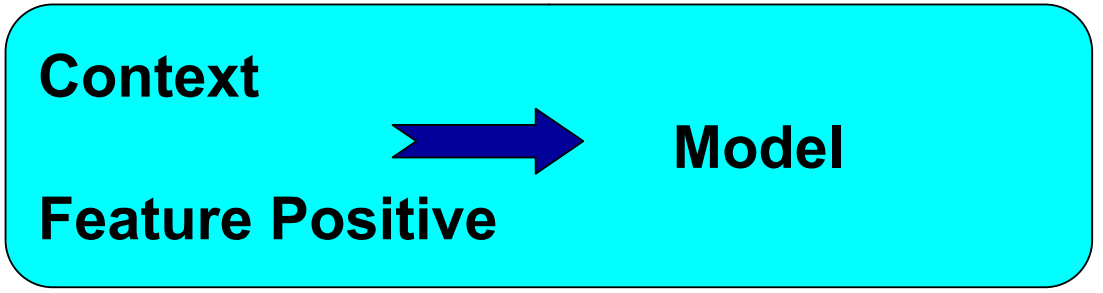


- Feature Positive (Hearst, 1991)
  - Attention, Learning
    - Presence vs absence of features, appearance vs disappearance of objects
    - Conditioning



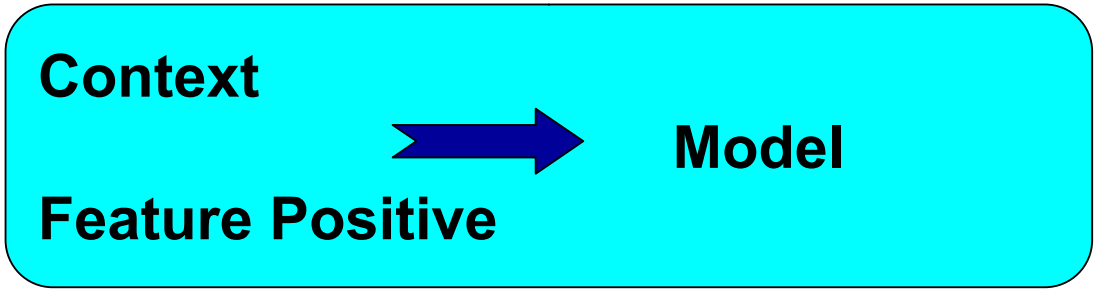
Stueben (1987)

Principles of Model Building

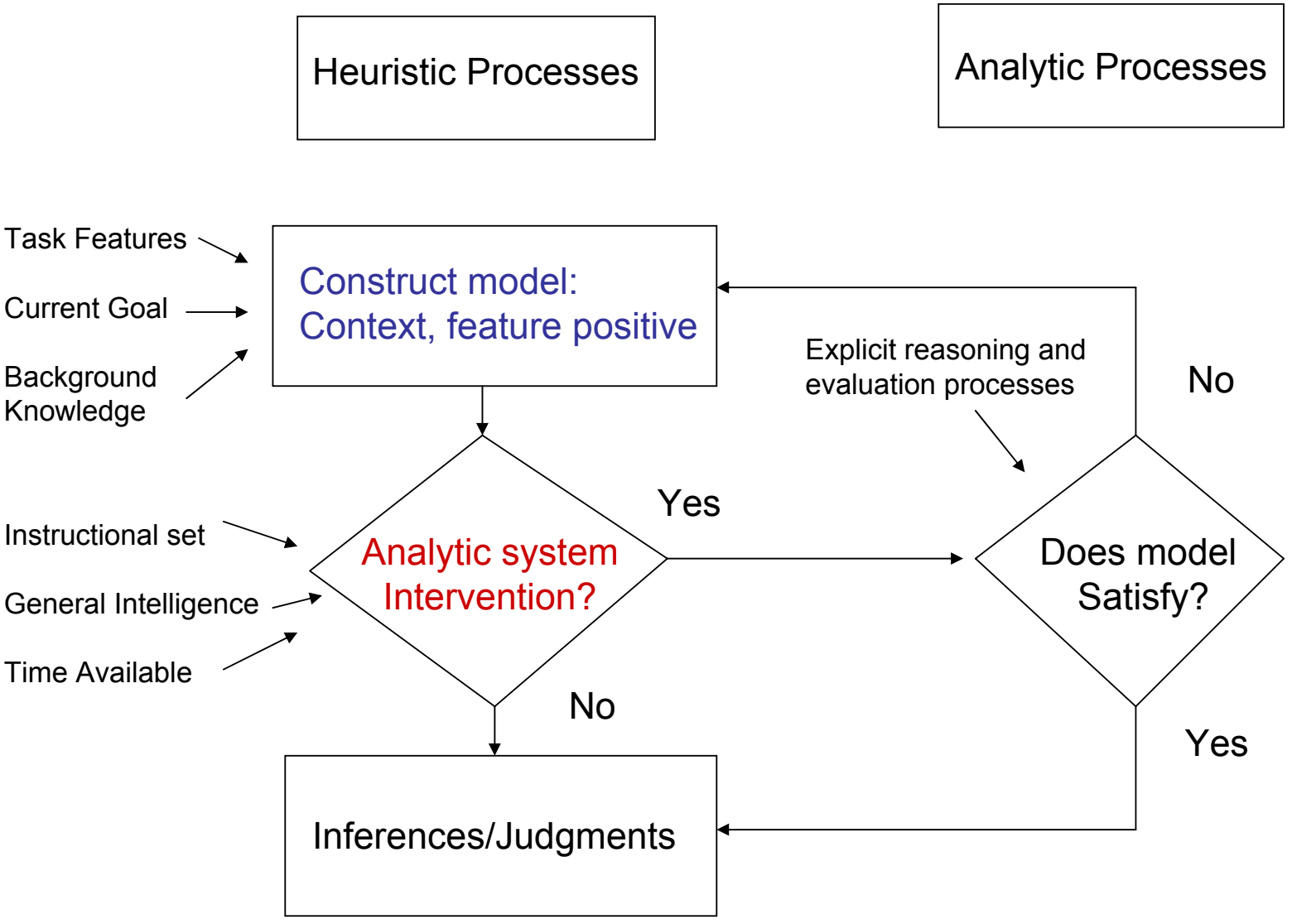


- Feature Positive (Hearst, 1991)
  - Attention, Learning
    - Presence vs absence of features, appearance vs dissapearance of objects
    - Conditioning
  - Representation
    - Represent present rather than absent
      - May omit relevant
    - Consistent with information provided
      - Syllogisms

Principles of Model Building



- Feature Positive (Hearst, 1991)
  - Attention, Learning
    - Presence vs absence of features, appearance vs dissapearance of objects
    - Conditioning
  - Representation
    - Represent present rather than absent
      - May omit relevant
    - Consistent with information provided
      - Syllogisms
- Phenomena
  - Causal judgment, positive testing, base rate neglect, availability, matching bias etc.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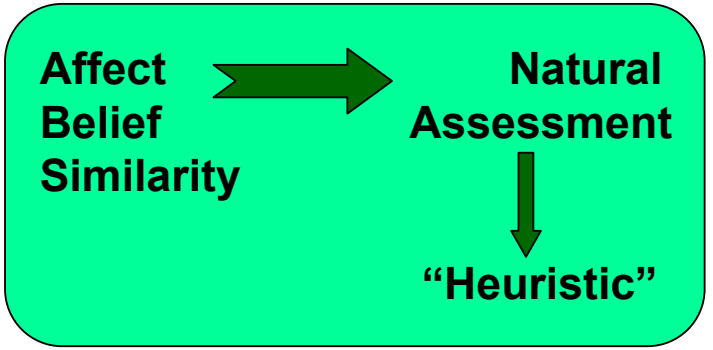
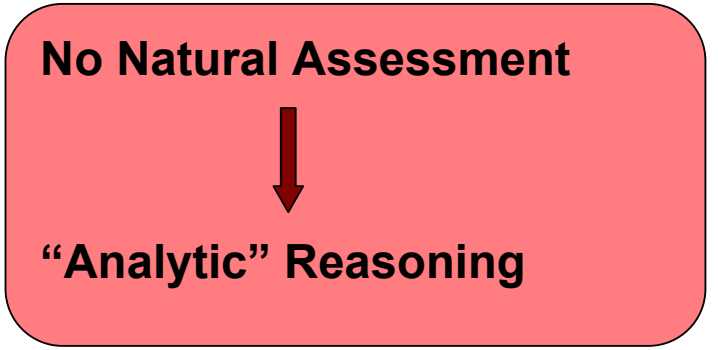
Background Knowledge
Construct model: Context, feature positive
Explicit reasoning and evaluation processes
No
Yes
Instructional set
General Intelligence
Time Available
Analytic system Intervention?
Does model Satisfy?
No
Yes
Inferences/Judgments

Natural Assessments

(Kahneman & Frederick, 2002)

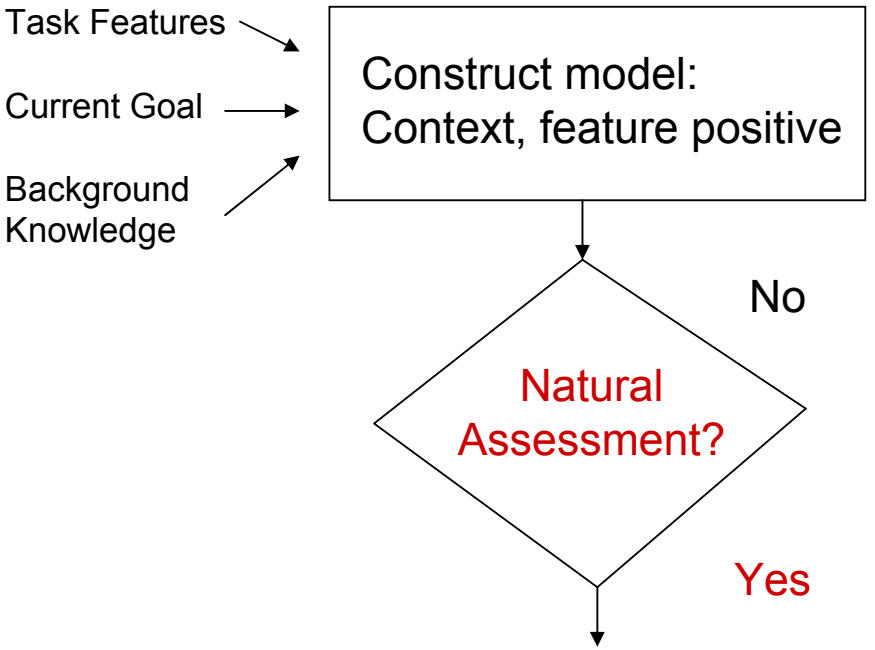




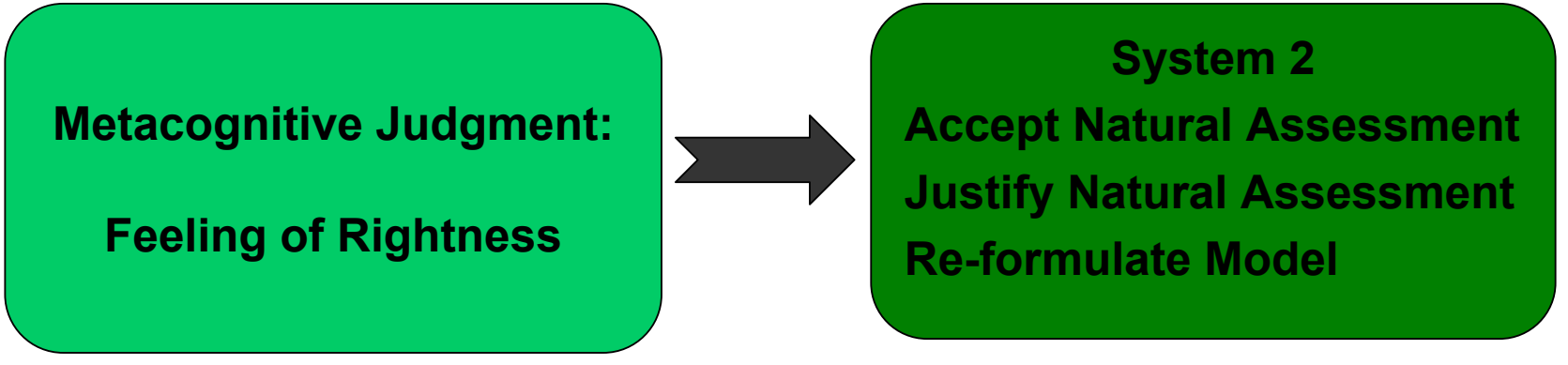
- Attributes that are routinely evaluated as part of perception and comprehension
  - Physical attributes
    - Size, distance, loudness
  - Abstract attributes
    - Affective valence, belief, similarity, recognition, surprise, etc
    - Heuristic judgment
    - Expert judgment

Heuristic Processes

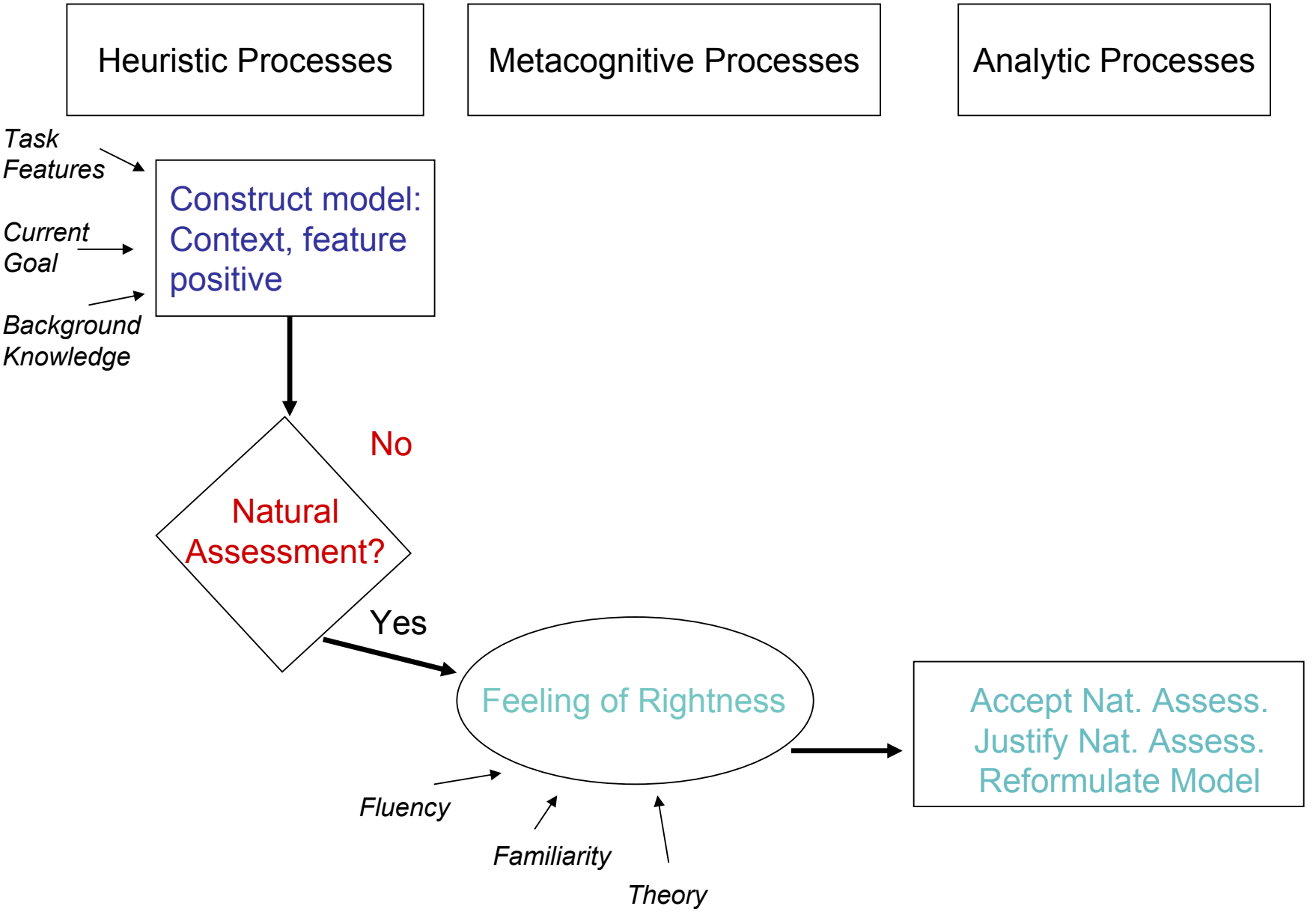
Analytic Processes



After Natural Assessment: Feeling of Rightness (FOR)

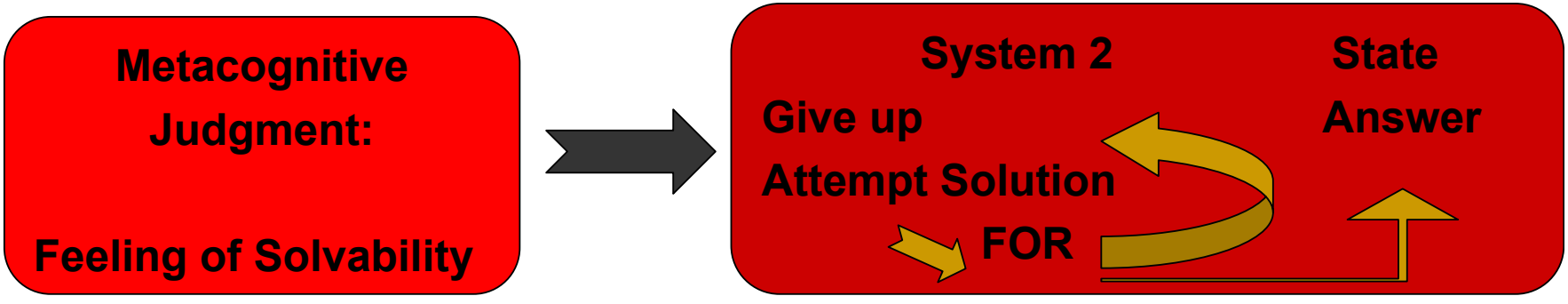


- Feeling of Rightness (FOR)
  - Metacognitive judgment
    - e.g., Feeling of Familiarity (FOF)
    - Basis: fluency, cue familiarity, metacognitive theory, others???
- Determines degree and type of S2 intervention

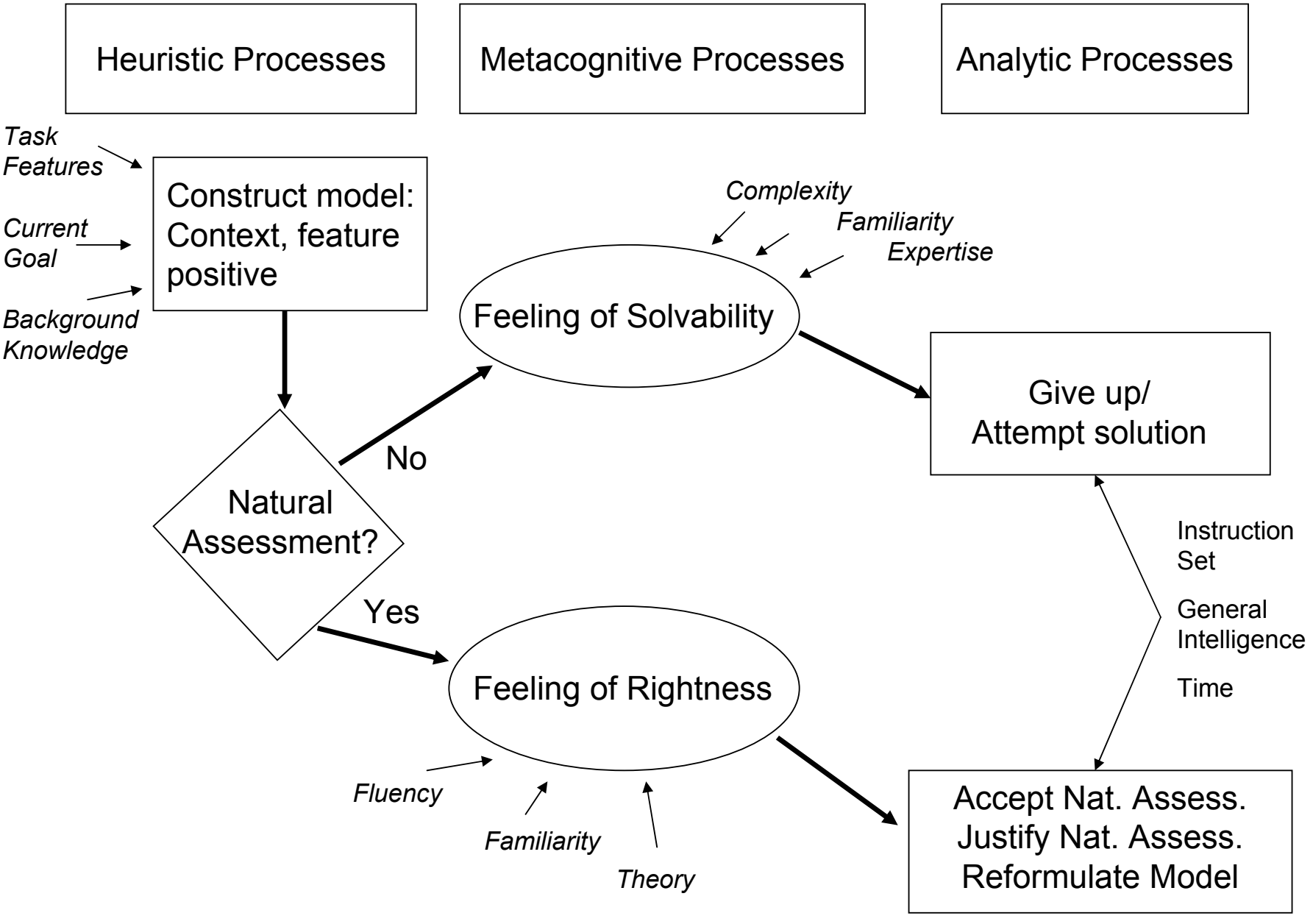

Heuristic Processes
Metacognitive Processes
Analytic Processes
Task Features
Current Goal
Background Knowledge
Construct model: Context, feature positive
No
Natural Assessment?
Yes
Feeling of Rightness
Fluency
Familiarity
Theory
Accept Nat. Assess.
Justify Nat. Assess.
Reformulate Model

Without a Natural Assessment

Feeling of Solvability (FOS)



- Feeling of Solvability (FOS)
  - Metacognitive Judgment
    - e.g., Feeling of Knowing (FOK)
    - Basis- perceived complexity, familiarity??
      - Expertise
- Determine degree of effort engaged by S2
  - FOR (Confidence?)
    - Basis?


Heuristic Processes
Metacognitive Processes
Analytic Processes
Task Features
Current Goal
Background Knowledge
Construct model: Context, feature positive
Complexity
Familiarity
Expertise
Feeling of Solvability
Give up/ Attempt solution
No
Natural Assessment?
Yes
Instruction Set
General Intelligence
Time
Feeling of Rightness
Fluency
Familiarity
Theory
Accept Nat. Assess.
Justify Nat. Assess.
Reformulate Model

Dual Process Theory???

- Changes to assumptions
  - "Systems" distributed
    - Implicit/ explicit processes may play a role at many different points
    - There are many types of "heuristic" and "analytic" processes
  - Integrate theories and paradigms from other disciplines
    - Predictive power, verify assumptions
    - Identify assumptions and processes that require further investigation
- Need for original assumptions?
  - Automatic and controlled processes
    - Automatic processes "Ballistic"
    - Anchoring and failure to adjust

Next Steps

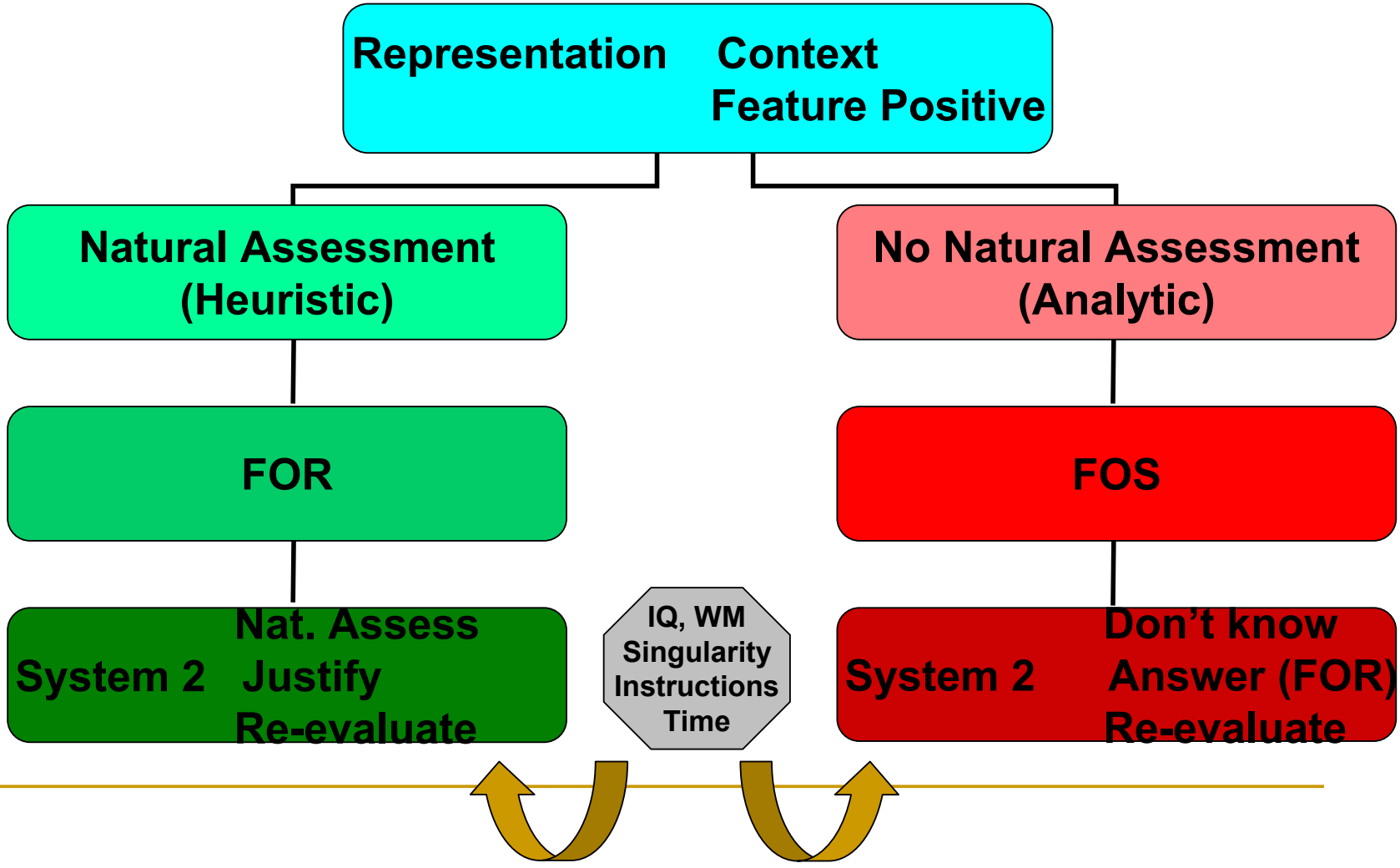
- Framework for asking questions
  - Link to broader cognitive theory
  - Verify and test putative processes
- Representation
  - Contextualization
    - Link between representation and judgment
    - Conditional Reasoning
- Metacognitive Judgments
  - Memory analogy limited
  - Determinants of FOR, FOS
    - Predict and Measure
- Expert Judgment

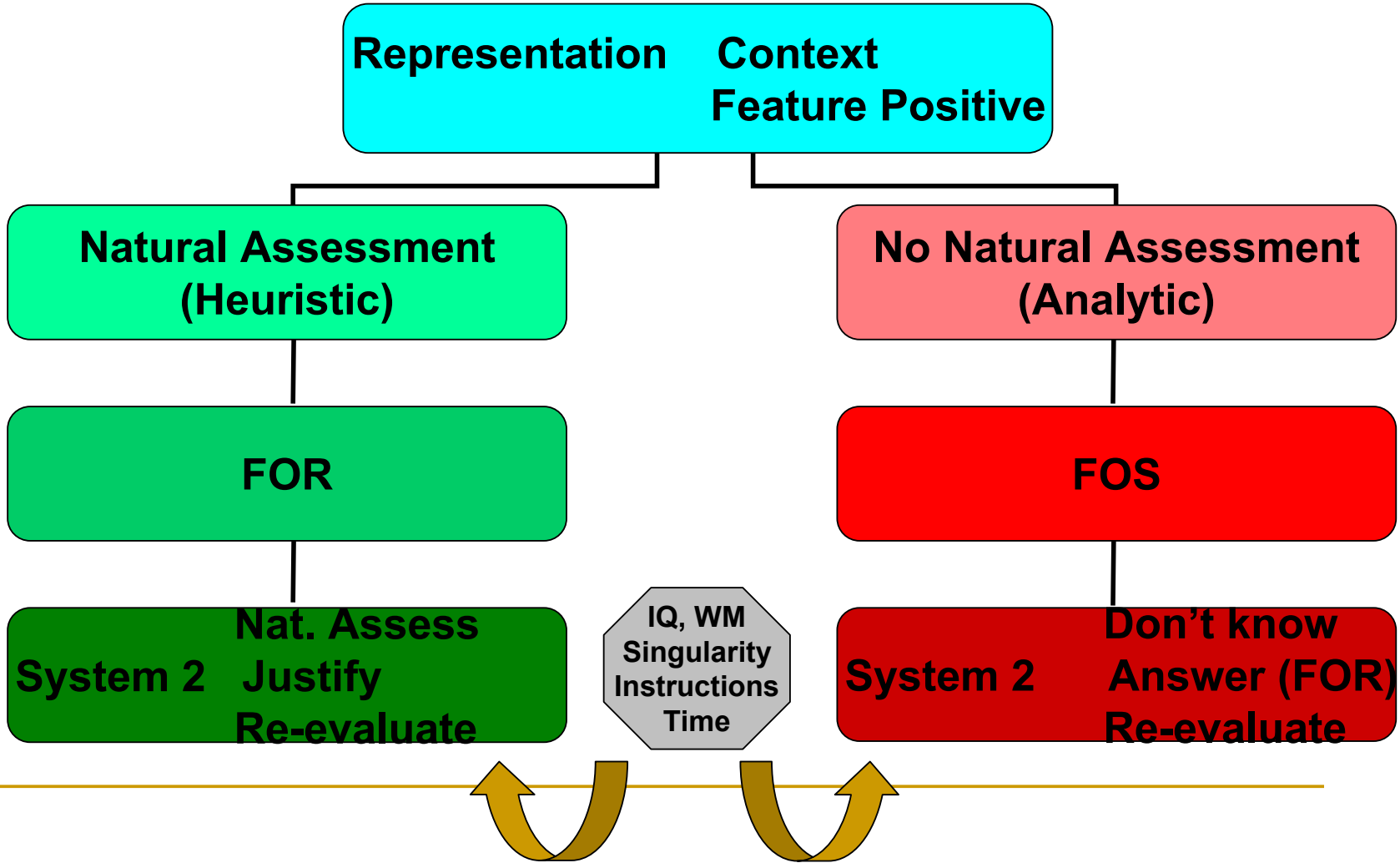
Feature Positive Attention

(Hearst, 1991)

How fast can you spot what is unusual about this paragraph? It looks so ordinary that you might think nothing was wrong with it at all and, in fact, nothing is. But it is atypical. Why? Study its various parts, think about its curious wording, and you may hit upon a solution. But you must do it without aid; my plan is not to allow any scandalous misconduct in this psychological study. No doubt, if you work hard on this possibly frustrating task, its abnormality will soon dawn upon you. You cannot know until you try. But it is commonly a hard nut to crack. So good luck!

I trust a solution is conspicuous now. Was it dramatic and fair, although odd? *Author's hint*: I cannot add my autograph to this communication and maintain its basic harmony.


Representation
Context
Feature Positive
Natural Assessment
(Heuristic)
No Natural Assessment
(Analytic)
FOR
FOS
System 2
Nat. Assess
Justify
Re-evaluate
IQ, WM
Singularity
Instructions
Time
System 2
Don't know
Answer (FOR)
Re-evaluate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Answer (FOR)
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