



Models: Connecting the Dots Between Science and Policy

Albert Simard

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Main Messages

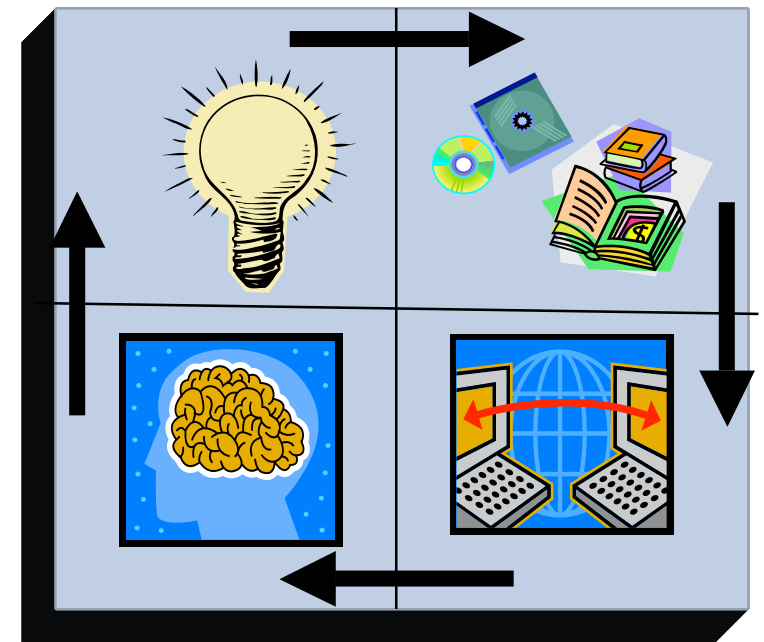
- **Models are needed to understand and predict the behavior of complex systems.**
- **Models are needed to fulfill an agency's mandate and support its core business.**
- **Inadequate or incorrect use of models wastes resources, results in errors, and exposes an agency to liability.**

Models should be *used wisely*



About Models

- **What are they?**
 - Simplified representations of reality.
 - Transform data, information, and knowledge into outputs.
- **Why do we use them?**
 - Reality is too complex
 - Experiments are infeasible
 - Predict consequences
 - Increase understanding



Nonaka (2000)



Supply & Demand

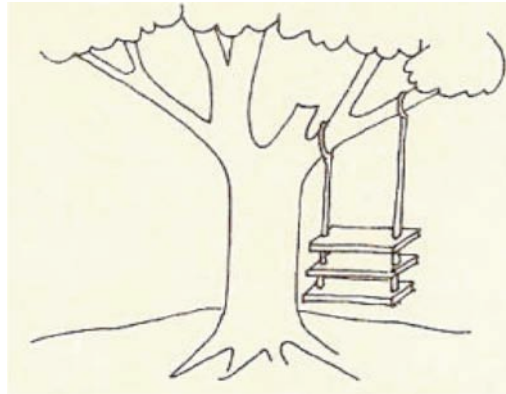
Demand: I have a problem that needs a model.



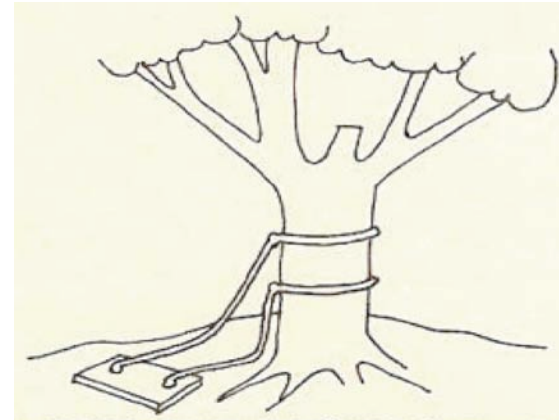
Supply: I have a model that solves your problem.



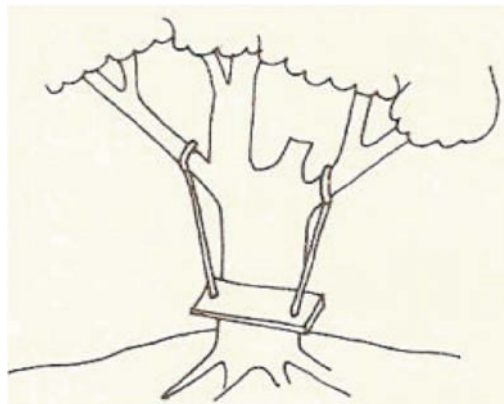
Different Perspectives



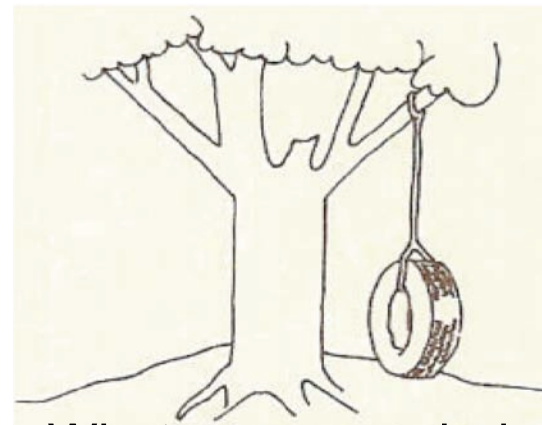
What developers proposed



What managers funded



What stakeholders wanted



What users needed



Modelling Process

Modelling combines science & computers; judgement & experience; insight & intuition.

- **Principles:** effort, simple, data, knowledge, transparent, understandable.
- **Complexity:** dynamic feedback process with delays and uncertainty.
- **Development:** techniques are well-understood; management less understood and practiced.
- **Use:** Decision making under uncertainty, unknown elements, outcome probabilities.



Framework Objectives

- Support science-driven *and* needs-driven analysis. (*supply and demand*)
- Promote dialogue among modelers, managers, & users.
- Reduce wasted time, effort, & money.
- Provide a basis for planning and action.
- Document and justify decisions.



Models and Data

A model and its data are inseparable; they succeed or fail as one.

- **Data Needs:** Situation may involve nature, a system, and/or intervention.
- **Sampling:** Statistics are essential to determine how much data is needed.
- **Source:** Ownership? Use rights? Privacy & security concerns?
- **Quality:** Level of accuracy, detail, scale, and completeness that are needed.



Models and Knowledge

(Food safety)

3. Complex

- Predictive feedback (+)
- Non-linear (1:?)
- Simulation
- Stochastic
- Uncertainty
- Tacit knowledge

(Predicting weather)

- Emergent
- Disorganized
- Scenario analysis
- Mental
- Reaction
- Intuition

4. Chaotic

2. Complicated

- Feedback
- Linear (1:n)
- Mathematics
- Deterministic
- Certainty
- Explicit knowledge

(Designing a building)

- Flow-through (-)
- Fixed (1:1)
- Planning
- Mechanistic
- Automated
- Data, facts

(Contracting)

1. Common

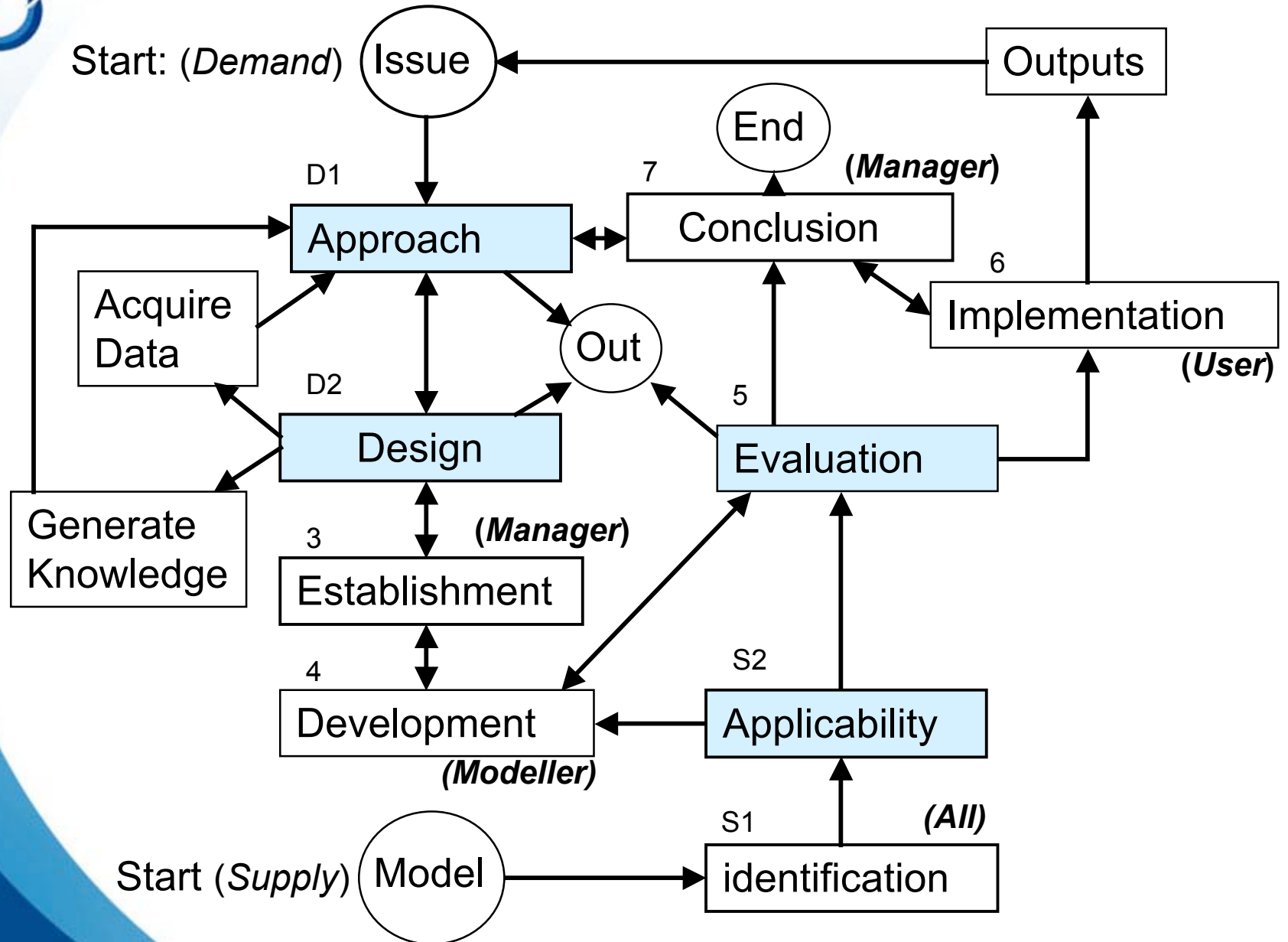


Decision Guide - Hierarchy

- **Phase:** (3) demand, supply, project
- **Stage:** (7) approach, design, establish, develop, evaluate, implement, conclude
- **Step:** (34) screening, problem definition, suitability, knowledge, data
- **Consideration** (132): recurrence, importance, problem space, existence

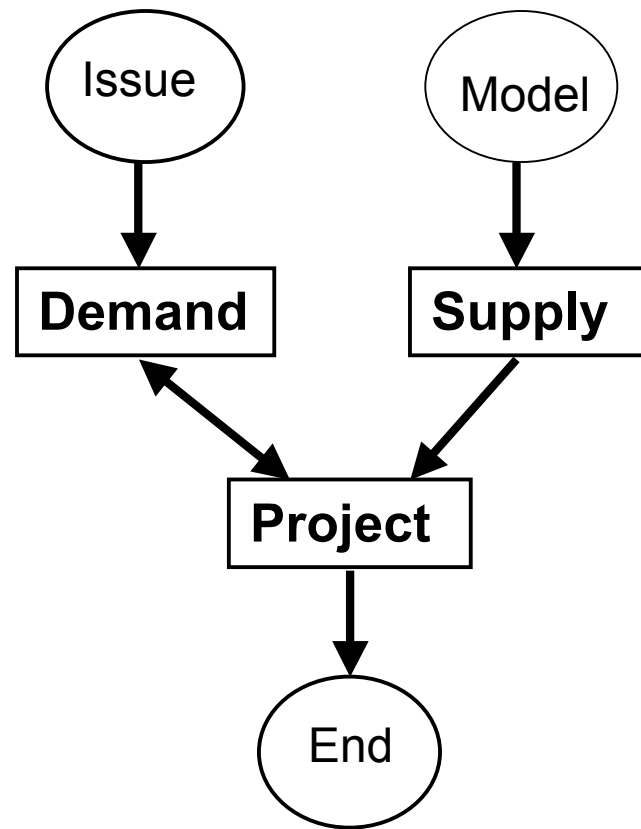


Decision Guide - Stages



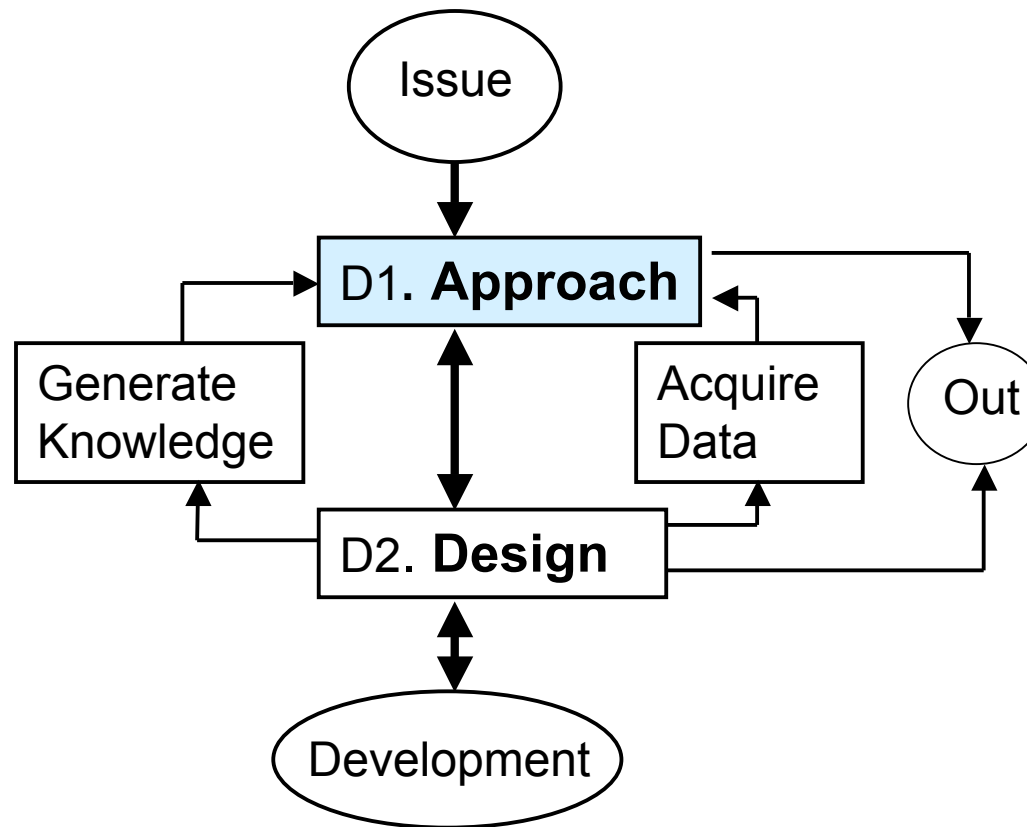


Decision Guide Phases



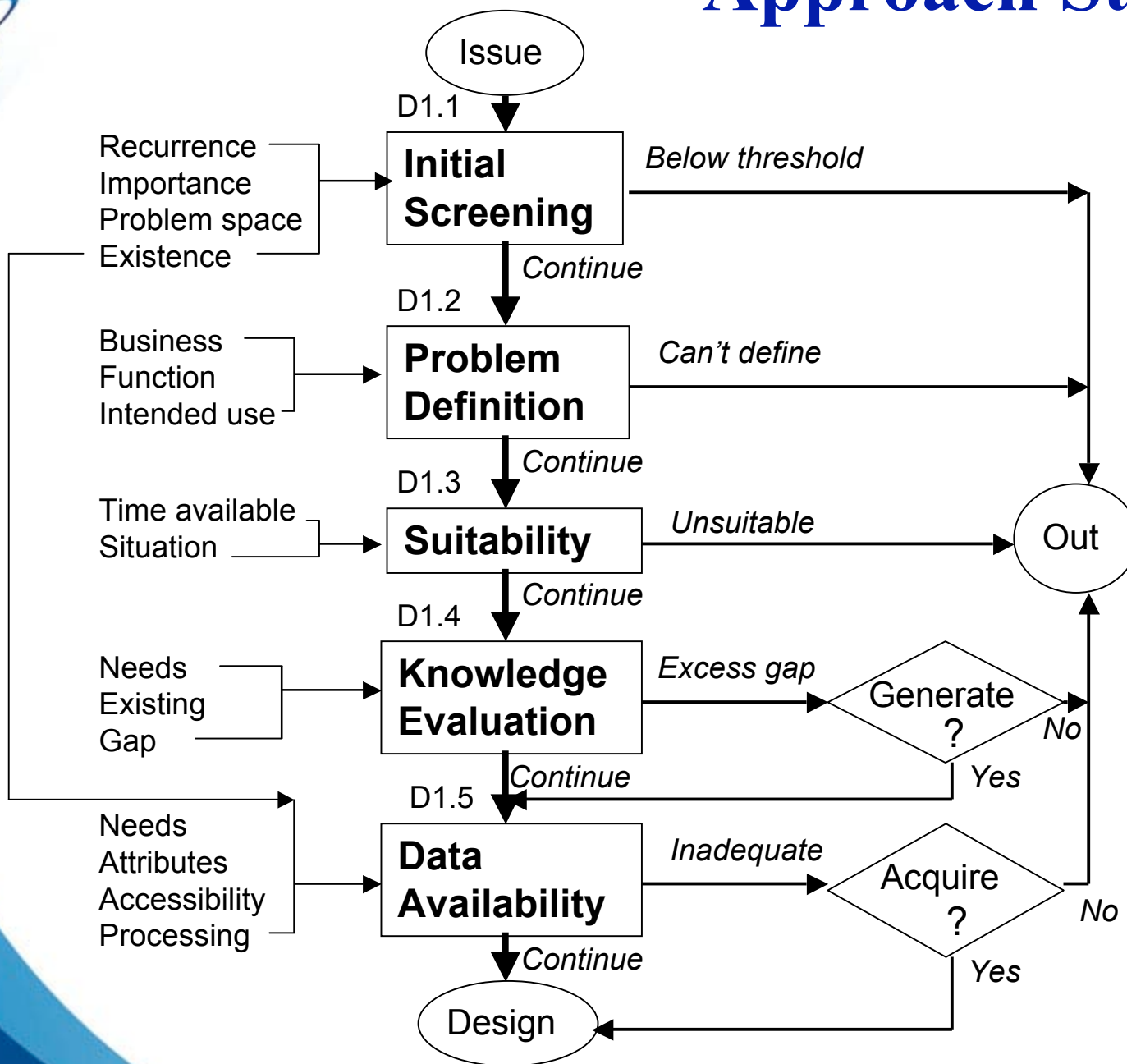


Demand Phase





Approach Stage



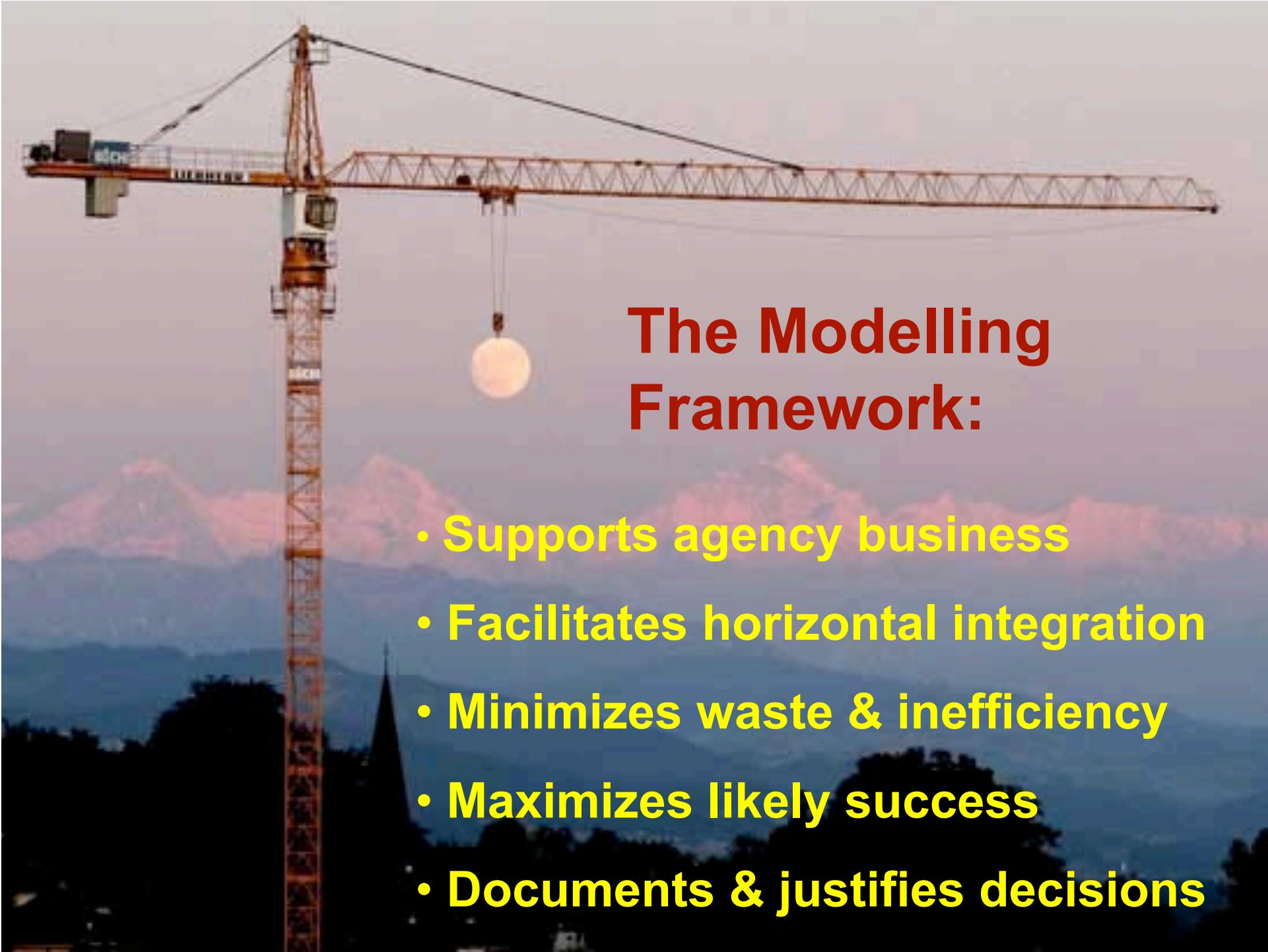


Decision Guide Considerations

- **Explains the question.**
- **Classify a situation or write a short description.**
- **Complete a statement template.**
- **Decide where to go next.**

Not a cookbook to be followed without interpretation.

Compliments experience & judgement; doesn't replace them.

A tall construction crane stands against a sunset sky. The crane's jib extends horizontally across the upper half of the frame. A large, glowing sun is positioned in the center of the crane's jib, appearing as if it is being lifted or lowered. The background features a range of mountains under a soft, orange and pink sky. The crane's tower is visible on the left side of the image.

The Modelling Framework:

- Supports agency business
- Facilitates horizontal integration
- Minimizes waste & inefficiency
- Maximizes likely success
- Documents & justifies decisions

Thank You

DEFENCE



DÉFENSE

Time for discussion...