Collaborative Sciences Center for ROAD SAFETY

Safe Systems Summit

Redefining Transportation Safety

Measuring System Success

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4.669 Evaluation and Planning

April 24, 2019

My challenge for this presentation

How to do a one hour workshop that covers:

- How to evaluate a Safe Systems approach?
- Alignment between Safe Systems and traditional safety measures
- Aligning safety performance measures to improve safety
- Iterative and organizational learning approaches to identify and implement safety measures
- Develop success measures shared by all relevant stakeholders
- Evaluation to recognize complex behavior

My answer:

- Focus on the special characteristics of systems
- Downplay evaluation of discrete innovations with a few discrete outcomes.
- Apologies for the false advertising. I may slight some topics.

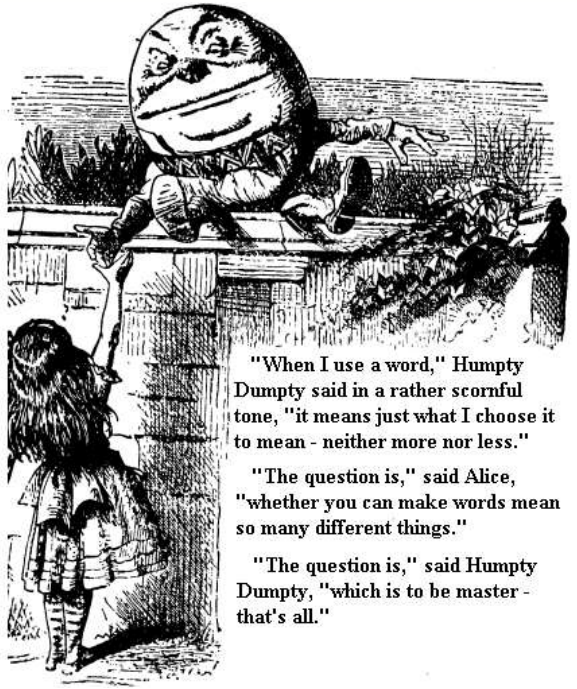
What is a system?

An assemblage or combination of things or parts forming a complex or unitary whole. [1]

A regularly interacting or interdependent group of items forming a unified whole [2]

A system is a group of interacting or interrelated entities that form a unified whole. A system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning.[3]

A collection of organized things; a whole composed of relationships among its members.[4]

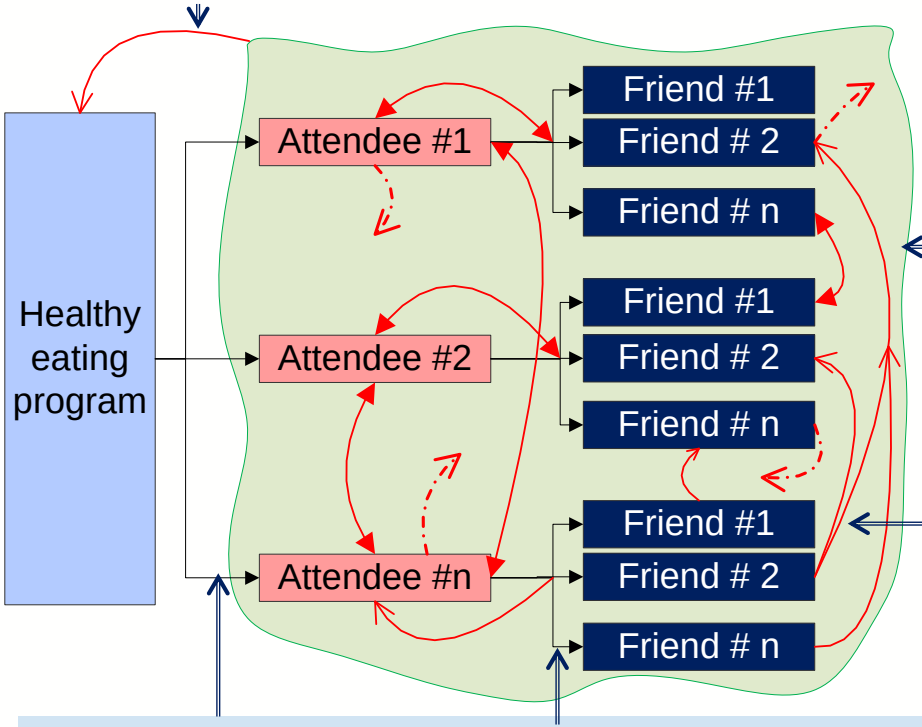


Through the Looking Glass, by Lewis Carroll
http://www.authorama.com/through-the-looking-glass-6.html

1 - Dictionary.com / 2- Merriam Webster / 3- Wikipedia / 4- Wiktionary

Complex system plebian methodology

Feedback
- Track changes in services over time
- Interview staff on perceptions of need



Unpredictable change emanating from community activity
- Monitoring
- Observation
- Open ended interviewing
- Content analysis of community social media

Network connection development
- Open ended interviewing
- Content analysis of community social media

1:1 impact -- Questionnaires / Interviews / Observation

When should something be considered a system for reasons of planning or evaluation?

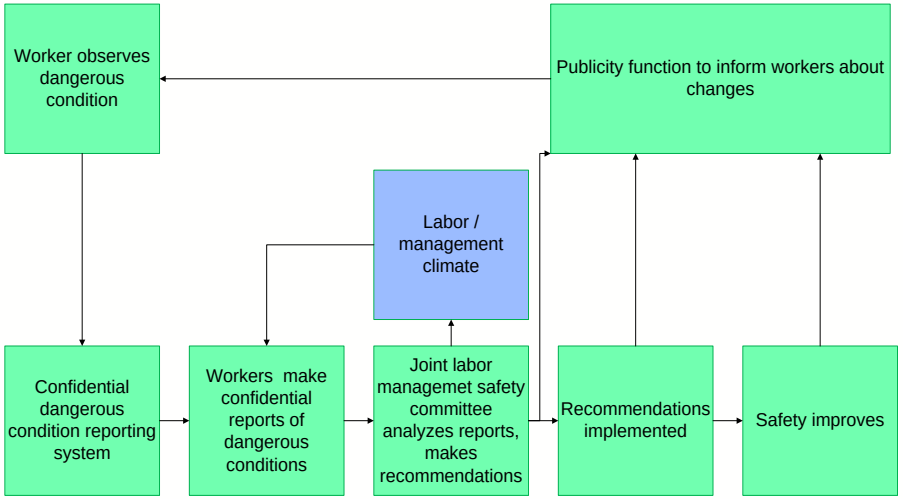
Technical rules of thumb

- Lots of feedback loops
- Elaborate connections among outcomes
- Elements not directly related to the innovation, e.g. environmental factors
- Lots of 1:many or many:1 relationships
- Focus on change over a long time.

Conceptual rules of thumb

- Will a systems approach make a difference for
  - Doing evaluation
  - Explaining how the program works
  - Advocating for the program
- Enough of a difference to be worth it?

Close call reporting innovation in a heavily unionized transportation industry

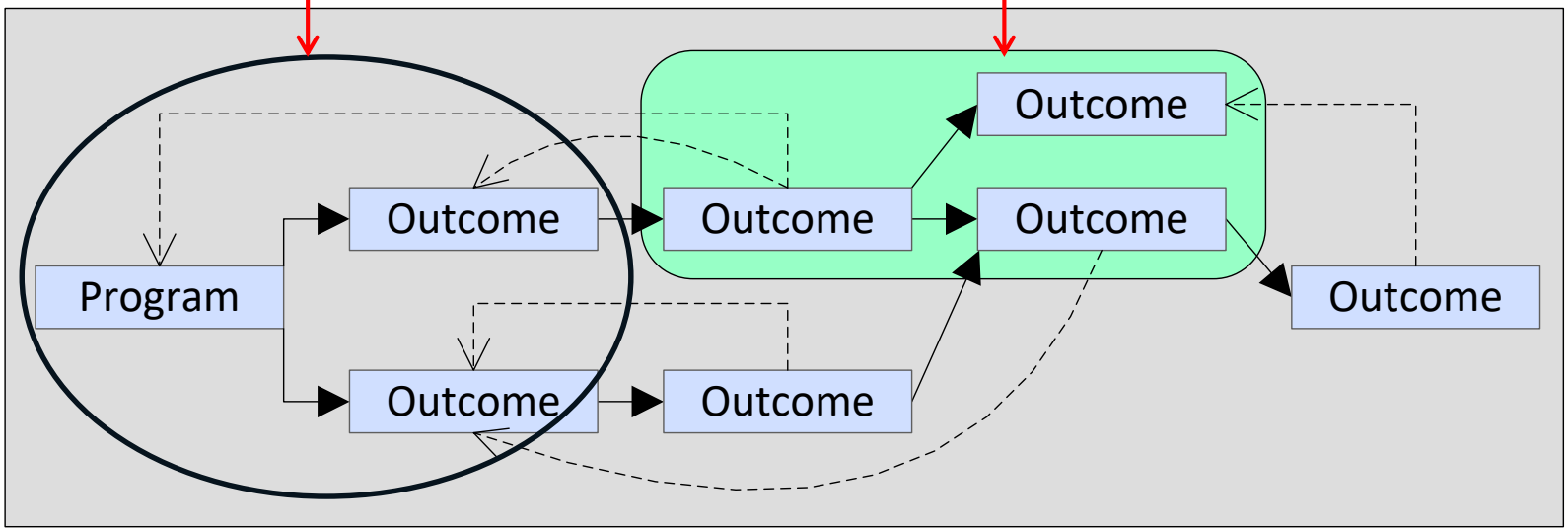


Worth a systems perspective, or not?

- Conducting the evaluation gets harder
- More elaborate methodology
- More concepts to measure
- Complicated model → greater likelihood it will be wrong

Model behavior may not be obvious or conform to common sense

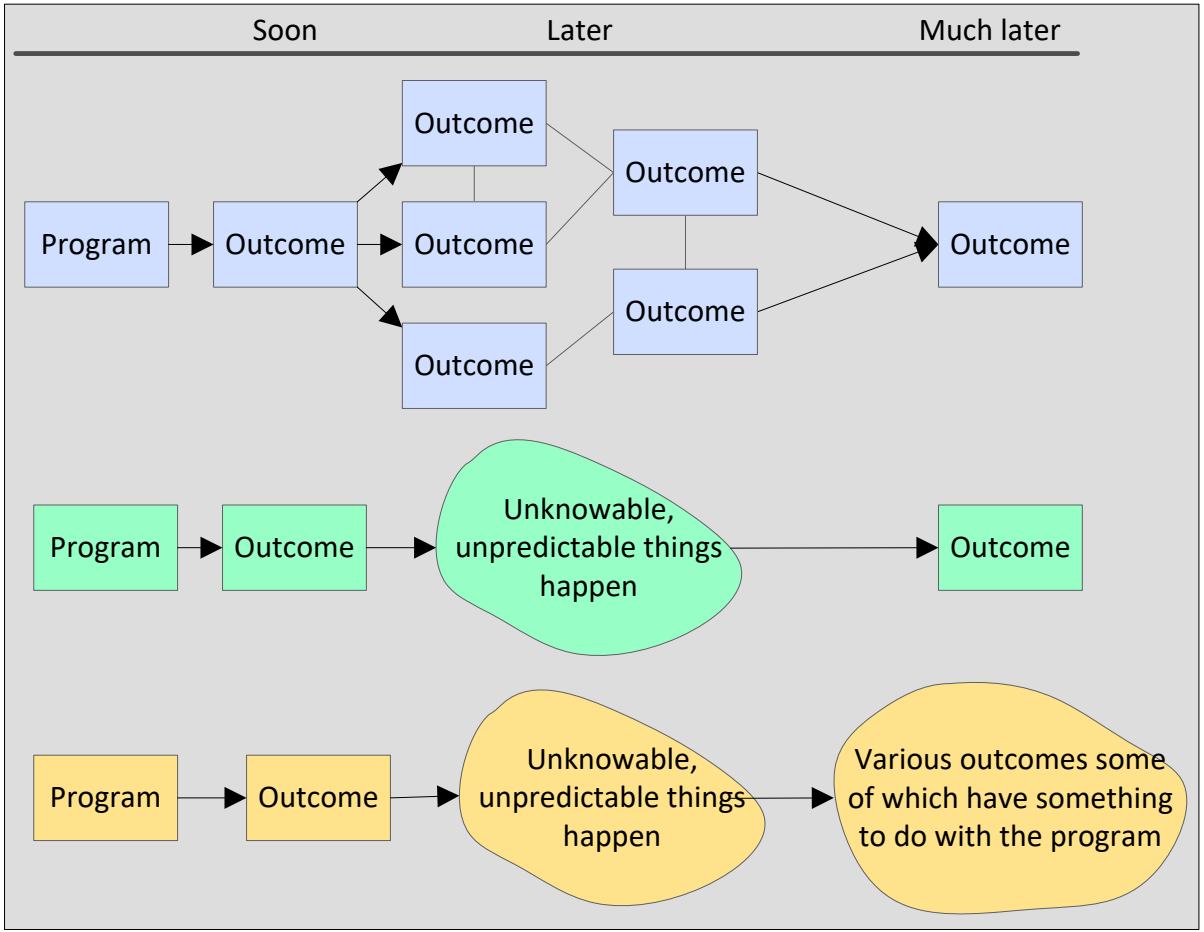
Specified relationships may be correct locally



Whole model may behave differently from the “sum” of its individual relationships

- Network effects
- Sensitive dependence

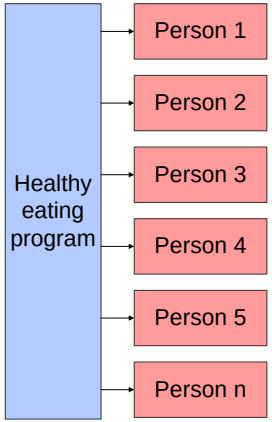
When designing models, some modesty is needed because system behavior is unpredictable.



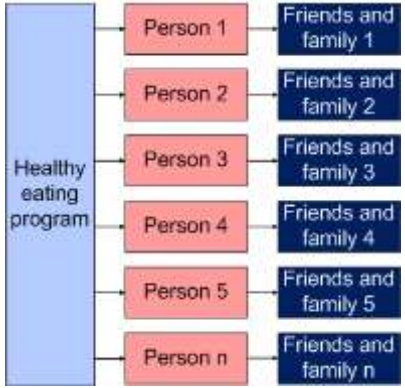
When thinking about systems, focus on the models. That is where systems issues are.

Iterative model development is required. Data will inevitably challenge models.

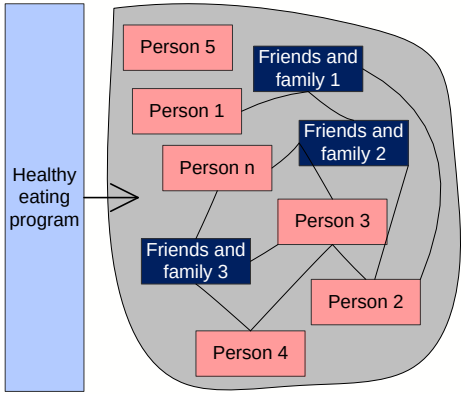
Same program. What should be evaluated?



- Cheap and easy
- Results can be very useful to decision makers



- Wider range of benefits
- Still a straightforward methodology
- More knowledge of community level benefits



- More work for qualitative efforts
- More likely to encounter unexpected outcomes
- Effort needed to assess community level effects
- Harder to find comparison groups because setting plays more of a role
- Unpredictable outcome chain, limits information for planning and advocacy
- State change – more frequent data collection to identify inflection point.

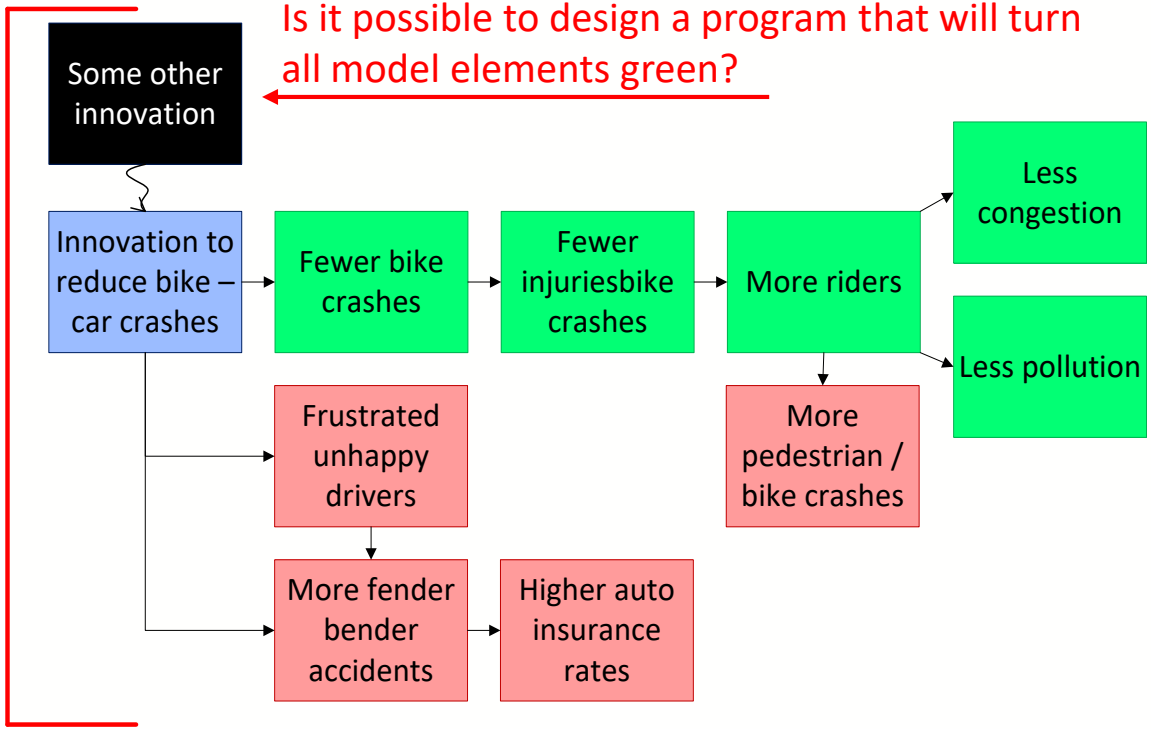
Alignment or difficult choices about when a systems view is taken?

- Cost
- Expertise
- Design time
- R&D requirements
- Implementation time
- Negotiation difficulty among stakeholders
- Organizational sources of funds and decision making

Can all these outcomes be aligned?

Or

Are difficult choices about joint optimization needed?

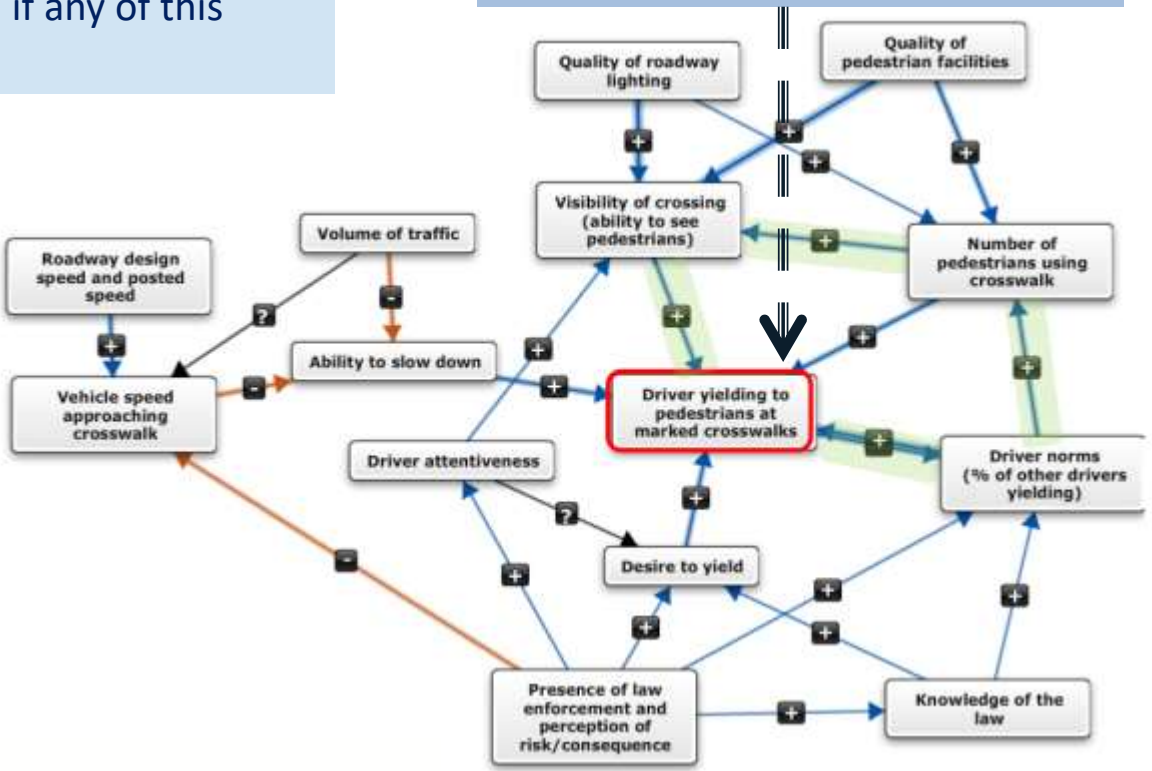


Explaining the Rise in Pedestrian Fatalities: A Systems Science Perspective [1]

1- Considering the technical and conceptual issues in evaluating a system. How much if any of this model should be evaluated?

2- What other model elements might be revealed with an expanded view of outcomes? Which of these are compatible and which would require either: 1) ignoring, or 2) jointly optimizing?

Evaluating an innovation to increase driver yields at marked crosswalks



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