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

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In many organizations, across all industries, production and marketing policies are set independently -- non-systemically

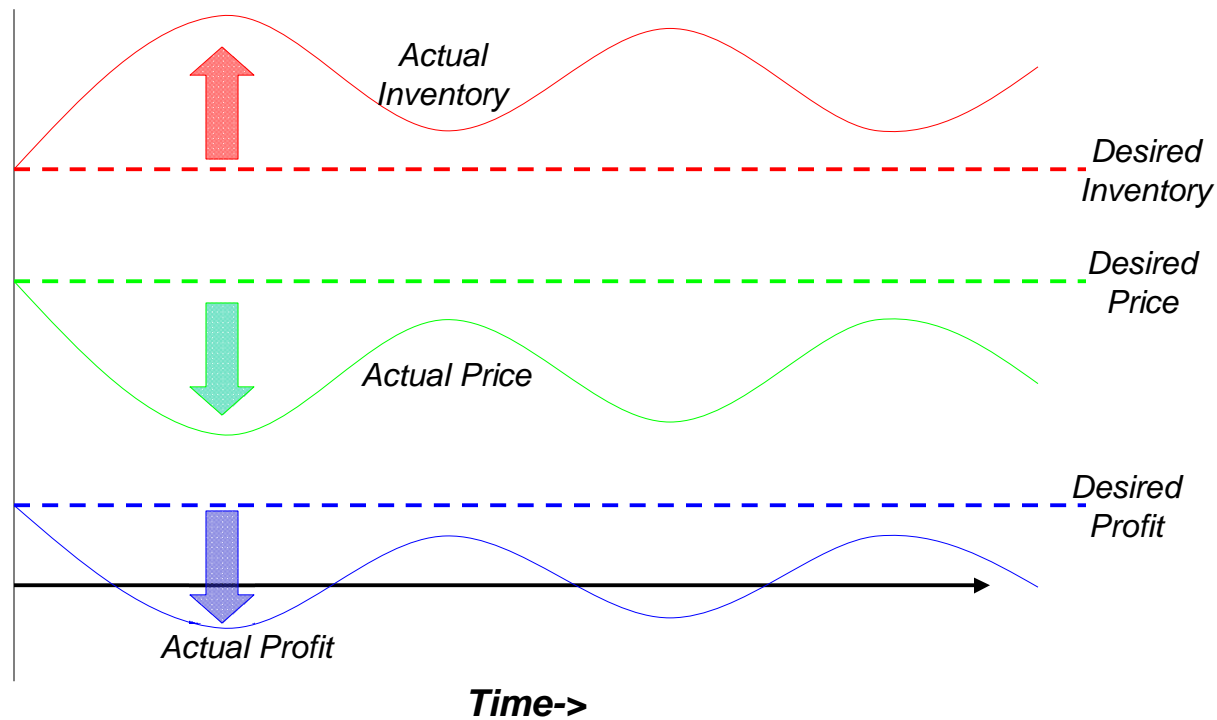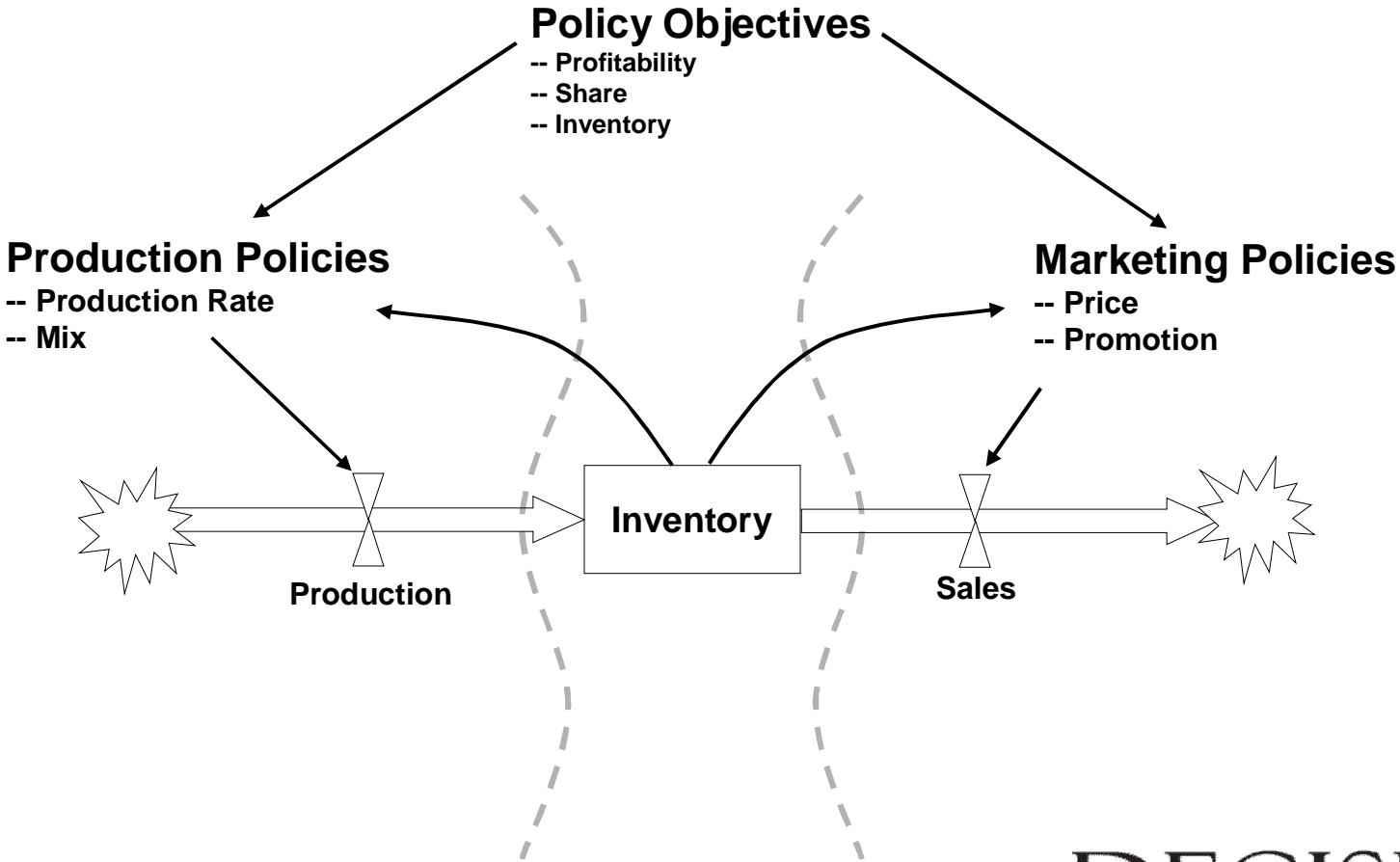**Production Policies**
-- Production Rate
-- Mix

Marketing Policies
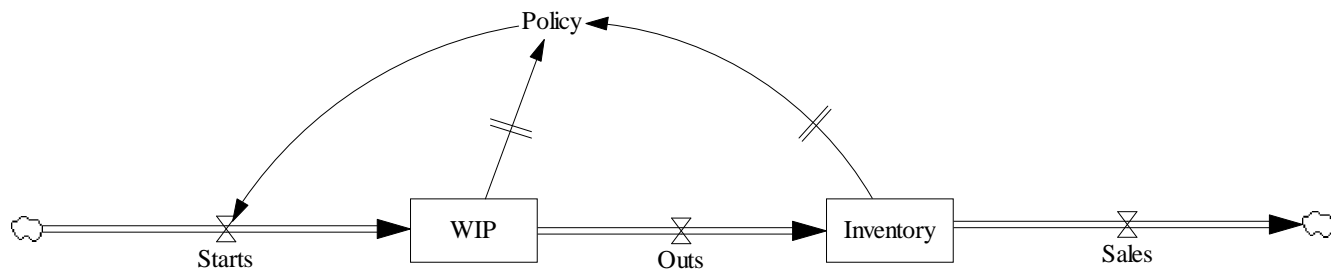**-- Price**
-- Promotion

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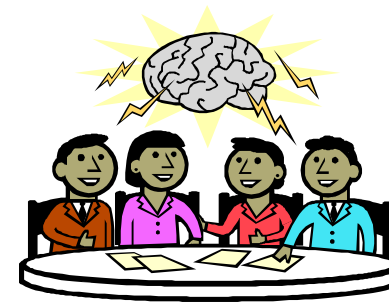
This non-systemic approach to management results in excess and unstable inventories resulting in lower prices and profitability

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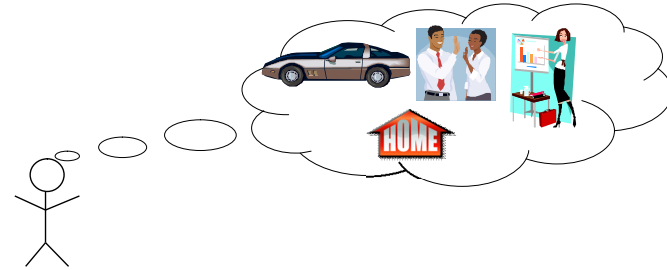
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Obviously, linked, systemic, production and marketing policies will perform better and improve the bottom line. We need a systems model to develop and implement these policies

Policy Objectives
-- Profitability
-- Share
-- Inventory

Production Policies
-- Production Rate
-- Mix

Marketing Policies
-- Price
-- Promotion

Inventory

Production

Sales

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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.

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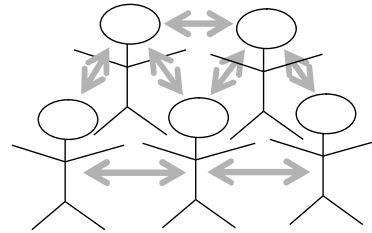
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Agent Based Modeling is excellent for capturing the heterogeneity and complexity of consumer decision processes
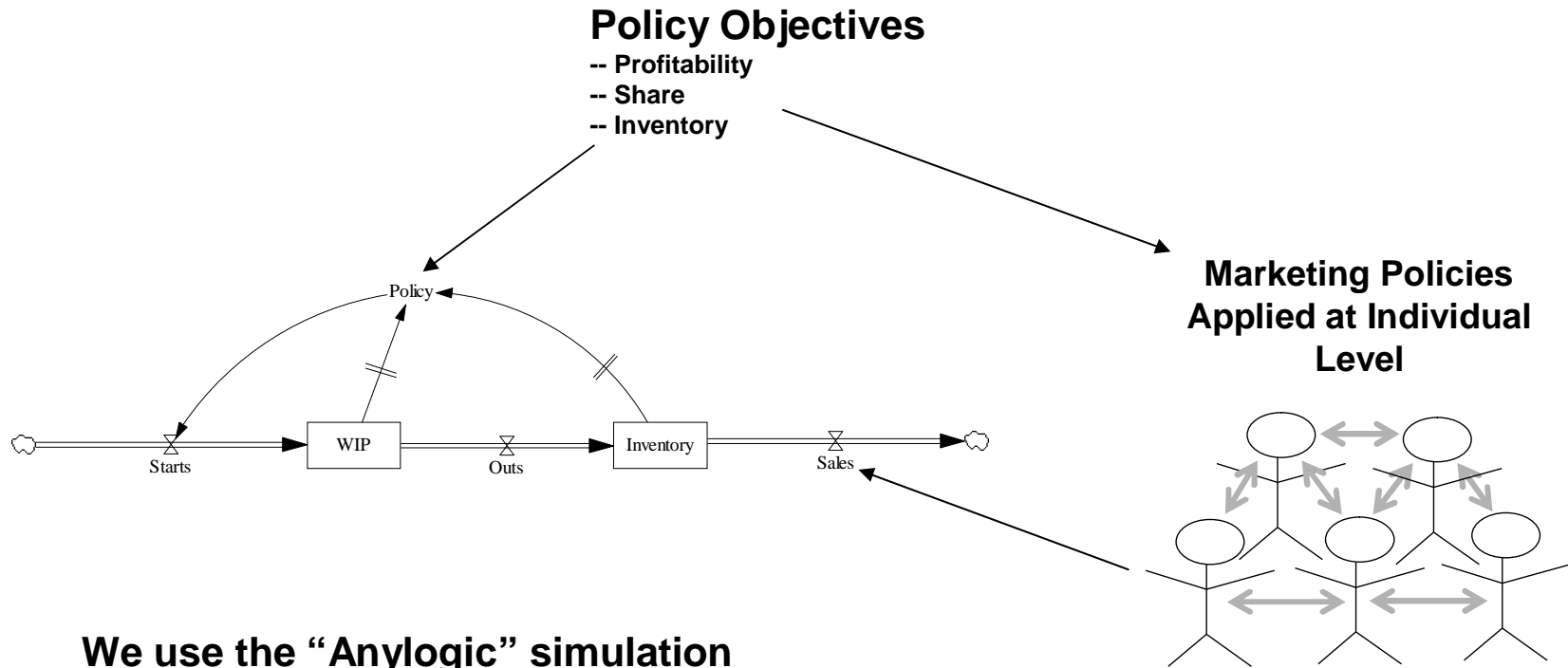
- Individual History and Current State

- Position in Social Network

- Individual Level Information Preferences
  - Internet, Print, Dealers, Expert Opinion

- Geographic/Spatial Influences
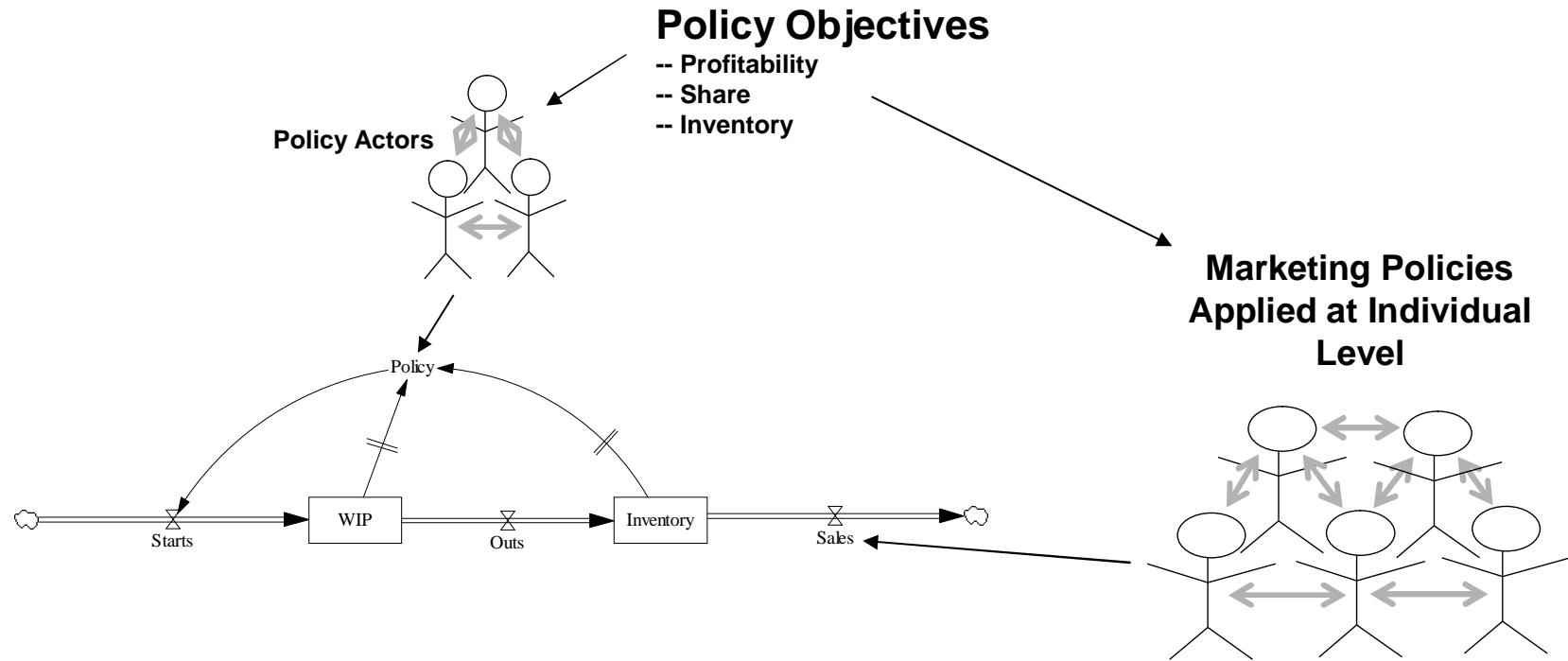
- Decision Psychology and Process, and Timing

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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

Policy

Starts   WIP   Outs   Inventory   Sales

We use the "Anylogic" simulation toolset developed by XjTek to create "multi-scale" models

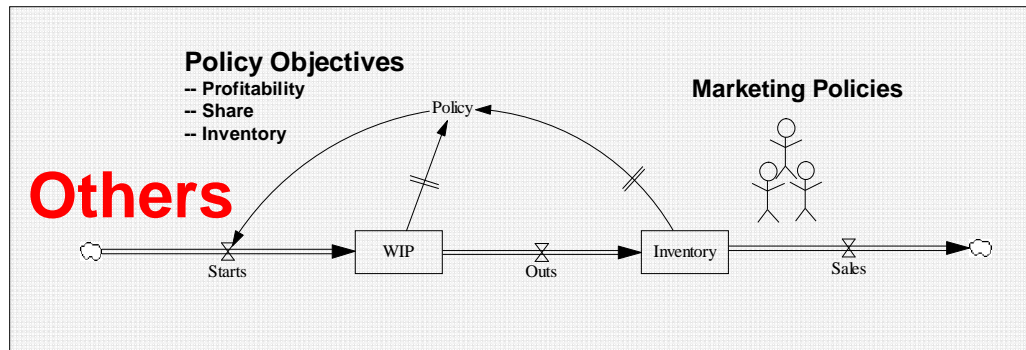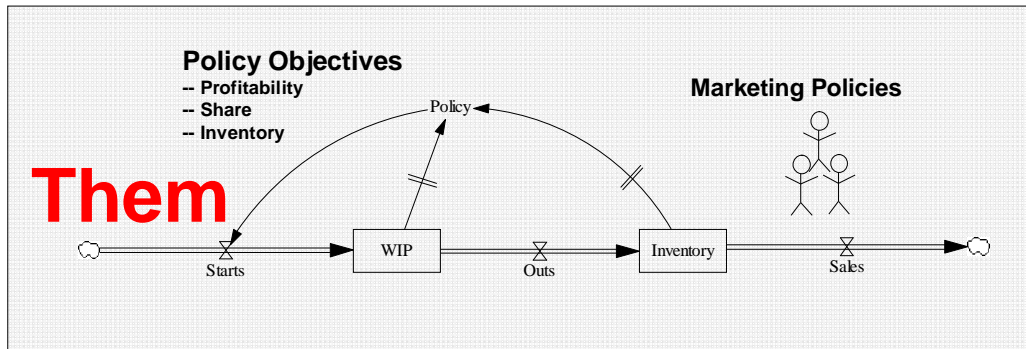**DECISIO**
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Policy setting "Actors" can also be represented individually. Their internal processes may be represented through SD or other representations including neural nets, state charts, etc.

Policy Objectives
-- Profitability
-- Share
-- Inventory

Policy Actors

Marketing Policies Applied at Individual Level

Policy

Starts · WIP · Outs · Inventory · Sales

We use the "Anylogic" simulation toolset developed by XjTek to create "multi-scale" models

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The multi-scale concept can be extended to capture competitive interactions and entire markets. Note that feedback relationships exist at multiple scales.

US

Policy Objectives
-- Profitability
-- Share
-- Inventory

Policy

Marketing Policies

Starts — WIP — Outs — Inventory — Sales

Them

Policy Objectives
-- Profitability
-- Share
-- Inventory

Policy

Marketing Policies

Starts — WIP — Outs — Inventory — Sales

Others

Policy Objectives
-- Profitability
-- Share
-- Inventory

Policy

Marketing Policies

Starts — WIP — Outs — Inventory — Sales

Marketing Policies Applied at Individual Level

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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

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- 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

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