
Linking the Firm to Its Environment: A System Dynamics Approach¹

**L. Martin Cloutier
Steven T. Sonka
Randall E. Westgren**

Food and Agribusiness Management Program
Department of Agricultural & Consumer Economics
University of Illinois at Urbana-Champaign
1301 W. Gregory Drive, 1301 Mumford Hall
Urbana, IL 61801
Internet: mcloutie@uiuc.edu

1- Prepared for *System Dynamics '96*, Cambridge, MA, July 22-26

THREE SECTIONS WITHIN THE PRESENTATION:

1. Environment & Dynamic Strategy
2. Organizational Learning
3. System Dynamics Case

OBJECTIVE

Explore the potential of **System Dynamics** as a tool enhance strategic learning at a time of rapid structural change

(Section 1.1)

CASE

System dynamics applications are developed for the US pork industry

(Section 1.2)

DYNAMIC THEORY OF STRATEGY

Strategy is the act of aligning a company and its environment. The environment is subject to change, as are the firm's own capabilities.

The task of strategy is to maintain a dynamic, not a static balance.

(Porter, 1994:426)

(Section 1.3)

ENVIRONMENT & STRATEGY

Theoretical and empirical research studying the firm in interaction with its environment suffers from both:

- Overabstraction
- Conceptual ambiguity

⇒ Research is less useful in helping the firm learn effective strategy

(Castrogiovanni, 1991)

(Section 1.4)

STRATEGY & ORGANIZATIONAL LEARNING

Strategy making must take the form of a process of learning over time, in which at the limit, formulation and implementation become indistinguishable

(Mintzberg, 1990:154)

(Section 1.5)

THE CASE ENVIRONMENT

is rapidly changing with...

Value-added on the farm

- Genetics management
- All-in-all-out technology

Growth in demand for specific market segments

(Section 1.6)

ORGANIZATIONAL LEARNING

Requires interaction between Individual & organizational structures
(Simon, 1991)

Learning is defined as increasing the range of possible behaviors
(Hubert, 1991)

(Section 2.1)

LEARNING MECHANISMS

**Congenital
Experiential
Vicarious**

- ⇒ **Grafting**
- ⇒ **Search**

(Section 2.2)

MEASURING ECONOMIC VIABILITY IN THE CASE APPLICATION

What are the effects of organizational form on future economic viability ?

- Economic viability is defined as cost reduction over time of production and marketing activities

(Section 3.1)

ROLE OF TRANSACTIONS

- Consequence of learning is the increase in the range of potential behaviors
- Transactions carry with them a measure of information value (Glazer, 1993)
- A changing environment, from which firms learn, offers future value based on a wider range of potential behaviors

(Section 3.2)

SYSTEM DYNAMICS

- **Requires explicit definition of mental maps**
 - Internal processes
 - Environmental linkages
- **Incorporates Dynamics & Complexity**
 - feedback loops, time lags, and non-linearities
- **Contributes to learning by modeling processes & discovering hidden assumptions, that augment the range of possible behaviors**

(Section 3.3)

EXPLICITLY MODELS

The structure of assumptions, strategies, norms, in a system using feedback-loops, time lags, and interactions among transactions within each market form using STELLA II

(Section 3.4)

CASE SPECIFICS

Modeling Market Structure to link firms to the environment

- S1 Independent pork producers
- S2 Coordinated pork production structures
 - backward coordination
 - forward coordination
 - networked coordination
 - or combination
- S3 Vertically integrated pork production

(Section 3.5)

PROPOSITIONS

1. With environmental change strategic learning is slower in S1, than in S2 or S3
2. With environmental change, strategic learning is slower in S3 than in S2 because of rigidities in S3
3. With environmental stability, strategic learning is slower in S3 because of complexity in S2

(Section 3.6)

EMPIRICAL ASPECTS

Four transactions of importance are specified to study the three organizational forms

1. Genetics
2. All-in-all-out
3. Growth in segment markets
4. assimilation of innovation

(Section 3.7)

MODELING VIABILITY AS OUTCOMES

1. Identify conditions that lead to strategic learning
2. Identify strategy responses that reduce costs

(Section 3.8)

SUMMARY

Paper contributes to the dynamic problem of strategic alignment between the firm and its environment

Organizational learning contributes to the changing capabilities of organizations and induces economic viability in the environment

The principles of system dynamics are applied to alternative organizational structures in the study of the US pork industry