

# **Sourcing and Contracts**

## **Chapter 13**

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# Outline

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- ◆ The Role of Sourcing in a Supply Chain
- ◆ Supplier Scoring and Assessment
- ◆ Supplier Selection and Contracts
- ◆ Design Collaboration
- ◆ The Procurement Process
- ◆ Sourcing Planning and Analysis
- ◆ Making Sourcing Decisions in Practice
- ◆ Summary of Learning Objectives

# The Role of Sourcing in a Supply Chain

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- ◆ Sourcing is the set of business processes required to purchase goods and services
- ◆ Sourcing processes include:
  - Supplier scoring and assessment
  - Supplier selection and contract negotiation
  - Design collaboration
  - Procurement
  - Sourcing planning and analysis

# Benefits of Effective Sourcing Decisions

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- ◆ Better economies of scale can be achieved if orders are aggregated
  - Eliminate some suppliers. Keep strategic dual sourcing.
- ◆ More efficient procurement transactions can significantly reduce the overall cost of purchasing
  - Buying from commodities from commodity exchanges / internet sites
- ◆ Design collaboration can result in products that are easier to manufacture and distribute, resulting in lower overall costs
  - Ford sends its own engineers to its suppliers
- ◆ Good procurement processes can facilitate coordination with suppliers
- ◆ Appropriate supplier contracts can allow for the sharing of risk
  - Buyback contract redistributes the risk of overstocking
- ◆ Firms can achieve a lower purchase price by increasing competition through the use of auctions

# Supplier Scoring and Assessment

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- ◆ Supplier performance should be compared on the basis of the supplier's impact on total cost
- ◆ There are several other factors besides purchase price that influence total cost
  - ◆ Replenishment Lead Time
  - ◆ On-Time Performance
  - ◆ Supply Flexibility
  - ◆ Delivery Frequency / Minimum Lot Size
  - ◆ Supply Quality
  - ◆ Inbound Transportation Cost
  - ◆ Pricing Terms
  - ◆ Information Coordination Capability
  - ◆ Design Collaboration Capability
  - ◆ Exchange Rates, Taxes, Duties
  - ◆ Supplier Viability

# Supplier Selection and Contracts

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- ◆ Contracts for Product Availability and Supply Chain Profits
  - Buyback Contracts
  - Revenue-Sharing Contracts
  - Quantity Flexibility Contracts
- ◆ Contracts to Coordinate Supply Chain Costs
- ◆ Contracts to Increase Agent Effort
- ◆ Contracts to Induce Performance Improvement

# Contracts for Product Availability and Supply Chain Profits

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- ◆ Many shortcomings in supply chain performance occur because the buyer and supplier are separate organizations and each tries to optimize its own profit
- ◆ Total supply chain profits might therefore be lower than if the supply chain coordinated actions to have a common objective of maximizing total supply chain profits
- ◆ Recall Chapter 10: double marginalization results in suboptimal order quantity
- ◆ An approach to dealing with this problem is to design a contract that encourages a buyer (retailer) to purchase more and increase the level of product availability
- ◆ The supplier must share in some of the buyer's demand uncertainty

# Contracts

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- ◆ A contract is an agreement between two parties.
- ◆ Pricing contract types
  - Fixed price
  - Dependent price
    - » Capturable uncertainty
    - » Third party measures, indicators as surrogates
  - Alterable price
    - » Uncapturable uncertainty
    - » Renegotiation necessary
- ◆ Same classification for quantity contracts
- ◆ Cost+fee contracts as opposed to price contracts
  - Car repair: Spark plug cost + labor fee

# Sourcing Planning and Analysis

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- ◆ A firm should periodically analyze its procurement spending and supplier performance and use this analysis as an input for future sourcing decisions
- ◆ Procurement spending should be analyzed by part and supplier to ensure appropriate economies of scale
- ◆ Supplier performance analysis should be used to build a portfolio of suppliers with complementary strengths
  - Cheaper but lower performing suppliers should be used to supply base demand
  - Higher performing but more expensive suppliers should be used to buffer against variation in demand and supply from the other source

# Contracts Advantages & Disadvantages

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## ◆ Advantages

- Uncertainty reduction
- Relationship leveraging

## ◆ Disadvantages for supplier

- Being blocked from selling to other retailers
- Harsh retailers: GM and its suppliers

## ◆ Disadvantages for retailer

- Being blocked from buying from other suppliers
- Retailer complacency – lack of incentives for improvement

# Buyback Contracts

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- ◆ Allows a retailer to return unsold inventory up to a specified amount at an agreed upon price
- ◆ Increases the optimal order quantity for the retailer, resulting in higher product availability and higher profits for both the retailer and the supplier
- ◆ Most effective for products with low variable cost, such as music, software, books, magazines, and newspapers
- ◆ Downside is that buyback contract results in surplus inventory for the supplier that must be disposed of, which increases supply chain costs
- ◆ Misleading for the supply chain as it reacts to (inflated) retail orders, not actual customer demand

# Revenue Sharing Contracts

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- ◆ The buyer pays a minimal amount for each unit purchased from the supplier but shares a fraction of the revenue for each unit sold
- ◆ Decreases the cost per unit charged to the retailer, which effectively decreases the cost of overstocking
- ◆ Misleading for the supply chain as it reacts to (inflated) retail orders, not actual customer demand

# Quantity Flexibility Contracts

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- ◆ Allows the buyer to modify the order (within limits) as demand visibility increases closer to the point of sale
- ◆ Better matching of supply and demand
- ◆ Increased overall supply chain profits if the supplier has flexible capacity
- ◆ Lower levels of misleading demand information than either buyback contracts or revenue sharing contracts

# Contracts to Coordinate Supply Chain Costs

- ◆ Differences in costs at the buyer and supplier can lead to decisions that increase total supply chain costs
- ◆ Example: Replenishment order size placed by the buyer. The buyer's EOQ does not take into account the supplier's costs.
- ◆ A quantity discount contract may encourage the buyer to purchase a larger quantity (which would be lower costs for the supplier), which would result in lower total supply chain costs
- ◆ Quantity discounts lead to misleading demand information because of order batching

# Contracts to Increase Agent Effort

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- ◆ There are many instances in a supply chain where an agent acts on the behalf of a principal and the agent's actions affect the reward for the principal
  - A car dealer who sells the cars of a manufacturer, as well as those of other manufacturers
  - A doctor who treats patients for an HMO
  - Sales force working on a commission
- ◆ Examples of contracts to increase agent effort include two-part tariffs and threshold contracts
- ◆ Threshold contracts increase information distortion, however

# Contracts to Induce Performance Improvement

- ◆ A buyer may want performance improvement from a supplier who otherwise would have little incentive to do so
- ◆ A shared savings contract provides the supplier with a fraction of the savings that result from the performance improvement
- ◆ Particularly effective where the benefit from improvement accrues primarily to the buyer, but where the effort for the improvement comes primarily from the supplier
  - GM and its suppliers

# Design Collaboration

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- ◆ 50-70 percent of spending at a manufacturer is through procurement
- ◆ 80 percent of the cost of a purchased part is fixed in the design phase
- ◆ Design collaboration with suppliers can result in reduced cost, improved quality, and decreased time to market
- ◆ Important to employ design for logistics, design for manufacturability
- ◆ Manufacturers must become effective design coordinators throughout the supply chain
  - Ford designs with its suppliers

# The Procurement Process

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- ◆ The process in which the supplier sends product in response to orders placed by the buyer
- ◆ Goal is to enable orders to be placed and delivered on schedule at the lowest possible overall cost
- ◆ Two main categories of purchased goods:
  - Direct materials: components used to make finished goods
  - Indirect materials: goods used to support the operations of a firm
  - Differences between direct and indirect materials listed in Table 13.2
- ◆ Focus for direct materials should be on improving coordination and visibility with supplier
- ◆ Focus for indirect materials should be on decreasing the transaction cost for each order
- ◆ Procurement for both should consolidate orders where possible to take advantage of economies of scale and quantity discounts

# Product Categorization by Value and Criticality (Figure 13.2)

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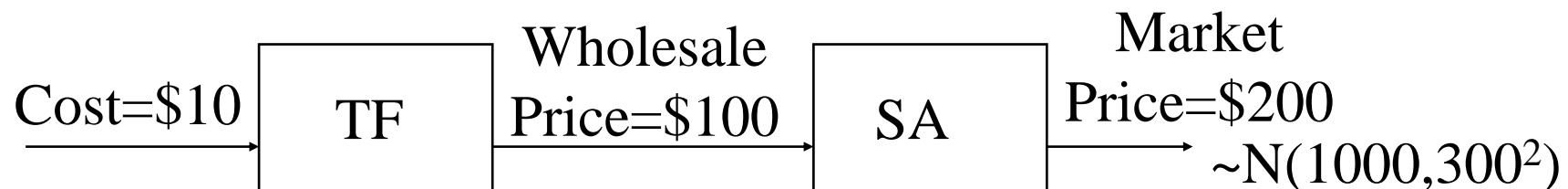
Criticality	High	Critical Items <i>Ensure availability</i>	Strategic Items <i>Ensure long term relationship</i>
	Low	General Items <i>Ensure low cost</i>	Bulk Purchase Items <i>Ensure low cost</i>
		Low	High

Value/Cost

# Impact of SC Contracts on Profitability: Buyback Contracts

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- ◆ Buybacks by publishers
  - Practice: Custom books are not bought back!
- ◆ Buyback by Panasonic
  - Panasonic sells a DVD at \$120 to BestBuy. BestBuy sells at \$150 to consumers. Unsold DVD's are sold at discount price \$100 to customers, Panasonic compensates BestBuy for  $\$120 - 100 = \$20$ . Is this a buyback scheme, if so what is the buyback price?
- ◆ Tech Fiber(TF) produces jacket and sells to Ski Adventure(SA) which sells them in the market. Unsold jackets have no salvage value. Should TF be willing to buy back unsold jackets? Why?



# Profits under centralization

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$$\text{Sales} = \int_0^{\infty} \min(y, D) f(D) dD = \int_0^y \bar{F}(D) dD$$

$$\text{Coordinated Profits} = p[\text{Sales}] - cy$$

$$\text{Optimal order quantity} = y_c^* = \bar{F}^{-1}(c/p) \quad \text{or} \quad c/p = \bar{F}(y_c^*) \quad \text{or} \quad 1 - c/p = F(y_c^*)$$

# Separately acting

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$$\text{Supplier Profit}(b | y) = (w - b)y + b[\text{Sales}] - cy = b[\text{Sales}] - (c - (w - b))y$$

$$\text{Retailer Profit}(y | b) = -wy + b(y - [\text{Sales}]) + p[\text{Sales}] = (p - b)[\text{Sales}] - (w - b)y$$

$$\text{Retailer's optimal order quantity} = y_R^*(b) = \bar{F}^{-1}\left(\frac{w - b}{p - b}\right)$$

$$\text{Retailer orders centralized quantity when } \bar{F}^{-1}\left(\frac{c}{p}\right) = \bar{F}^{-1}\left(\frac{w - b}{p - b}\right) \text{ which implies}$$

$$b^c := \frac{w - c}{1 - c/p}$$

# Split of Supply Chain Profits under the Buyback Contract

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$$\text{Retailer's Profit}(y | b^c) = \frac{p - w}{p - c} \text{Centralized Profit}(y)$$

Retailer obtains the big portion of the profits when the wholesale price is far smaller than the sales price.

# Buyback Contracts

<i>Wholesale Price c</i>	<i>Buy Back Price b</i>	<i>Optimal Order size for SA</i>	<i>Expected Profit for SA</i>	<i>Expected Returns to TF</i>	<i>Expected Profit for TF</i>	<i>Expected Supply Chain Profit</i>
\$100	\$0	1,000	\$76,063	120	\$90,000	\$166,063
\$100	\$30	1,067	\$80,154	156	\$91,338	\$171,492
\$100	\$60	1,170	\$85,724	223	\$91,886	\$177,610
\$100	\$95	1,501	\$96,875	506	\$86,935	<b>\$183,810</b>
\$110	\$78	1,191	\$78,074	239	\$100,480	\$178,555
\$110	\$105	1,486	\$86,938	493	\$96,872	<b>\$183,810</b>
\$120	\$96	1,221	\$70,508	261	\$109,225	\$179,733
\$120	\$116	1,501	\$77,500	506	\$106,310	<b>\$183,810</b>

# Quantity Flexibility Contracts

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- ◆ If a retailer order  $q$  units the manufacturer commits to supplying up to  $(1+\alpha)q$  and the retailer commits to buying  $(1-\beta)q$ 
  - *Unfortunately the book denotes  $(1+\alpha)q$  by  $O$*
- ◆ How can quantity flexibility contracts help increase profitability?
  - Uncertainty reduction for
    - » Retailers
    - » Suppliers

# Quantity Flexibility Contract

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1. Retailer knows the demand distribution  $F$  and makes a forecast  $q$  for its order size, typically  $q > E(D)$ .

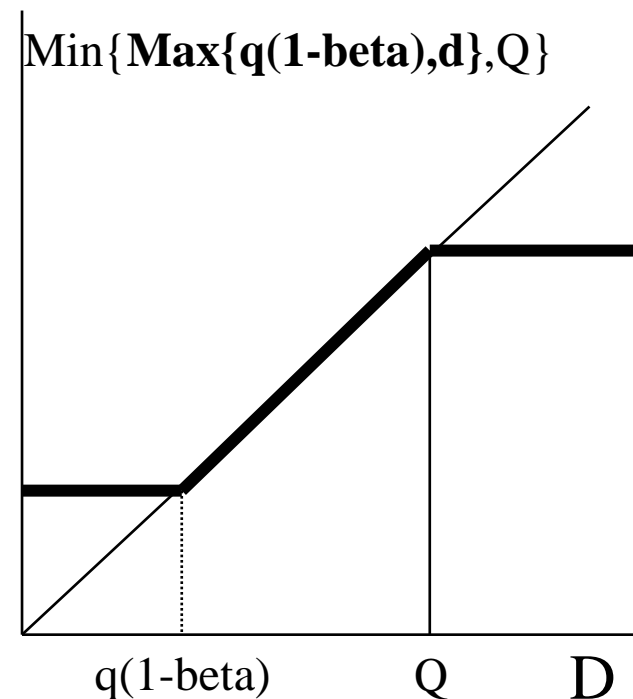
2. Supplier guarantees to supply  $q(1+\alpha)$ ,  $\alpha \geq 0$ .

Retailer guarantees to buy  $q(1-\beta)$ ,  $0 \leq \beta \leq 1$ .

Supplier produces  $Q \geq q(1+\alpha)$ .

3. The demand is realized as  $D=d$  and the supplier buys

$$\text{Min} \{ \text{Max}\{q(1-\beta),d\} , Q \}$$



# Quantity Flexibility Contract

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- ◆ Without coordination the supplier produces less than with coordination.
- ◆ The contract is advantageous to the supplier if  $Q=q(1+\alpha)$ . Otherwise, the supplier orders more than the contract would have indicated even without the contract.
- ◆ The supplier can coordinate the chain by setting the wholesale price appropriately.

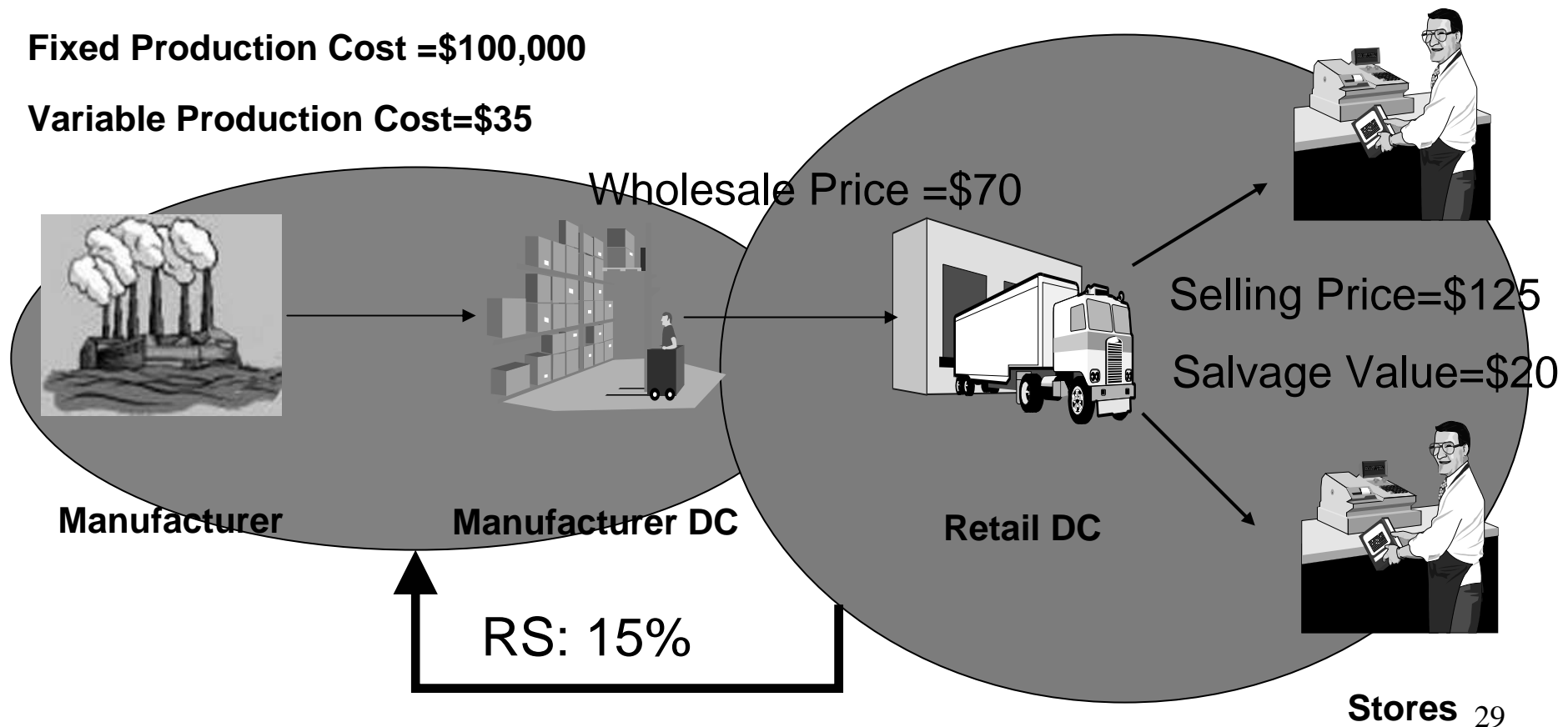
# Quantity Flexibility Contracts

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$\alpha$	$\beta$	Wholesale price $c$	Order size $O$	Expected purchase by SA	Expected sale by SA	Expected profits for SA, $P(Q^*)$	Expected profits for TF	Expected supply chain profit
0.00	0.00	\$100	1,000	1,000	880	\$76,063	\$90,000	\$166,063
0.20	0.20	\$100	1,050	1,024	968	\$91,167	\$89,830	\$180,997
0.40	0.40	\$100	1,070	1,011	994	\$97,689	\$86,122	\$183,811
0.00	0.00	\$110	962	962	860	\$66,252	\$96,200	\$162,452
0.15	0.15	\$110	1,014	1,009	945	\$78,153	\$99,282	\$177,435
0.42	0.42	\$110	1,048	1,007	993	\$87,932	\$95,879	\$183,811
0.00	0.00	\$120	924	924	838	\$56,819	\$101,640	\$158,459
0.2	0.2	\$120	1,000	1,000	955	\$70,933	\$108,000	\$178,933
0.5	0.5	\$120	1,040	1,003	996	\$78,874	\$104,803	\$183,677

# Revenue Sharing (RS) Contracts

Manufacturer reduces wholesale price,  
Retailer shares a percentage of the revenue



# Blockbuster Case Study

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- ◆ Demand for a movie newly released video cassette typically starts high and decreases rapidly
  - Peak demand last about 10 weeks
- ◆ Blockbuster purchases a copy from a studio for \$65 and rent for \$3
  - Hence, retailer must rent the tape at least 22 times before earning profit
- ◆ Retailers cannot justify purchasing enough to cover the peak demand
  - In 1998, 20% of surveyed customers reported that they could not rent the movie they wanted
- ◆ Starting in 1998 Blockbuster entered a revenue sharing agreement with the major studios
  - Studio charges \$8 per copy
  - Blockbuster pays 30-45% of its rental income
- ◆ Even if Blockbuster keeps only half of the rental income, the breakeven point is 6 rental per copy
- ◆ The impact of revenue sharing on Blockbuster was dramatic
  - Rentals increased by 75% in test markets
  - Market share increased from 25% to 31% (The 2nd largest retailer, Hollywood Entertainment Corp has 5% market share)

# Making Sourcing Decisions in Practice

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- ◆ Use multifunction teams
- ◆ Ensure appropriate coordination across regions and business units
- ◆ Always evaluate the total cost of ownership
- ◆ Build long-term relationships with key suppliers

# Summary of Learning Objectives

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- ◆ What is the role of sourcing in a supply chain?
- ◆ What dimensions of supplier performance affect total cost?
- ◆ What is the effect of supply contracts on supplier performance and information distortion?
- ◆ What are different categories of purchased products and services? What is the desired focus for procurement for each of these categories?