Big Data in Retail
Taking the next step with System Dynamics

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isee systems

The Value and Promise of Big Data

- Unlocking customer needs

- Fact based decision making
  - Knowing what works
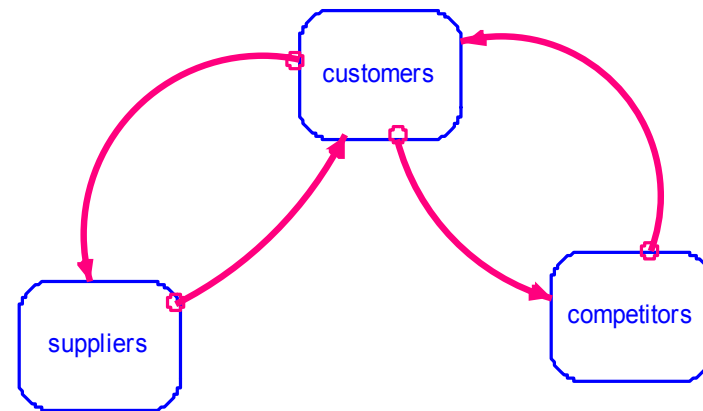 - Who it works on

- Finding out more and more
  - Measureable activities are everywhere

The Big Picture with System Dynamics

- Changes propagate
- Customers evolve
- Suppliers respond
- Competitors adapt
- System Dynamics brings it all together

Setting the Stage

- Buymore is a large electronics store chain
  - Sales have been stagnant
  - Largemart, their competitor, has been gaining market share
- TLA, a Big Data consultancy, is pushing a system to help target customer outreach
  - Bob, a student of System Dynamics, is hoping to add insights around TLA's design
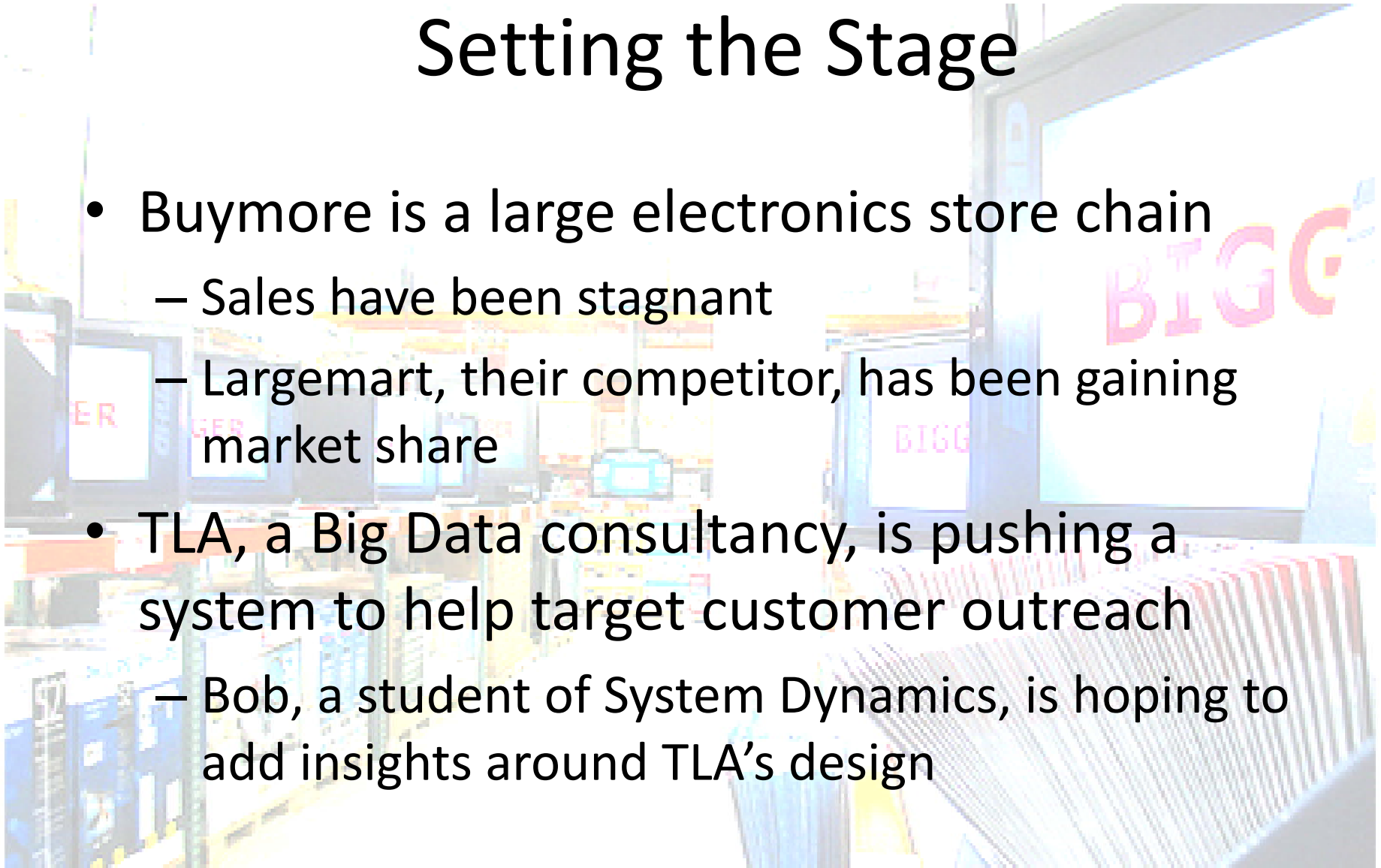
TLA's Pitch to Buymore

- We can identify customers responsive to marketing efforts
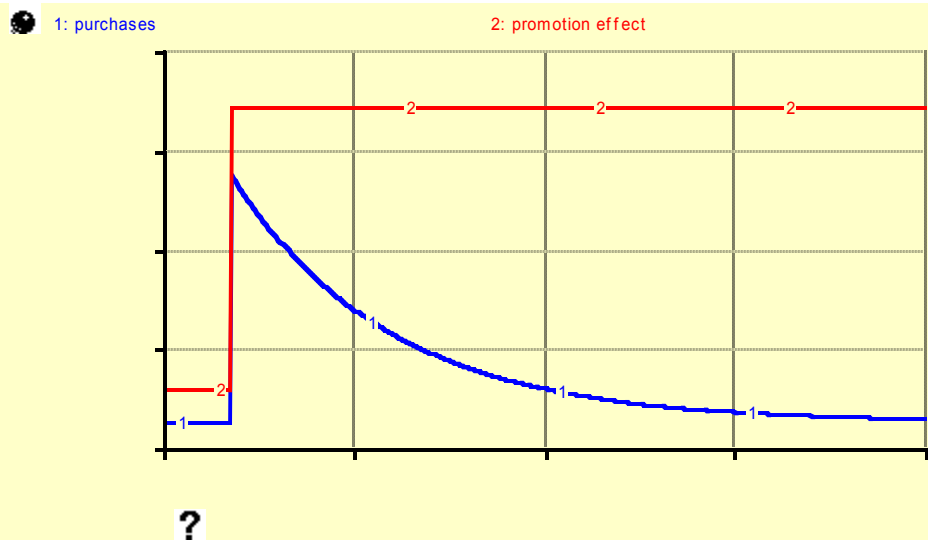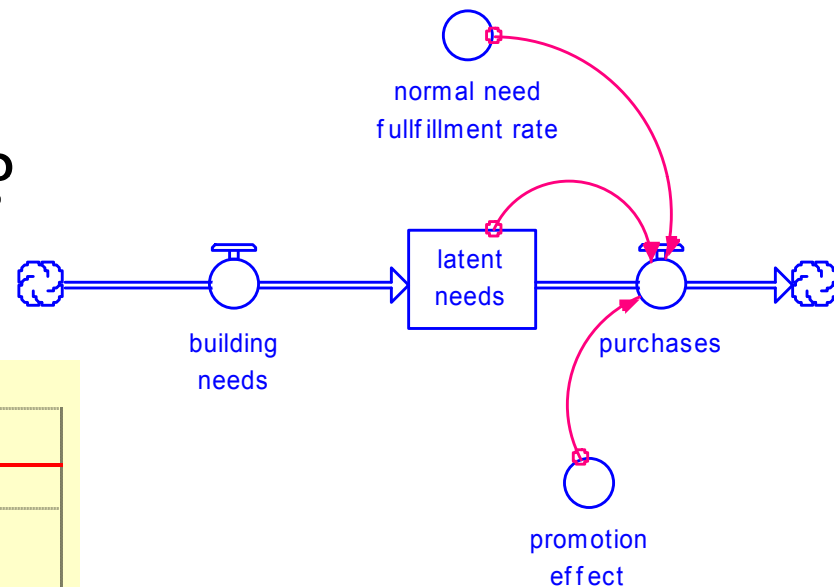 - Target them, ignore the unresponsive
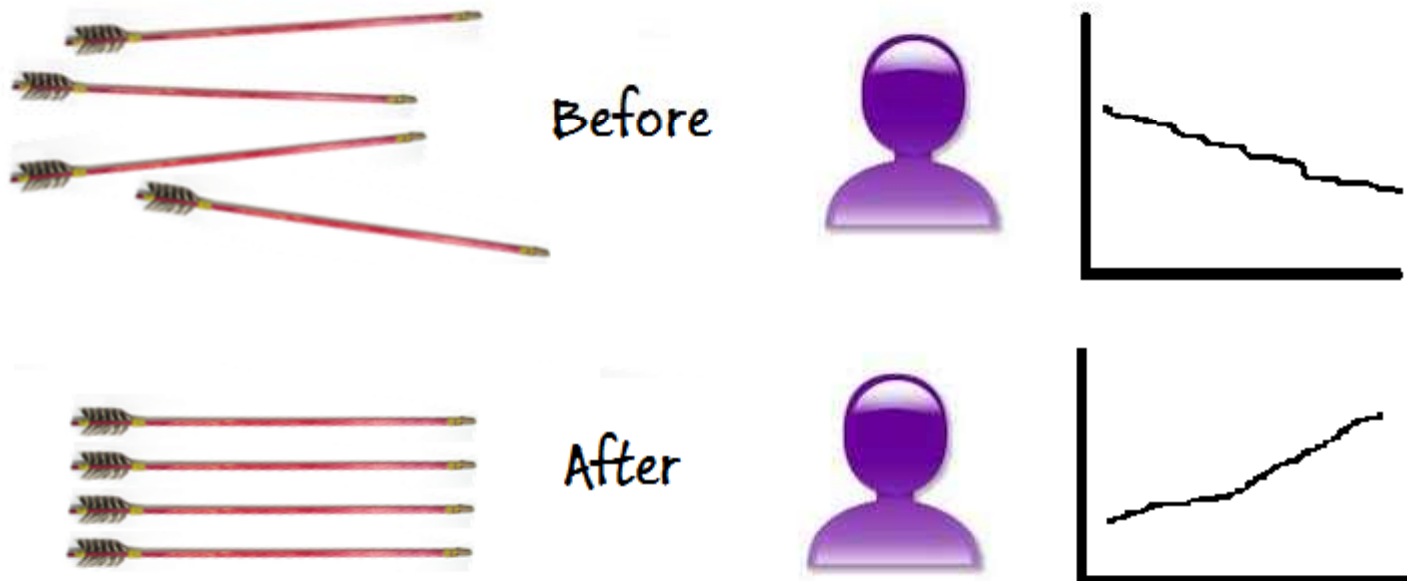
Bob's Reaction

- That's really cool
  - Cause it is
- You have great inputs predicting response
  - Demographics
  - Location
  - Time of year
  - Product novelty
- But there is more than a list

From Lists to Stocks

- Stepping behind the curtain
  - What causes that?
 - Why do things change?
- A simple thought

Implication for Data Analytics

- Response effects will change over time
  - Even when the inputs are not changing
- We measure what has happened
  - We want to know what will happen
    - That is the value of "structure"
- But, one of the TLA crew thoughtfully says…
  - "Buymore has thousands of customers – you can't just model one."

Getting at the Detail

- "Different, but not that different" Bob replies
  - We can capture that with a bit more detail
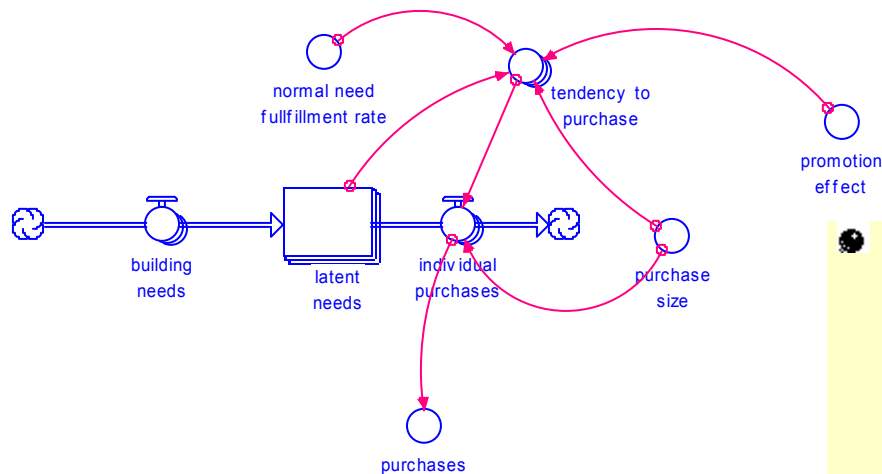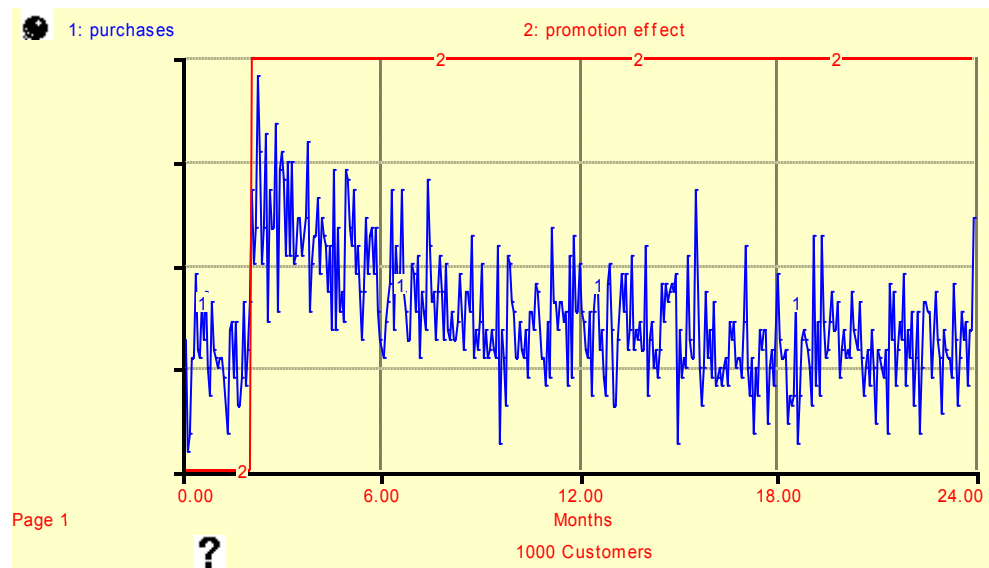

  - Periodic purchasing
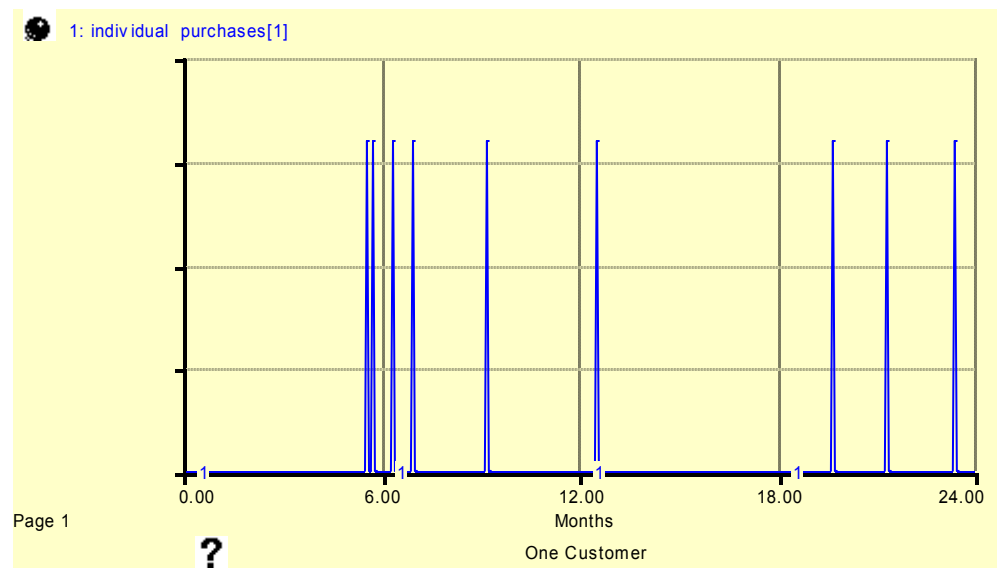
Adding things up

- With 1,000 customers
  - Each purchasing periodically
  - Together we get:
- Same pattern

Why'd that work?

- The TLA gang think it is a coincidence
  - But it is a bit more
- Same "feedback structure"
  - Purchases change latent needs which influence purchases
  - The individual model just has more detail
- The behavior adds up
  - Feedback insights always do
    - Not always true with bottom up

Anything we can use?

- The data scientists are now curious
- Bob has to XMILE
- Two approaches
  - Use the models offline
    - Efficiently developed using System Dynamics
    - Translated for use in operational systems
      - Tricky, but doable
  - Incorporate the models directly
    - That is the promise of XMILE

XMILE at the front end

- XMILE will support integration with standard tools
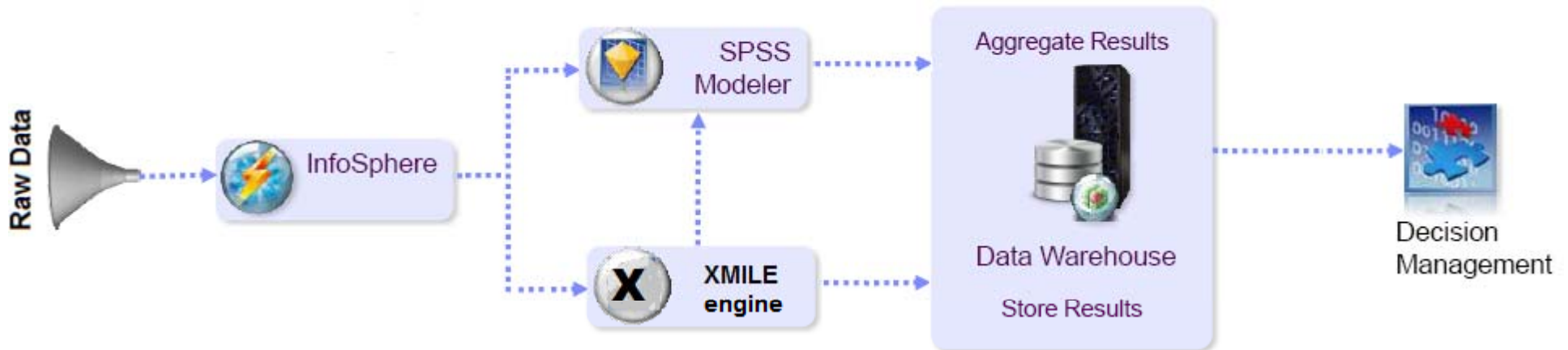
System Dynamics Inside Big Data

- Discrete choice models are already there
  - Logit and Probit analysis
- Constrained by the efficiency of design
  - System Dynamics simplifies this process
    - Especially working the conceptual case
- The resulting models can be used directly
  - Hand coded
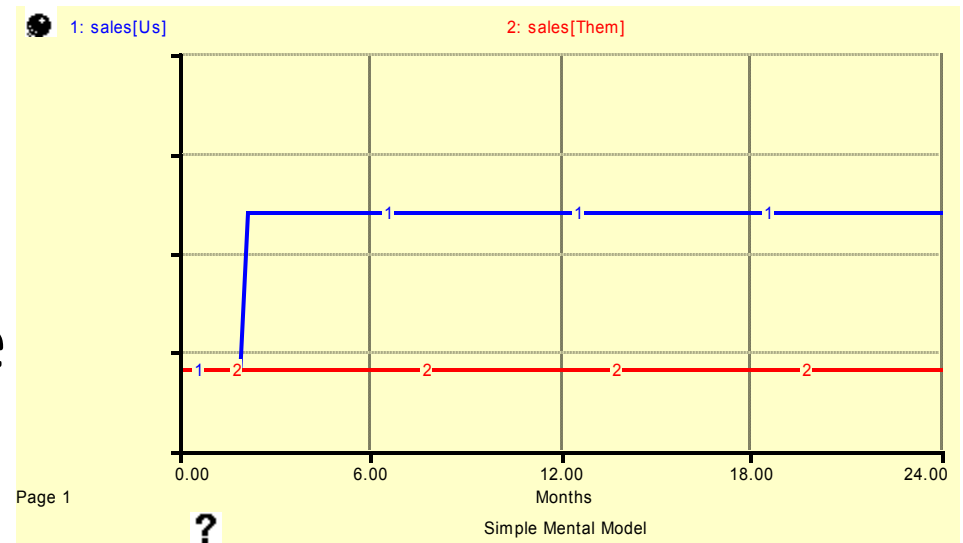 - Or with XMILE supporting an engine

Taking a step back

- System Dynamics is a helpful framework for conceptualizing micro structure
  - But it shines with the Macro
- Buymore wants to know what will happen when the new analytics are turned on.
  - Customers
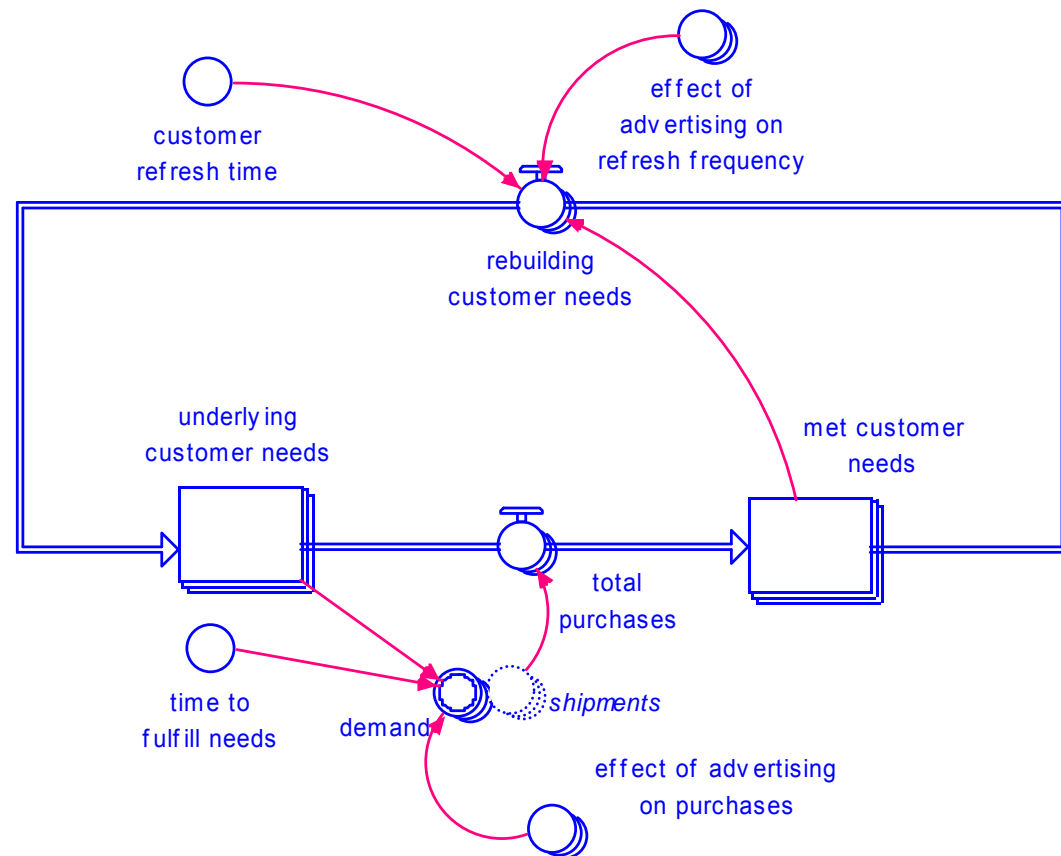 - Suppliers
  - Competitors

The Straight Arrow View
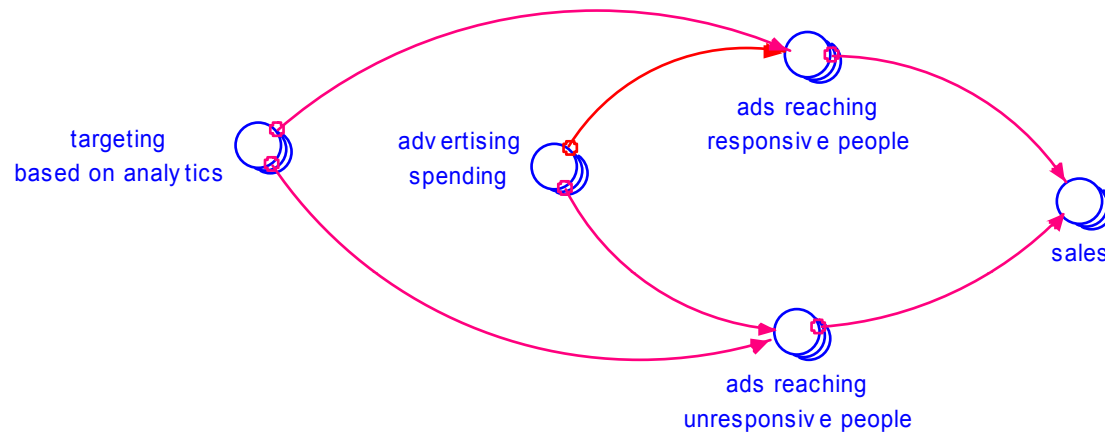
- Change who we hit

- Get lasting results

- Largemart no change
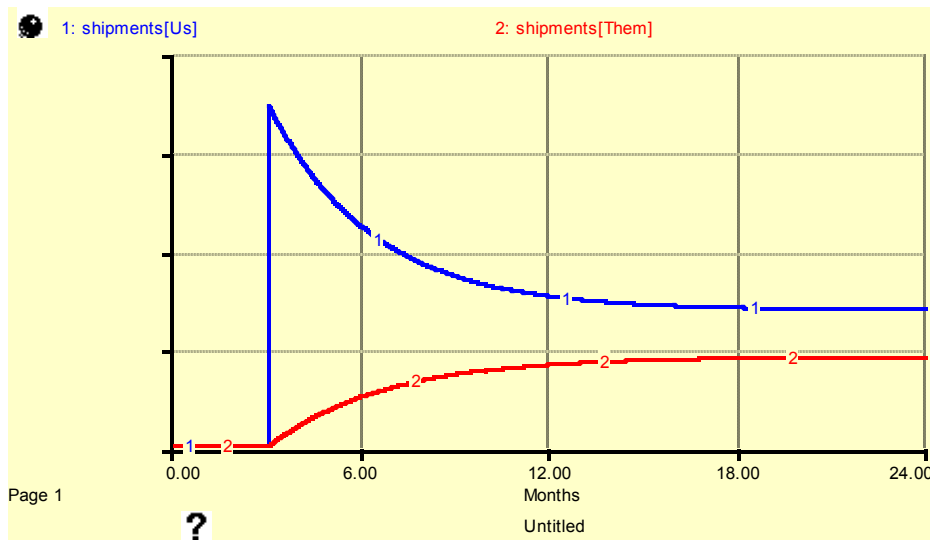
Refining the Customer View

- Refresh dynamics
  - Rebuilding
    - Influence that
- Change demand
  - Direct impact

Customers Respond

- ## We gain, but diminish
  - ### Catch the low hanging fruit first
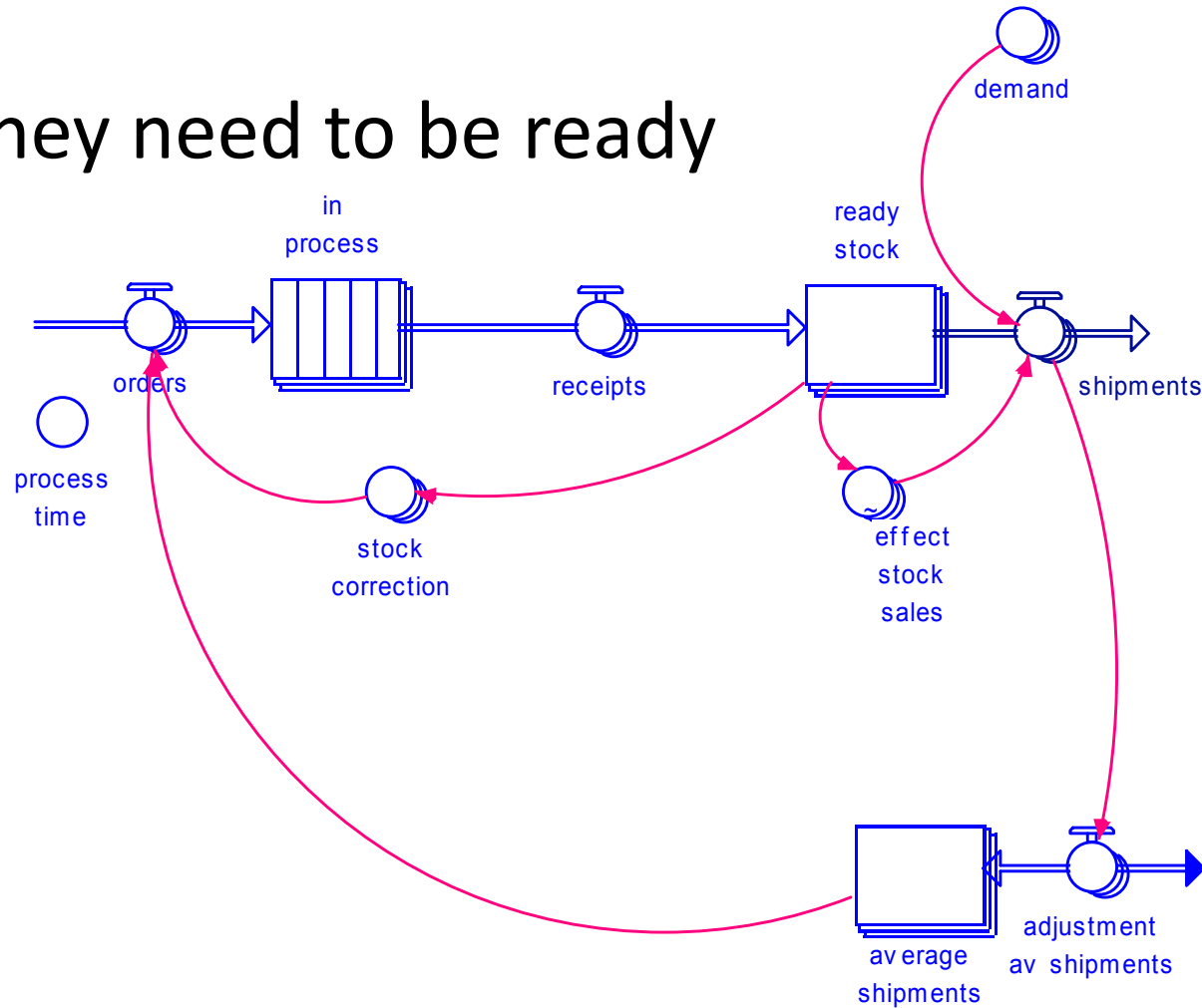- ## But our competitors?

Why do we help Largemart?

- First we are quickening the refresh rate
  - Focusing on the most responsive customers
  - Get them to upgrade faster
    - Sometimes they upgrade at that place
- Second, we have given up on one population
  - They become low hanging fruit for Largemart
    - Whose ads continue to reach them
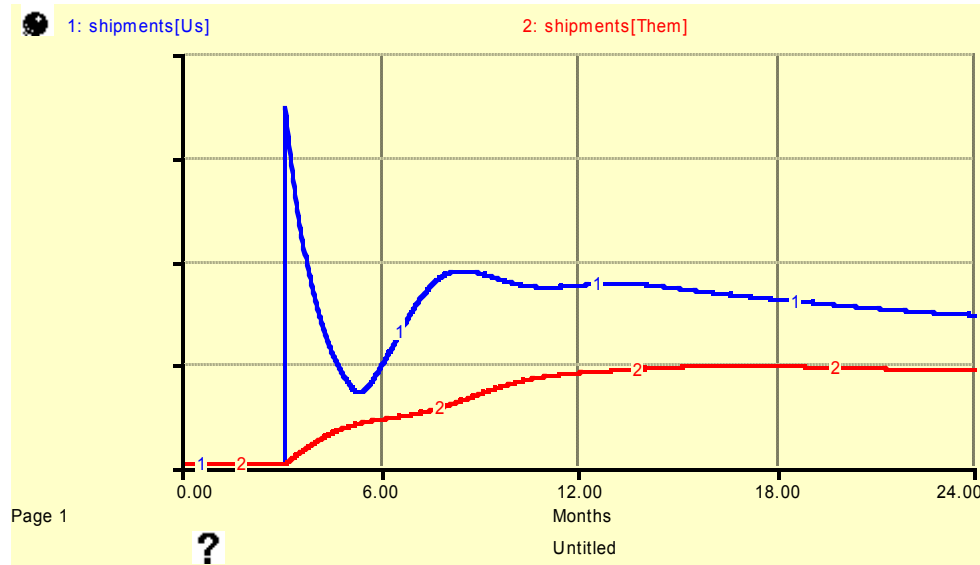 - Their market share goes up on the unresponsive customers

And what about our suppliers?

- They need to be ready

Or the response can be uneven

- Giving our competitor a bump

Big Data is a Good Thing

- Same spending on ads
  - Better sales as a result
- But identifying the best customers is only the first step
  - Everything will evolve after we make changes
- We can anticipate that evolution
  - A few first steps are shown here

Tracking ongoing changes

- The power of Big Data is to help implement new systems integrating the data and analytics
  - Ongoing sources of insights
  - Continually refined with renewed data
- That same implementation can be done with System Dynamics models
  - What stands in the way is the lack of a Standard

Integrating Both
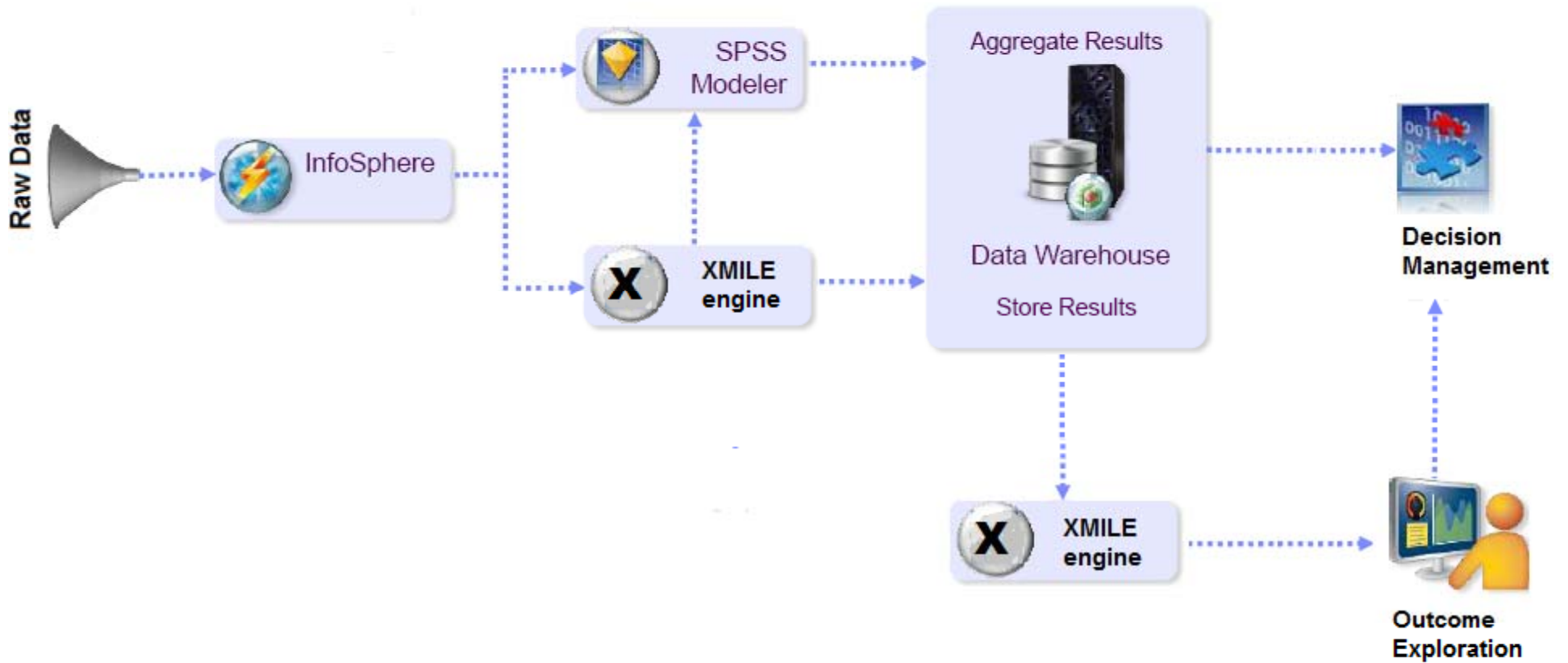
Observations

- Many very standard components
  - Supply chains
  - Market segmentation
- Relatively simple models
  - Capturing aggregate relationships
  - Focused on feedback – action and reaction
    - Anticipating dynamics

XMILE

- An XML standard for representing System Dynamics models

- Supports integration with other toolsets

- Encourages more big data applications

- Allows models to be incorporated into:

  – Standard analytic tools
  – Enterprise support software

The XMILE Technical Committee

- A committee of the OASIS standards body
- Working on the specification
  - Based on an existing draft specification
- Expected to publish in the next 12-14 months.
- Looking for input
  - Industry and application specialists
  - Technical people seeking integration
- www.oasis-open.org/committees/xmile