

SITE LOCATION
AND
STRATEGIC PLANNING
IN THE
PROCESS INDUSTRY

Stuart J. Allen

Penn State-Erie

Edmund W. Schuster

Welch's

1. INTRODUCTION

A. SITUATION

- Consumer goods, highly competitive
- Vertically integrated
- Manufacture to stock (See Figure 1)
- Increasing importance of customer service
 1. Order cycle time and reliability
 2. Fill rate
 3. Cost
- Sales volume increasing
- High production capacity utilization
 1. Difficulty maintaining target inventories
 2. Downward pressure on customer service
 3. Upward pressure on product cost

B. SOLUTION

- Build a new plant/warehouse combination
- Where?
 1. List candidates
 2. Screen by intangibles, tangibles
 3. Scenario analysis of the logistics using LP software

C. WEAKNESSES

- Customer service is not addressed explicitly
- Logistics is treated in isolation
- Implicit assumption that "new" capacity is the answer
- Static view of the problem

D. WHAT'S NEEDED?

- Coherent analysis of the entire system
- Stalk et al. (1992 HBR):

"...competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer."

"Every company has business processes that deliver value to the customer. But few think of them as the primary object of strategy." Those who do, "conceive of the organization as a giant feedback loop that begins with identifying the needs of customers and ends with satisfying them."

E. DEFINITIONS

Strategic Analysis - identification of the key system processes which affect customer service measures.

Strategic Planning - the process of choosing the "settings" of key processes to provide a stated level of customer service at the least cost.

F. ORGANIZATION OF THE PRESENTATION

- Strategic Analysis
 1. Description of the existing system
 2. Determination of key processes
- Characteristics of a Strategic Planning System
- A Proposed Strategic Planning System

2. STRATEGIC ANALYSIS

A. THE EXISTING SYSTEM

- The Environment (Figure 2)
- Major Subsystems (Figure 3)

B. EXAMINATION OF THE CHARACTERISTICS OF MAJOR SUBSYSTEMS

- Forecasting
 1. Large MAPE
 2. Forecast biases
 3. Impact of promotions
 4. Impact on scheduling and purchasing
- Order Processing
 1. Order confirmation procedures
 2. Order promise date policy
 3. Consolidating and routing
 4. Incorporation of inventory status

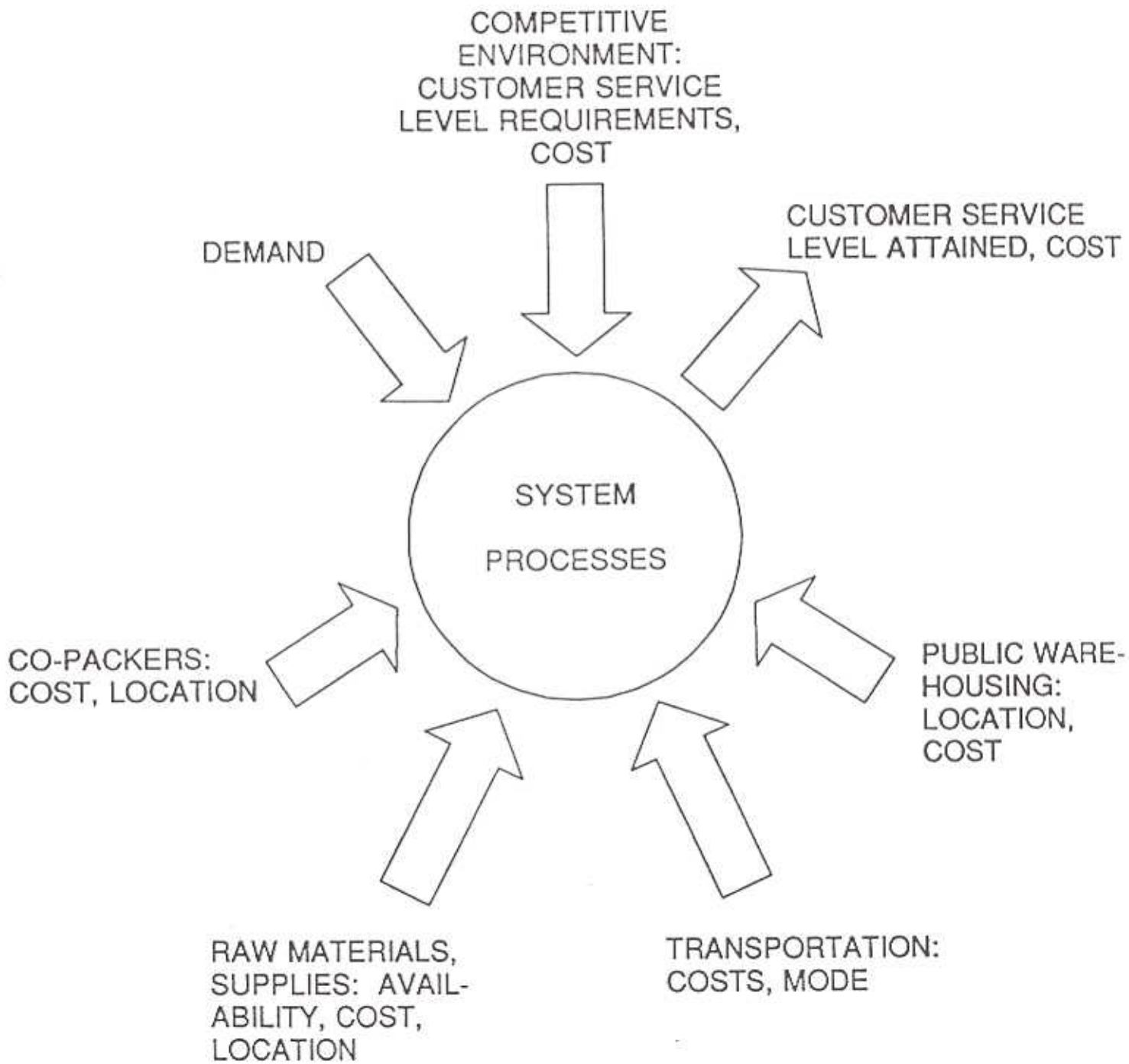


FIGURE 2. THE ENVIRONMENT

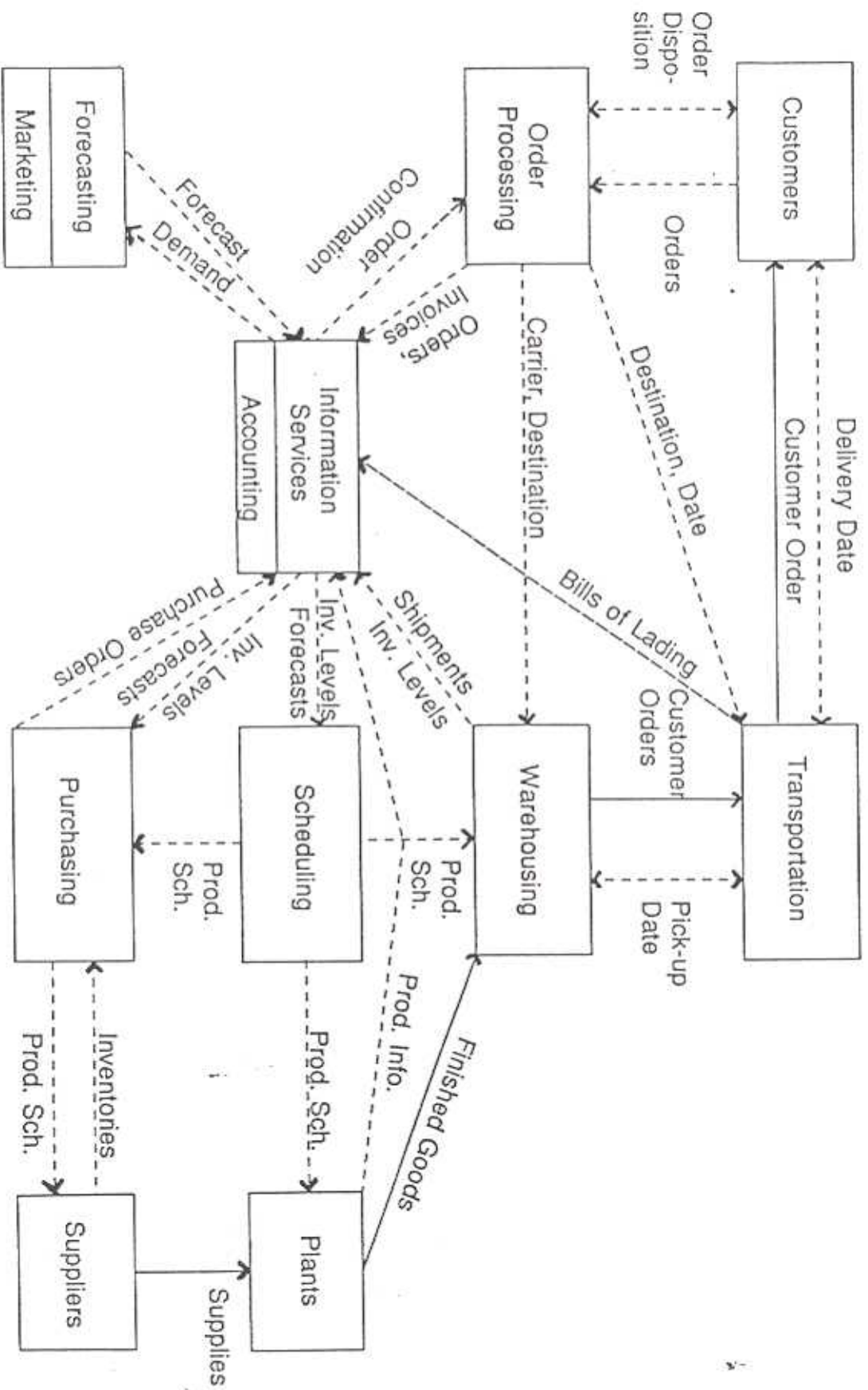


FIGURE 3. MAJOR SUBSYSTEMS

B. EXAMINATION OF THE CHARACTERISTICS OF MAJOR SUBSYSTEMS (Cont'd.)

- Production Scheduling

1. Highly variable demand
2. Many SKUs
3. Shared Production Facilities
4. Revisions caused by forecast errors, quality,...
5. Scheduling procedures

- Purchasing

1. System of initiating delivery orders
2. Flexibility under forecast errors and scheduling revisions
3. Quality control with suppliers
4. Transportation costs

B. EXAMINATION OF THE CHARACTERISTICS OF MAJOR SUBSYSTEMS (Cont'd.)

- Plants

1. Capacity and location (including co-packers)
2. Processes and equipment reliability
3. Maintenance policies
4. Quality control systems
5. Degree of flexibility

- Warehousing

1. Capacity and location (including public)
2. Layout
3. Equipment
4. Operational procedures and information support
5. Assigned demand centers

B. EXAMINATION OF THE CHARACTERISTICS OF MAJOR SUBSYSTEMS (Cont'd.)

- Transportation

1. Mode
2. Corporate vs. contract
3. Reliability of meeting promise dates
4. Carrier/customer interface

- Marketing

1. Promotional campaign policies and plans
2. Pricing policies
3. Introduction of new products
4. Customer service policy

- Info Services

1. Integrity of inventory records

3. CHARACTERISTICS OF A STRATEGIC PLANNING SYSTEM

A. WILL SUPPORT INVESTIGATION OF THE IMPACT ON SYSTEM COSTS AND CUSTOMER SERVICE LEVELS OF

- Improvements in forecast errors and bias
- Shorter order processing times
- Shorter manufacturing cycle times
- Improved quality and availability of supplies and raw materials, transportation costs
- Plants
 1. Capacity, timing
 2. Location
 3. New technology
 4. Quality
 5. Operational Improvements
- Warehousing
 1. Capacity, timing
 2. Location
 3. Operational improvements
- Modes and Ownership of Transportation
- Timing of Promotional Policies
- Accuracy of Inventory Records

B. IMPLICATIONS

- Stochastic Elements

1. Demand
2. Order cycle time
3. Manufacturing Cycle Time

- Dynamic Elements

1. Demand
2. Production rate
3. Production capacity
4. Inventory targets (warehouse capacity)
5. Assignment of demand locations to warehouses

4. A PROPOSED STRATEGIC PLANNING SYSTEM

A. SYSTEM STRUCTURE

1. Construct a dynamic model of the existing logistic/production operational system (Figure 2).
2. Using the model:
 - a. Examine all strategic processes for improvements in customer service and throughput rates. Implement.
 - b. Investigate system response to future demand scenarios.
3. When indicated, site new capacity using existing models.
4. Return to step 1. (update the dynamic model).

4. PROPOSED SYSTEM (Cont'd.)

B. MODEL OF LOGISTICS OPERATIONS (BOWERSOX (1992), JOURNAL OF MARKETING)

1. Approach - simulation with actual orders

2. Modules

a. Order processing

Confirmation and consolidation delays
Stockout delay

b. Warehousing

Pick delay

c. Transportation

In transit delay

d. Reporting

Customer service level
Costs

4. PROPOSED SYSTEM (Cont'd.)

C. SIMULATION OF PRODUCTION OPERATIONS

1. Modules

a. Scheduling (by product code) weekly

Actual forecasts and orders, forecast error and bias

Use ROP to select products and amounts

b. Purchasing

P. O. delay

c. Suppliers

Delivery delay

d. Plant

Set product priority

Raw material/supplies stockout delay

Manufacturing delay

Product yield

Hold delay

e. Reports

Production data

Costs

4. PROPOSED SYSTEM (Cont'd.)

D. SITE LOCATION/ALLOCATION MODELS

1. CPLP

Cornuejols, et. al. (1991), European Journal of Operational Research

2. DCPLP

Shulman (1991), Operations Research

Klincewicz (1988), European Journal of Operational Research

3. Limitations

Single commodity
Linear transportation costs
Typically split-sourcing
Insufficient echelons
Complex heuristics

4. PROPOSED SYSTEM (Cont'd.)

E. DYNAMIC SIMULATION

1. Bowersox (1972), Journal of Marketing
2. Markland (1973), Decision Sciences

F. CHOICE: LOCATE

1. Uncapacitated, single period
2. Raw materials, supplies, transportation costs estimated outside model
3. Trial-and-error on plant capacity
4. Multiple runs to model dynamic demand rates

5. SUMMARY OF THE SYSTEM

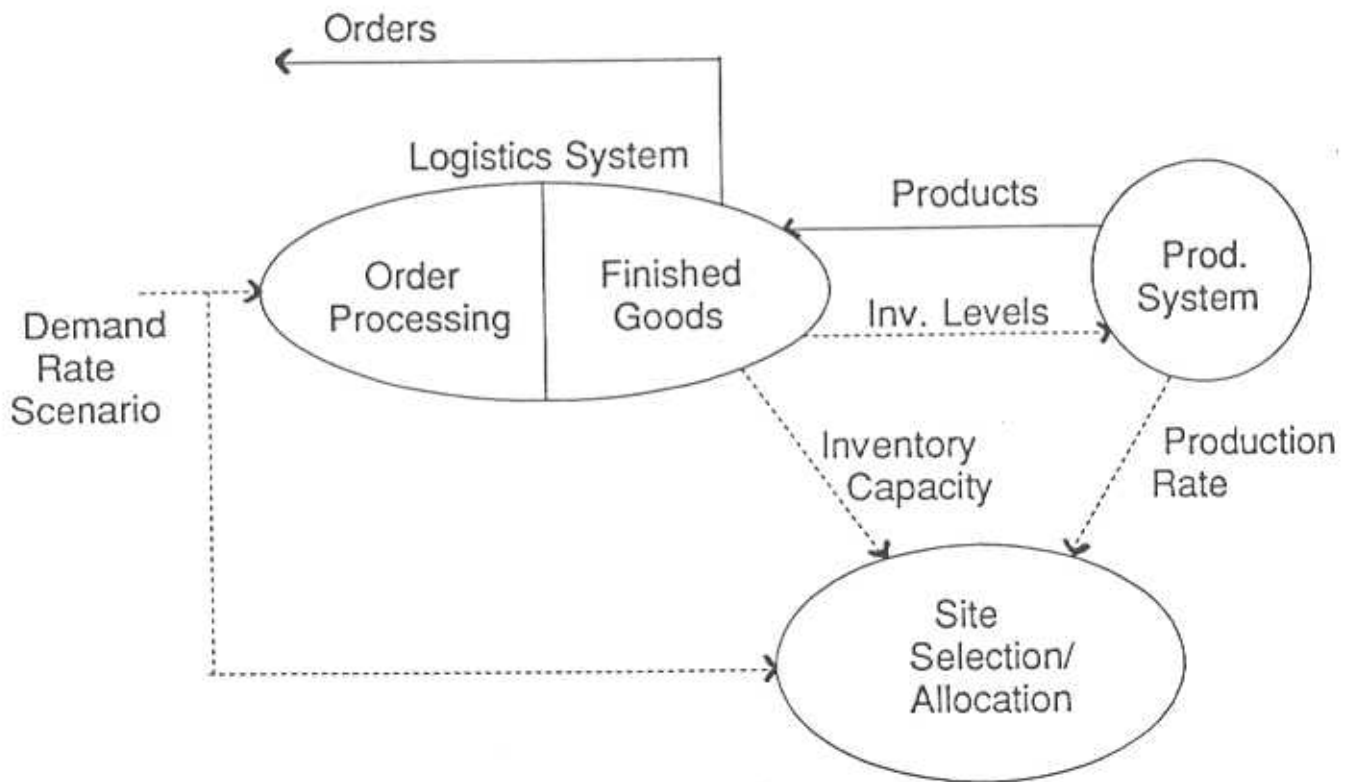


FIGURE 4. STRATEGIC PLANNING SYSTEM