Big Data in Retail
Taking the next step with System Dynamics

Bob Eberlein
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

[Diagram showing the process of integrating raw data through InfoSphere, SPSS Modeler, and XMILE engines to aggregate results in a data warehouse, with decision management and outcome exploration.]
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