Dynamic Marketing Models: Combining System Dynamics and Agent Based Modeling Techniques

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Agenda

- Overview of the production/marketing system problem
- Challenges in creating adequate systems models
- How combining System Dynamics (SD) and Agent Based Modeling (ABM) supports effective policy intervention
In many organizations, across all industries, production and marketing policies are set independently -- non-systemically.

**Production Policies**
- Production Rate
- Mix

**Marketing Policies**
- Price
- Promotion
This non-systemic approach to management results in excess and unstable inventories resulting in lower prices and profitability.
Obviously, linked, systemic, production and marketing policies will perform better and improve the bottom line. We need a systems model to develop and implement these policies.

Production Policies
-- Production Rate
-- Mix

Marketing Policies
-- Price
-- Promotion

Inventory

Policy Objectives
-- Profitability
-- Share
-- Inventory

Production
Sales
System Dynamics is excellent for building aggregate production inventory systems without unnecessary detail. Unfortunately it is not very good at describing the complexity of consumer markets.
Agent Based Modeling is excellent for capturing the heterogeneity and complexity of consumer decision processes

• Individual History and Current State

• Position in Social Network

• Individual Level Information Preferences
  – Internet, Print, Dealers, Expert Opinion

• Geographic/Spatial Influences

• Decision Psychology and Process, and Timing
Being able to easily combine both representations in the same simulation creates deep insight into the dynamics of complex market environments.

Policy Objectives
-- Profitability
-- Share
-- Inventory

Marketing Policies Applied at Individual Level

We use the “Anylogic” simulation toolset developed by XjTek to create “multi-scale” models.
Policy setting “Actors” can also be represented individually. Their internal processes may be represented through SD or other representations including neural nets, state charts, etc.

We use the “Anylogic” simulation toolset developed by XjTek to create “multi-scale” models.
The multi-scale concept can be extended to capture competitive interactions and entire markets. Note that feedback relationships exist at multiple scales.

Marketing Policies
Applied at Individual Level

Policy Objectives

-- Profitability
-- Share
-- Inventory

Marketing Policies

US

WIP

Inventory

Starts

Outs

Sales

Policy Objectives

-- Profitability
-- Share
-- Inventory

Marketing Policies

Them

WIP

Inventory

Starts

Outs

Sales

Policy Objectives

-- Profitability
-- Share
-- Inventory

Marketing Policies

Others

WIP

Inventory

Starts

Outs

Sales

Policy Objectives

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-- Inventory

Marketing Policies

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Marketing Policies

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making sense of the future
By integrating SD and ABM approaches the impact of rich and complex consumer decision-making processes on production policies can be evaluated and interventions designed
• Modeling General Motors and the North American Automobile Market by Philip Keenan and Mark Paich
• Business Dynamics: Systems Thinking and Modeling for a Complex World–John Sterman
• Anylogic Simulation Software www.xjtek.com