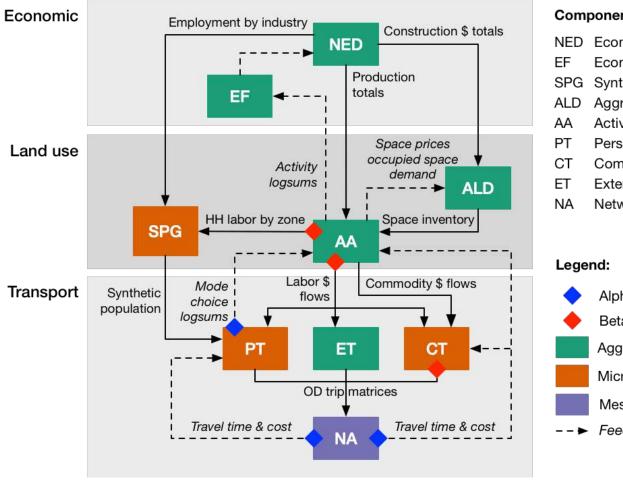


# Rapid 4W presentation

- 1. What
- 2. Why
- 3. Which
- 4. Wisdom

# The gist



#### Component models:

NED Economic & demographic

Economic Feedback (optional)

SPG Synthetic population generator

Aggregate land development

Activity allocation (part of PECAS)

Person travel demand

Commercial travel demand

External travel demand

Network assignment

Alpha-beta zone conversion

Beta-alpha zone conversion

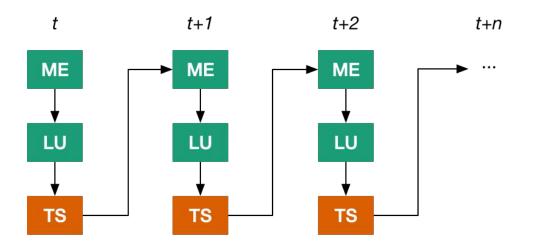
Aggregate/equilibrium model

Microsimulation component

Mesoscopic component

Feedback in next period

# Simulated evolution



#### Systems:

ME Macroeconomic

LU Land use

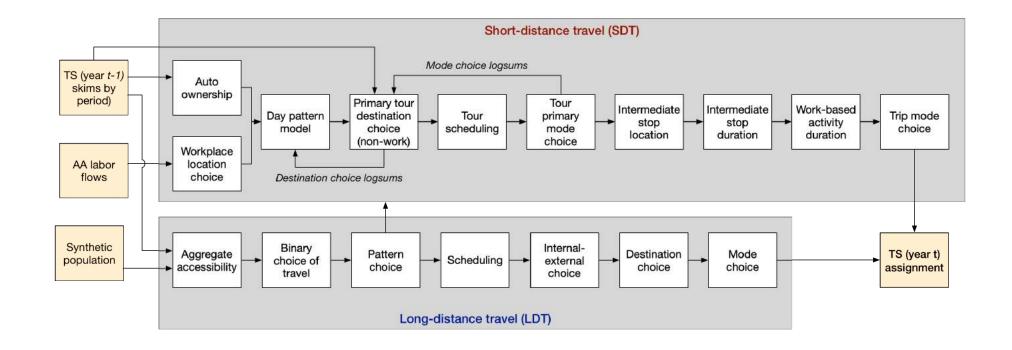
TS Transport system

#### Legend:

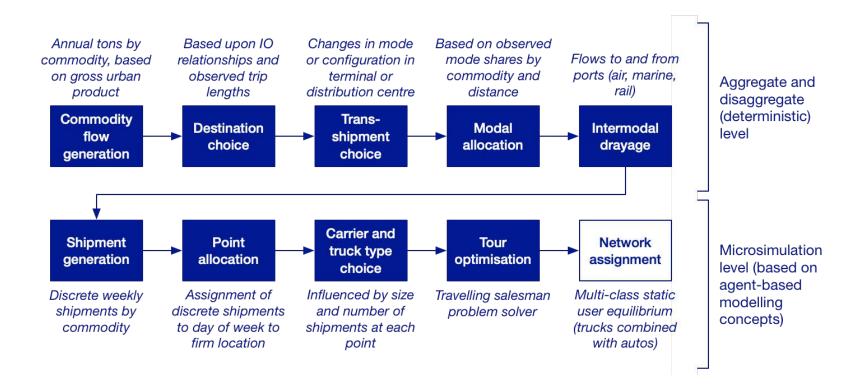
Aggregate/equilibrium models

Microsimulation components

## Person travel model



## Commercial travel model



## Why?

#### Original requirements (1998)

Effects on land use and travel decisions:

- Land supply
- Congestion
- Cumulative retail location choices
- Large commercial growth at UGB boundary
- Roadway capacity increases
- Network connectivity changes
- Parking supply
- Urban form influence mode choice
- Rail investment on highway use
- · Changes in demographics

#### Additional requirements (2010)

Ability to evaluate effects of:

- Climate change
- Fuel scarcity
- Economic downturn
- Pricing
- Technological changes
- · Supply chain recoil
- Gentrification

#### Anticipated requirements (2017)

Ability to inform major changes:

- Autonomous vehicles
- · Dynamic micro-pricing
- · Mobility as a service
- "Second machine age" effects
- . . .

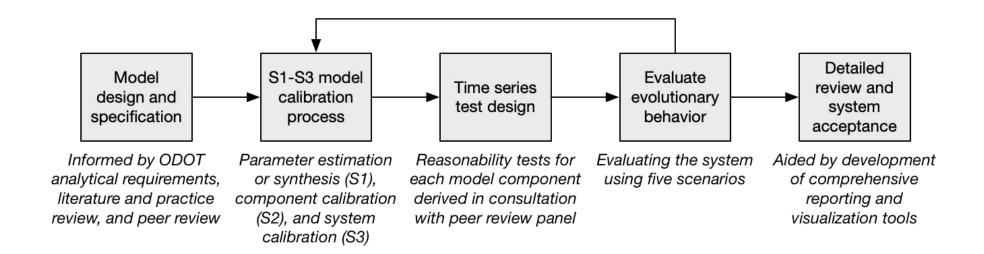
# Lessons learned: methodological

- Noisy price data
- Dynamics → complexity
- Black swans rule
- Expect parameter storm
- Don't fight the data
- Expansive view of validation
- Embrace machine learning

#### Values shown subject to frequent revisions

Group	Model	Dev	User
Land use and economic	Macroeconomic	21	4
	Population synthesis	18	8
	Economic allocation	120	28
Transport	Internal person travel	64	9
	Long-distance person travel		
	Commodity flow	12	3
	Long-distance freight		
	Truck tour model	9	2
	Network analyses	28	8
Evaluation	Post-processors	2	2
	Total parameters	274	64
	Percent of total parameters		23.4

# Three-stage validation



## Lessons learned: institutional

- Imperative of the champion
- Necessity of agile development
- Land use model development cost
- Long-term dependence on developer
- Value of peer review
- Data anchors the process
- Rapidly changing requirements

# Agile development

ED model

SPG model

#### Required model functionality (implemented as semi-autonomous components) Economic and Synthetic Production demographic Land use allocation/activity Person travel **Transport** Environmental population Freight travel forecasts demand model generator model interaction demand model supply model analyses Models Simplified Trend Adapt Simplified QRS QRFM Assign trips Simple evolve over **TRANSIMS** model land use economic trip-based trip-based emissions using time and EMME2 allocation allocation model model calculator process sometimes at different rates Household Business Tour Import-Manual Daily tour Standalone GHG perexport transitions overrides transitions pattern generator static formance forecasts generator assignment measures Vehicle Parallel Input-Land re-Interactions Destination Destination Interface to MOBILE6 output ownership developmodel choice choice static models model extensions model ment model models assignment Originally Tour & trip Structural Parallel Originally Trans-Select link Interface to **MOVES** specified specified PI mode analysis econocode shipment LD model & Al models choice metrics version model capabilities beta model Originally Originally Transition to PECAS Originally Originally Originally **Emissions** specified specified specified specified specified modeling

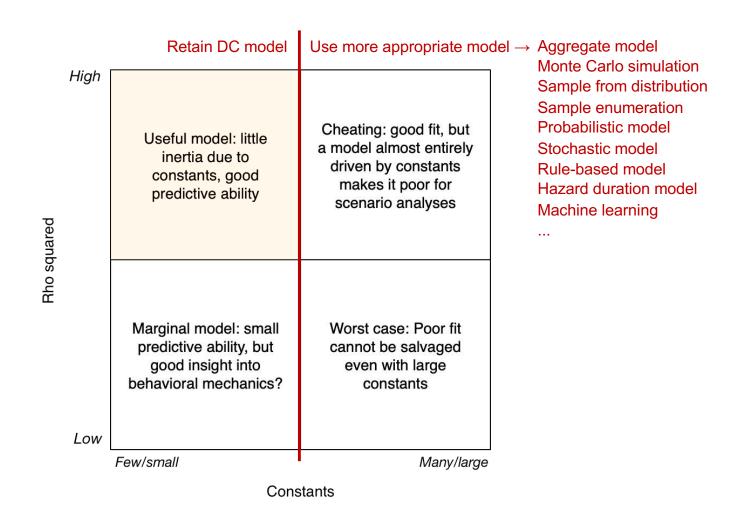
PT model

CT model

TS model

capability

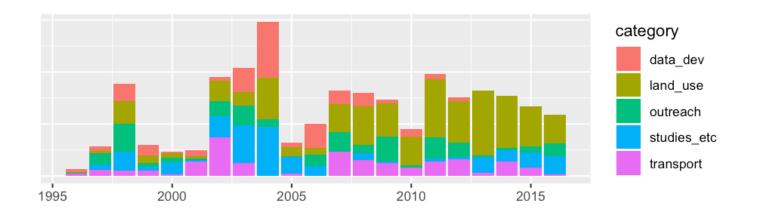
## DC model rant

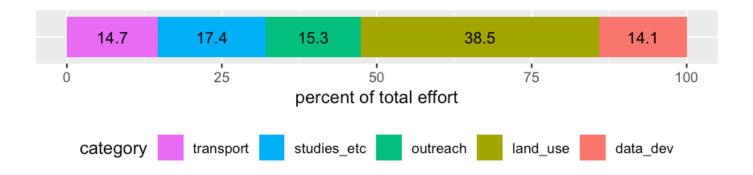


## Lessons learned: institutional

- Imperative of the champion
- Necessity of agile development
- Land use model development cost
- Long-term dependence on developer
- Value of peer review
- Data anchors the process
- Rapidly changing requirements

# Building SWIM2.x





## Lessons learned: institutional

- Imperative of the champion
- Necessity of agile development
- Land use model development cost
- Long-term dependence on developer
- Value of peer review
- Data anchors the process
- Rapidly changing requirements

Agile *mindset* 

# Questions for the SWIM team?

## Champions

Becky Knudson Bill Upton

### **Key Contributors**

John Abraham Carl Batten

Alex Bettinardi

**Patrick Costinett** 

Bill Davidson

Rick Donnelly

Chris Frazier

Joel Freedman

Brian Gregor

Jim Hicks

Graham Hill

John Douglas Hunt

Gregory Macfarlane

Yegor Malinovskiy

Ben Stabler

Paul Waddell

Erin Wardell

Tara Weidner

Michal Wert

Christi Willison

#### **Peer Review Panelists**

Julie Dunbar

Kimberly Fisher

Frank Koppelman

Keith Lawton

Gordon Shunk

**David Simmonds** 

Bill Upton

Michael Wegener