THE CLIOS PROCESS

STAGE 2: DESIGN, EVALUATION AND SELECTION

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12 Steps in a CLIOS Analysis

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Representation

Structure

1. Describe System: Checklists and Goal Identification

2. Identify Major Subsystems of the Physical Domain and Major Actor Groups on the Institutional Sphere

3. Populate the Physical Domain and the Institutional Sphere on the CLIOS

Behavior

4A. Describe Components on the Physical Domain and Organizations on the Institutional Sphere

4B. Describe Links Among Components and Organizations

5. Seek Insights about System Behavior

Design, Evaluation and Selection

6. Identify Performance Measures, Refine System Goals, and Exercise Models and Frameworks

7. Identify and Design Strategic Alternatives for Performance Improvements

8. Flag Important Areas of Uncertainty

9. Evaluate Strategic Alternatives And Select Robust Bundles That Perform "Best" Across Uncertainties

Implementation

10. Design Strategy for Implementation in the Physical Domain and Implement

11. Design Strategy for Implementation in the Institutional Sphere and Implement

12. Post-Implementation Evaluation and Modification

Figure by MIT OpenCourseWare.

Transition to the Design, Evaluation and Selection (DES) Stage

We have completed the Representation Stage and have a first-order understanding our the CLIOS System.

We have characterized the issues we face.

We have identified preliminary goals.

We have some insight of the CLIOS System behavior

- In the physical domain
- In the institutional sphere
- In the interactions between the two

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CLIOS STAGE CHARACTERISTICS

Stage 1 **Representation**	Primarily Qualitative *Key Idea:* Understanding the CLIOS System Establishing Preliminary Goals
Stage 2 **Design, Evaluation, and Selection**	Both Qualitative and Quantitative Aimed at improvement of the CLIOS System *Key Idea:* Developing bundles of strategic alternatives
Stage 3 **Implementation**	Pragmatic in nature. How to implement bundles of strategic alternatives *Key Idea:* Follow-through: changing and monitoring the performance of the CLIOS System
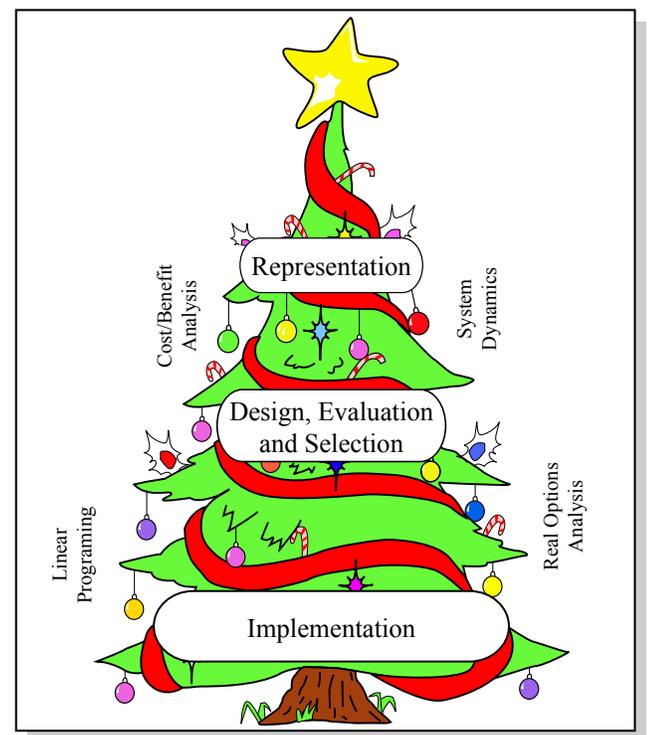
Figure by MIT OpenCourseWare.

Stage 2: DES Diagram

Design, Evaluation and Selection

6. Refine CLIOS System Goals, Identify Performance Measures, and Develop Models and Frameworks

7. Identify and Design Strategic Alternatives for CLIOS System Improvements

8. Flag Important Areas of Uncertainty

9. Evaluate Strategic Alternatives and Select Robust Bundles that Perform "Best" Across Futures

Figure by MIT OpenCourseWare.

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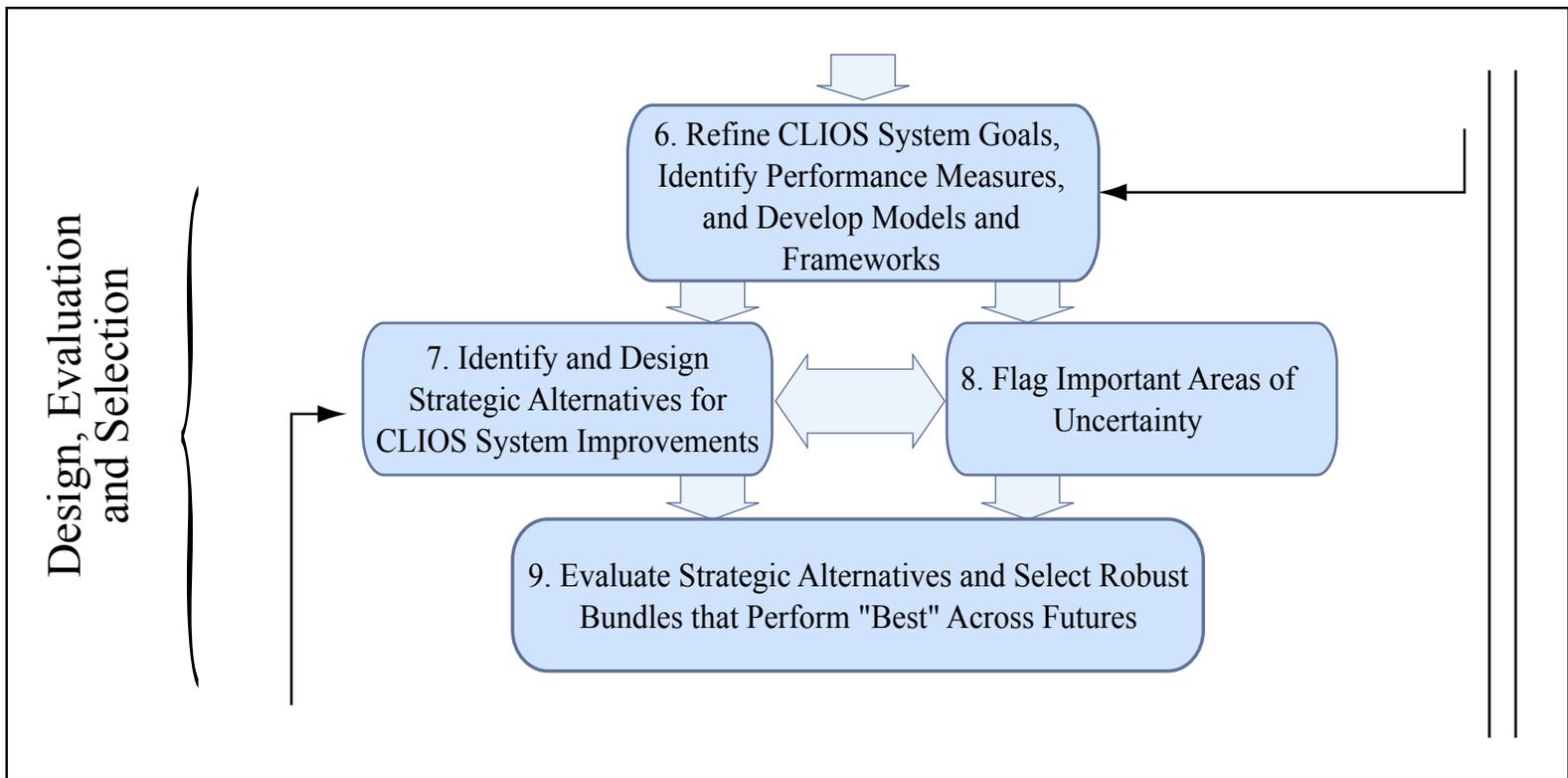
DES Stage

- Creative in nature – we are *designing* our CLIOS System—

- But we are doing so with humility, recognizing its complexity, and the challenge we face

- Another "d-word", "discernment" for more effective decision-making is a better term

- But keep in mind, at the end of the "day," we do have to move forward. We don't simply study our CLIOS System--- we implement bundles of strategic alternatives to improve performance

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Step 6: *Refine CLIOS System Goals*, Identify Performance Measures, and Develop Models and Frameworks (1)

- Evolve from Preliminary System Goals to Refined Goals (given our more sophisticated understanding at this stage of the process)
- Decide how to measure performance as we strive towards goals

Step 6: Refine CLIOS System Goals, *Identify Performance Measures*, and Develop Models and Frameworks (2)

- Performance is often difficult to define and will vary according to the stakeholders involved
    - Understanding *their* measures for performance is key
    - Especially where policymakers/stakeholders compete for influence
- Performance measures shown diagrammatically as double lines:

Policy Levers   *Components*   *Common Drivers*

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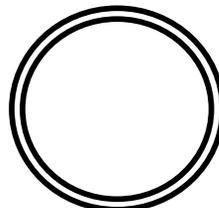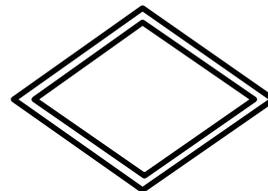
CLIOS Representation
of Mexico City

Notation for different components

- Components, common drivers, and policy levers
- Including performance measures
- Some components can be expanded (here identified by dashed lines) or perhaps treated as separated subsystems (a matter of taste)
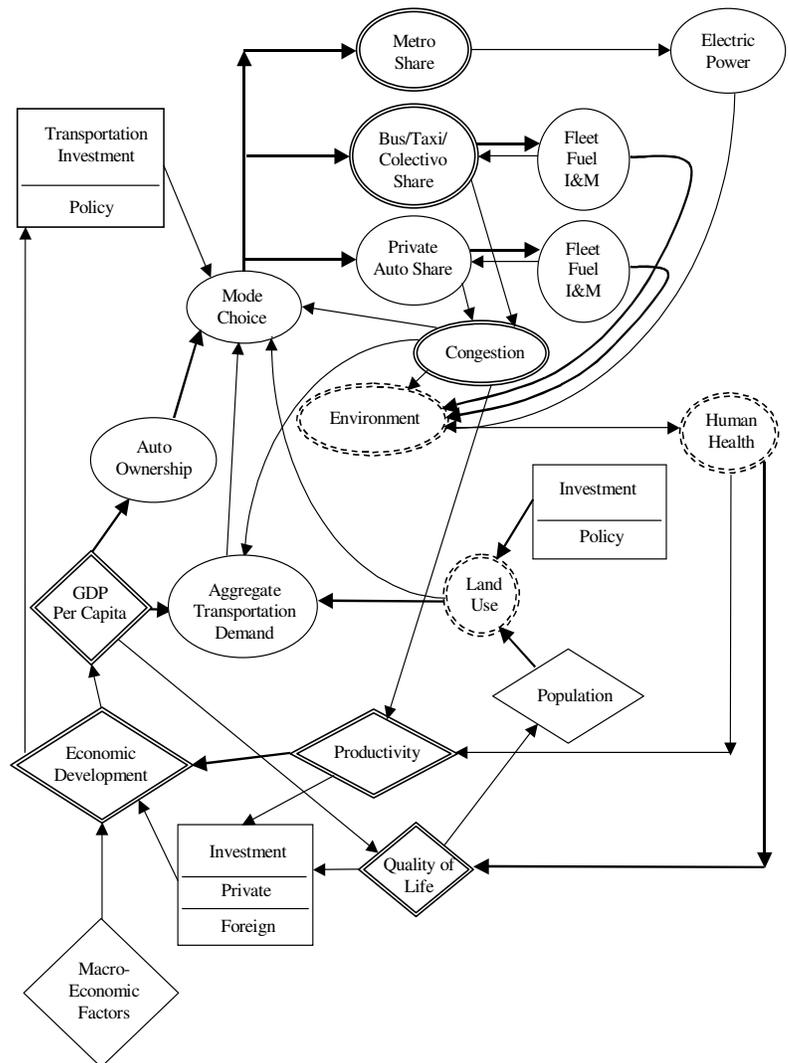
Step 6: Refine CLIOS System Goals, Identify Performance Measures, and *Develop Models and Frameworks* (3)

- Build and test models of the current CLIOS System
- Roughly speaking, the equivalent of the qualitative representation in Stage 1
  - System-wide models
  - Case-specific models

Step 7: Identify and Design Strategic Alternatives for CLIOS System Improvement

- ❖ This is the creative step in the CLIOS Process. We are interested in improving the performance of our CLIOS System.
  - ❖ Searching the "solution space"
  - ❖ Thinking "outside the box" – new / fresh ideas, cutting across the CLIOS System
  - ❖ But don't overlook conventional strategic alternatives
  - ❖ Be sensitive to the behavioral complexity in our CLIOS System

Design as a Multi-level Concept

Macro-design
Conceptual
"Architecture"

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Micro-design

Detailed in nature

Example--sizing--how many lanes do we need

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Strategic Alternatives of Various Kinds

In the Physical Domain:

- physical – "hardware"
- policy-driven – e.g. environmental regulations

On the Institutional Sphere:

- Changes to organizations Structural / Functional
- Changes to relationships between organizations

Recognize that changes on the institutional sphere may be needed to make physical domain changes implementable.

MANAGING A METROPOLITAN CLIOS SYSTEM

- Mexico City provides a clear example of how changes in the physical domain can impact the types of policy-institutional structures that are needed to manage certain issues.

- The urbanized area has progressed beyond the Federal District across state boundaries to the State of Mexico, and more recently, to the State of Hidalgo.

- In this manner, *the physical domain changes generated a tension on the institutional sphere, which necessitated new institutions* at the metropolitan-level.

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Step 8: Flag Important Areas of Uncertainty (1)

Uncertainty is everywhere – deal with it!

Possible uncertainties (simply as examples):

◆ Demand for services produced by our CLIOS System

◆ Rate of technology development and acceptance

◆ Change in macro-economic or geo-political situation

We are thinking ahead to the development of flexible strategic alternatives

Step 8: Flag Important Areas of Uncertainty (2)

Uncertainty in the performance of the system

- Subsystem and system-wide level
- Links with large magnitude, fast-moving, non-linear or irreversible influences on other components within the system (Step 5)
- "Openness" of the system
- Analyze the impact of key external factors

Step 8: Flag Important Areas of Uncertainty (3)

Scenario Planning as a technique for thinking about uncertainty.

Developed in the 1970s by Royal Dutch Shell.

The idea: "coherent credible stories about alternative futures"

"Practicing" the future – training your mind to recognize alternative ways events can play out.

Step 8: Flag Important Areas of Uncertainty (4)

- ◆ An approach to scenario building in the CLIOS Process
  - ◆ Link the CLIOS System to its broader environment
  - ◆ Identify the external forces that influence the common drivers
  - ◆ international trade regimes, societal attitudes, environmental movements, and many others
  - ◆ CLIOS Systems are "open" systems, and the most significant uncertainties may come from "outside" the CLIOS

Step 9: Evaluate Strategic Alternatives and Select Robust Bundles that Perform "Best" Across Futures (1)

Evaluate strategic alternatives and refine them as appropriate.

Consider whether to include flexibility in the strategic alternatives.

Select robust bundles of strategic alternatives, recognizing the interaction effects of various strategic alternatives.

Step 9: Evaluate Strategic Alternatives and Select Robust Bundles that Perform "Best" Across Futures (2)

- Evaluation of alternatives according to performance measures
  - Assess trade-offs-- optimization is difficult (evaluative complexity)
- Engineering-based or cost-benefit analysis
- Assess the possible impacts on:
  - Other components of the same subsystem layer
  - Other subsystems
  - Different actors on the institutional sphere

- Some modeling and quantitative analysis is central to this step
- Create robust bundles of strategic alternatives – where robustness is the ability to perform reasonably well in different futures

Performance of Bundles across different Futures

Discussion-- which bundle would you choose?

	Future1	Future2	Future3
Bundle 1	+	–	++
Bundle 2	+	++	+
Bundle 3	+	0	+

Evaluative Complexity Rears its Head!

What does "good performance" mean?

"Optimizing" not a realistic goal – finding something that works is more realistic.

Do we optimize?

This is NOT the world of

$$\frac{d\beta(x)}{dx} = 0$$

and we are all done.

Stage 3: Implementation

Implementation

10. Design Plan for Implementation and Implement in the Physical Domain	11. Design Plan for Implementation and Implement in the Institutional Sphere

12. Post-Implementation Evaluation and Modification
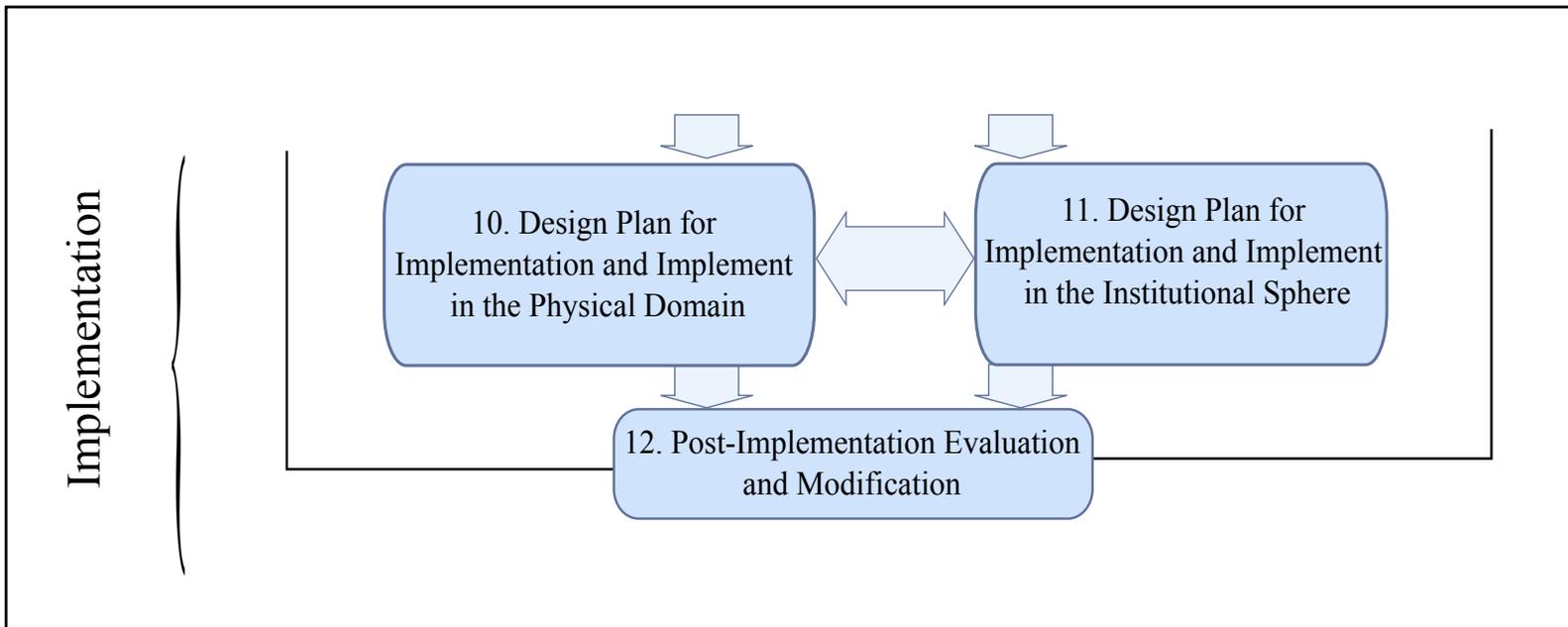
Figure by MIT OpenCourseWare.

In the CLIOS Process, we distinguish between "strategic alternatives," developed in Stage 2, and a "plan" for implementation although sometimes this is a fine point.

We will discuss Stage 3 in detail later

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