Scenario Planning:
A Proposed Approach for Strategic Regional Transportation Planning

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Performance and Planning Issues

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Outline

- **I. A Primer on Scenario Planning**

- **II. The Houston Platform**

- **III. Houston: Conclusions & Observations**

- **IV. Ongoing Work**

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I. Scenario Planning – A Primer

- **What?**
  - Scenarios – "An imagined sequence of future events"

- **Why?**
  - To prepare us for uncertain futures, examining multiple sequences/stories because...
    - *"the conclusion you jump to may be your own"* (James Thurber)
  - Not replace traditional forecasting; rather, help us better prepare for the unexpected

- **How?**
  - Develop structured, in-depth stories of plausible futures

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I. Scenario Planning – A Primer

- **Origins – Royal Dutch Shell in the 1960s, early '70s**
  - Frequency and magnitude of forecasting errors increasing
  - Developed a planning approach that could:
    - deal with uncertainty,
    - cover "a wide span of possible futures"
    - be "internally consistent"
    - drive strategic thinking and – ultimately – strategic action.

- **"Stories" - to "describe different worlds"** *not* **"different outcomes of the same world"**
  - Logical depictions of possible futures

- **Organizational Learning – the process (scenario planning) as important as the result (the scenarios)**
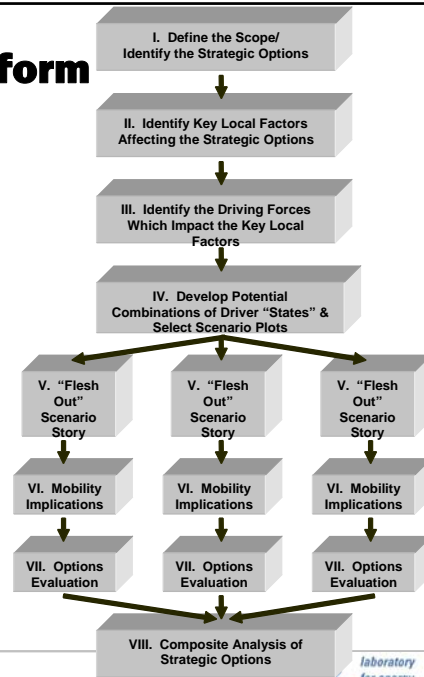 - "*protective*" role – helping decision makers anticipate and better understand risk
  - "*entrepreneurial*" role – enabling decision-makers discover *new strategic options*

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II. The Houston Platform

- I. Define the Scope/ Identify the Strategic Options
- II. Identify Key Local Factors Affecting the Strategic Options
- III. Identify the Driving Forces Which Impact the Key Local Factors
- IV. Develop Potential Combinations of Driver "States" & Select Scenario Plots
- V. "Flesh Out" Scenario Story
- VI. Mobility Implications
- VII. Options Evaluation
- VIII. Composite Analysis of Strategic Options

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II. The Houston Platform – Step I

- **Step I: Define the Scope**
  - Identify strategic options to satisfy mobility demands in Metropolitan Houston over approximately the next 20-25 years
    - Drawing from existing plans, including inter-city nodes, "pushing the envelope"

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II. The Houston Platform – Step II

- **Step II: Outline *Key Local Factors* that Influence the Performance of the Options**
  - Should be both important to the decision to be made *and* uncertain.

- **Key Local Factors:**
  - Health of the local economy
  - Shifts in environmental attitudes/policies
  - Demographics
  - Federal/state investments/control
  - Local politics

- **These Categories of Key Local Factors are generalizable to other metro areas.**

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II. The Houston Platform – Step III

- **Step III: Identify the Driving Forces Which Impact the Key Local Factors**
  - Social, economic, political, environmental and technological *macro*-issues, which are most likely external to the area being considered.
  - Again, should be both *uncertain* & *important* to decision

- **Driving Forces**
  - State of the economy - global and regional economic integration, trade, capital flows, competition, wages;
  - Finance - availability of infrastructure funding, user fees and charging mechanisms, private sector participation;
  - Future Technology - ITS, telecoms, vehicle technologies, fuel supply technologies, advances in other modes (rail, shipping);
  - Environment - local air pollutants, climate change, endangered species, water pollution, "sprawl"

- **Similar to Key Local Factors, these Categories of Driving Forces are generalizable to other metro areas.**

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II. The Houston Platform – Step IV

■ **Step IV: Develop Potential Combinations of Driver "States" & Select Scenario Plots**

- Matrix of the "states" (i.e., good/bad) provides potential driver combinations
- Wack (1985) suggests 3 ultimate combinations to form scenario (story) "plots"

Scenario	Drivers			
	Economy	*Finance*	*Environment*	*Technology*
United States of N. America	Rapid Growth	Ease of Finance	Environmental Indifference	Little Innovation
Balkanization	Stagnant	Lack of Finance	Environmental Indifference	Little Innovation
Earth Day 2020	Rapid Growth	Lack of Finance	Environmental Concern	Innovation

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II. The Houston Platform – Step V

■ **Step V: Flesh Out the Scenario Stories**

- Give "full reality" to the scenarios, to leave a clear impression
- Remain faithful to the scenario logic
- Build plausible cause-effect relationships
  - Key to internal consistency and organizational learning
- Estimate the driver effects (macro story lines) on the key local decision factors

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II. The Houston Platform – Step VI

- **Step VI: Mobility Implications of the Scenarios**
  - Examine the state of mobility under each scenario
    - Change in the magnitude of activity in the region
    - Change in the spatial distribution of activity in the region
    - Change in the types of activity in the region

  - Provides initial portraits of mobility needs in the future to evaluate the various options (from Step 1)
    - Challenge: can certain scenarios develop without options in place (i.e., USNA)?

  - We used simple, modeling techniques, but more sophisticated analysis entirely possible

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II. The Houston Platform: Steps V & VI

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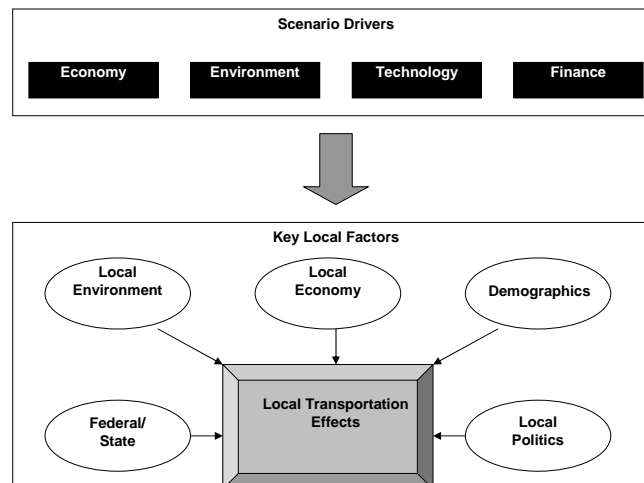
II. The Houston Platform – Step VII

■ **Step VII: Options Evaluation**
- Required an approach to match scenario planning's multi-dimensional, holistic and *organizational* perspective
- Chose multi-criteria analysis to integrate quantitative and qualitative factors
  - a process that can "*lead to better communication between the analysts and the decision-makers*" (Won, 1990)
- Two general categories of criteria (feasibility & effectiveness), with specific evaluation criteria in each
  - Cardinal numbers for ranking each option by each criteria
  - Summation provides ranking/prioritization
- Again, a basic, first-order approach, that can be made more thorough and detailed (metrics, etc.)

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II. The Houston Platform – Step VII

Example structure of the multi-criteria evaluation framework

Criteria Category	Criteria	Strategic Mobility Option			
		A	B	C	N
Feasibility	Financial				
	Environmental				
	Institutional				
Effectiveness	Individual Accessibility				
	Freight Mobility				
	Equity				

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II. The Houston Platform – Step VIII

■ **Step VIII: Composite Analysis of Strategic Options**
  - Aggregate the individual multicriteria analysis outputs into a composite matrix
  - "Robustness" approach – Each option's summed score in each scenario
  - "Risk Minimization" approach – Each option's lowest score across the scenarios
  - Similar top-five options under each approach, slightly different order of prioritization:
    – system maintenance
    – HOV network expansion
    – congestion pricing
    – port expansion
    – light rail

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III. Houston: Conclusions & Observations

■ **Potential benefits of approach**
  - A logical planning framework
    – Scenarios require internal consistency, certain things cannot happen together.
  - Can help stakeholders identify robust transportation strategies in a time of uncertainty
  - Can aid in grasping the "larger picture" – range of forces that fall outside scope of "traditional" planning practice

■ **Drawbacks to demonstrated approach**
  - Academic setting, unable to see true organizational impacts
  - Might meet considerable resistance in established organizations, with institutionalized/codified practices
  - Qualitative nature might meet skepticism
    – Can be more closely linked with quantitative methods
  - Time constraints limited tests of scenario "goodness"

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III. Houston: Conclusions & Observations

- **Possible refinements to the Scenarios**
  - "actor testing" to determine internal scenario consistency
    - Stakeholders and their interests/power in time
  - Comparison of pre-determined elements across scenarios
    - To ensure that these remain consistent throughout each
  - Development of "indicators" so that we know which future is actually occuring

- **Possible refinements to options evaluation**
  - Capturing mobility interactions among options (i.e., network effects)
  - A method to more effectively capture uncertainty, complexity and controversy

- **Differences with Conventional Approaches?**
  - Robustness idea
  - Internal consistency
  - Organizational learning and buy-in
  - Thinking "out of the box", preparing for the truly uncertain

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IV. Ongoing Work

- **Current Application: Mexico City Integrated Program on Urban, Regional and Global Air Pollution**

  - Combining Bottom-Up Modeling (activities) with Top Down Models (scenarios – "Future Stories")

  - "Future Stories" serve as organizing principles for complex policy analysis

  - 3 "Future Stories" containing 8 different Driving Forces

  - Will use multi-attribute trade-off analysis to assess option performance
    - Looking at transportation and non-transportation sectors

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