Sustainability in the Supply Chain

SUPPLEMENT 5

PowerPoint presentation to accompany
Heizer, Render, Munson
Operations Management, Twelfth Edition, Global Edition
Principles of Operations Management, Tenth Edition, Global Edition

PowerPoint slides by Jeff Heyl

Outline

- Corporate Social Responsibility
- Sustainability
- Design and Production for Sustainability
- Regulations and Industry Standards

Learning Objectives

When you complete this chapter you should be able to :

- **S5.1** ***Describe*** corporate social responsibility
- **S5.2** ***Describe*** sustainability
- **S5.3** ***Explain*** the 3*R*s for sustainability
- **S5.4** ***Calculate*** design for disassembly
- **S5.5** ***Explain*** the impact of sustainable regulations on operations

Corporate Social Responsibility

- How products and services affect people and the environment
- Stakeholders have strong opinions about environmental, social, and ethical issues
- Doing what's right can be beneficial to all stakeholders
- **Corporate social responsibility (CSR)**

Sustainability

- Meeting the needs of the present without compromising the ability of future generations to meet their needs

- More than “going green”
- Includes employees, customers, community, and company reputation

Systems View

- Looking at a product's life from design to disposal, including all the resources required
- The product or service itself is a small part of much larger social, economic, and environmental systems
- Understanding systems allows more informed judgments regarding sustainability

Commons

- Many inputs to a production system held by the public
- *Common* resources often misallocated
- Possible solutions include
  1) Moving some of the *common* to private property
  2) Allocation of rights
  3) Allocation of yield

Triple Bottom Line

- Consider the systems necessary to support the three *Ps: people*, *planet*, and *profit*

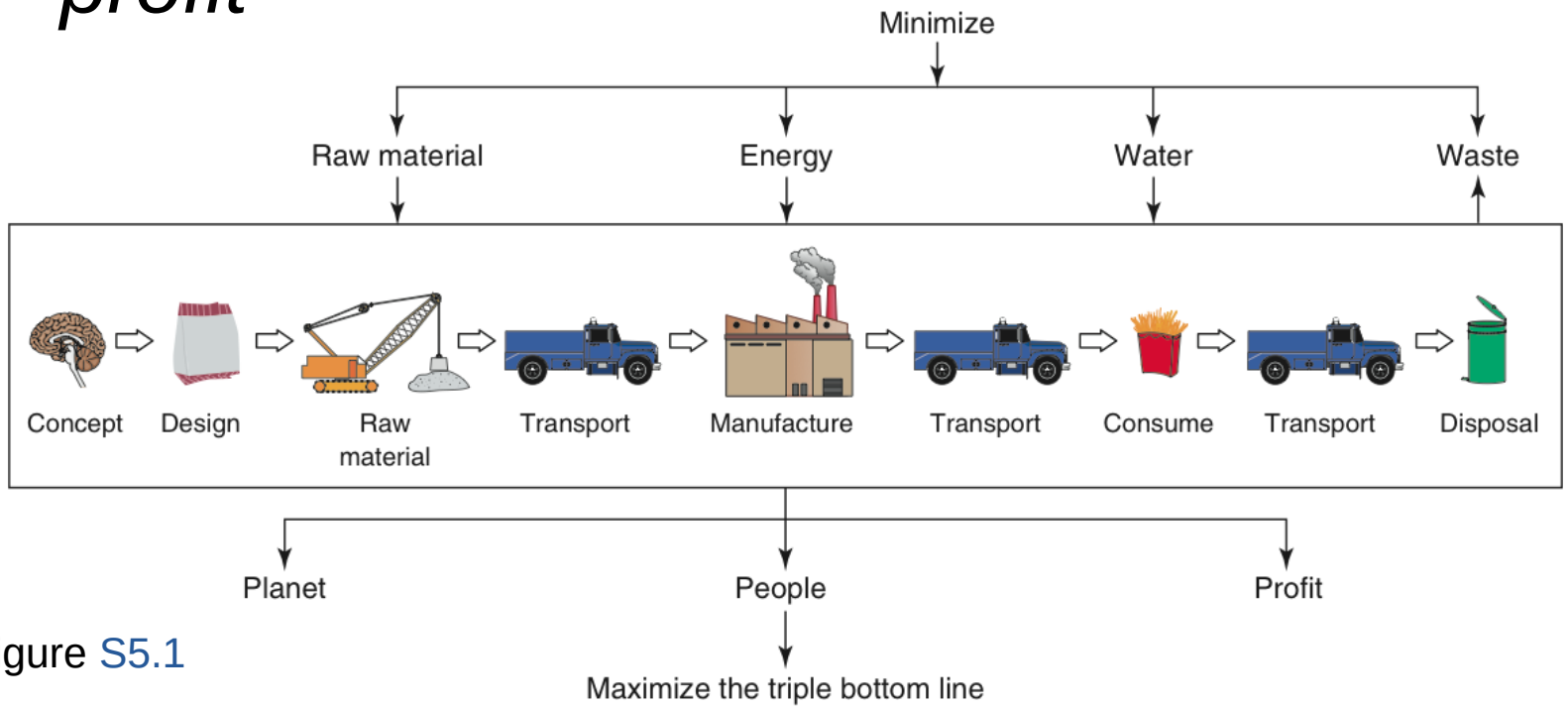

Figure S5.1

Triple Bottom Line

- Decisions affect people
- Globalization and outsourcing complicate the task
- Supplier selection and performance criteria are important
- Materials must be safe and environmentally responsible

Walmart's Objectives

1. Improving livelihoods through the creation of productive, healthy, and safe workplaces
2. Building strong communities through access to affordable, high-quality services
3. Preventing exposure to substances that are considered harmful or toxic
4. Promoting health and wellness

Triple Bottom Line

- The planet's environment
- Look for ways to reduce the environmental impact of operations
- Overarching objective is to conserve scarce resources
- **Carbon footprint** and greenhouse gas emissions (GHG)

Carbon Footprint

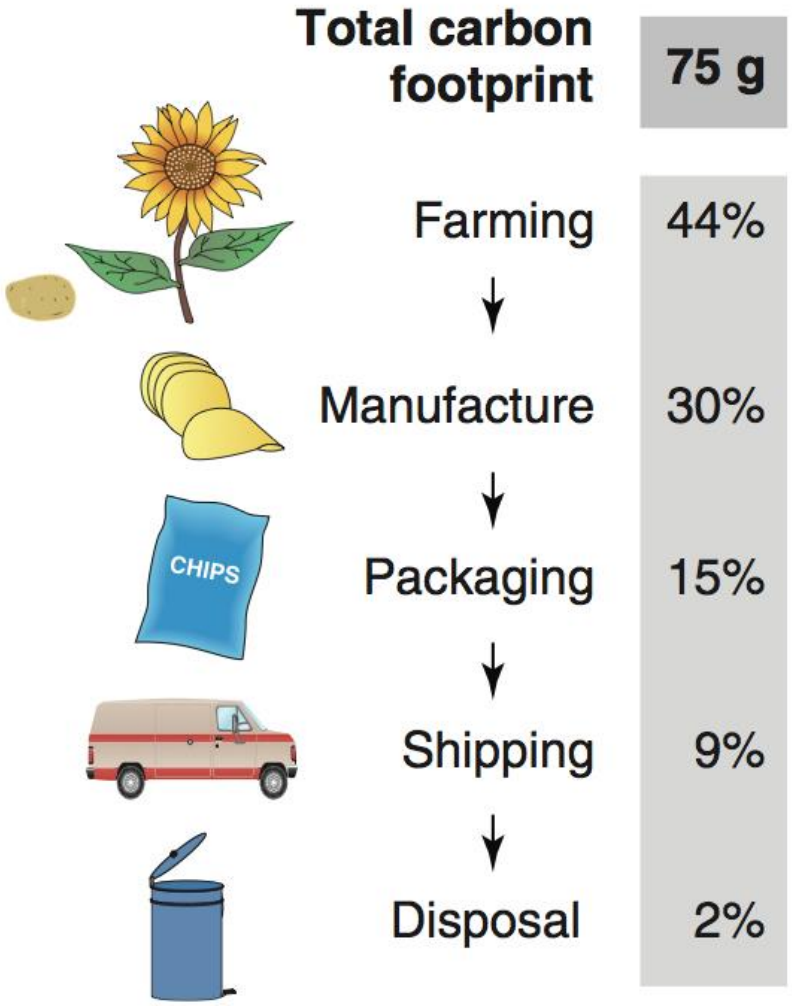

Figure S5.2

34.5-gram Bag of Frito-Lay Chips

Triple Bottom Line

- Social and environmental sustainability do not exist without **economic sustainability**
- Staying in business requires making a profit
- Alternate measures of success include risk profile, intellectual property, employee morale, and company valuation
- *Social accounting* can supplement financial accounting to support economic sustainability

Design and Production for Sustainability

- **Life cycle assessment** valuates the environmental impact of a product, from raw material and energy inputs all the way to the disposal of the product at its end-of-life
- The goal is to make decisions that help reduce the environmental impact of a product throughout its entire life
- The 3*R*s— *reduce, reuse,* and *recycle*

Product Design

- Design decisions affect materials, quality, cost, processes, related packaging and logistics, and how the product will be processed when discarded
- Incorporate systems view to lower environmental impact
- Alternative materials

Design for Disassembly

Harmonizer

PART	RESALE REVENUE PER UNIT	RECYCLING REVENUE PER UNIT	PROCESSING COST PER UNIT	DISPOSAL COST PER UNIT
Printed circuit board	$5.93	$1.54	$3.46	$0.00
Laminate back	0.00	0.00	4.53	1.74
Coil	8.56	5.65	6.22	0.00
Processor	9.17	2.65	3.12	0.00
Frame	0.00	0.00	2.02	1.23
Aluminum case	11.83	2.10	2.98	0.00
Total	$35.49	$11.94	$22.33	$2.97

Design for Disassembly

Rocker

PART	RESALE REVENUE PER UNIT	RECYCLING REVENUE PER UNIT	PROCESSING COST PER UNIT	DISPOSAL COST PER UNIT
Printed circuit board	$7.88	$3.54	$2.12	$0.00
Coil	6.67	4.56	3.32	0.00
Frame	0.00	0.00	4.87	1.97
Processor	8.45	4.65	3.43	0.00
Plastic case	0.00	0.00	4.65	3.98
Total	$23.00	$12.75	$18.39	$5.95

Design for Disassembly

Revenue retrieval	=	Total resale revenue	+	Total recycling revenue	–	Total processing cost	–	Total disposal cost

Revenue retrieval for Harmonizer	= $35.49 + $11.94 – $22.33 – $2.97 = $22.13
Revenue retrieval for Rocker	= $23.00 + $12.75 – $18.39 – $5.95 = $11.41

Production Process

- Reduce the amount of resources in the production process
  - Energy
  - Water
  - Environmental contamination
- Reduce cost and environmental concerns

Logistics

- Reduce costs by achieving efficient route and delivery networks
  1. Getting shipments to customers promptly
  2. Keeping trucks busy
  3. Buying inexpensive fuel

Logistics

- Management analytics can help
- Evaluate equipment alternatives
- Life cycle ownership costs

Life Cycle Ownership Costs

VEHICLE	COST TO BUY	FUEL	EFFICIENCY	OPERATING COSTS PER MILE
Ford TriVan	$28,000	Regular Unleaded	24 mpg	$.20
Honda CityVan	$32,000	Regular Unleaded/Battery	37 mpg	$.22
Annual distance = 22,000 miles		Life = 8 years	Gas price = $4.25/gallon	

Total life cycle cost = Cost of vehicle + Life cycle cost of fuel + Life cycle operating cost

Life Cycle Ownership Costs

a) Ford TriVan

Total life-cycle cost

$$= \$28{,}000 + \left[\frac{22{,}000\ \frac{miles}{year}}{24\ \frac{miles}{gallon}}\right]\left(\$4.25 / gallon\right)\left(8\ years\right)$$

$$+ \left(22{,}000\ \frac{miles}{year}\right)\left(\$.20 / mile\right)\left(8\ years\right)$$

$$= \$28{,}000 + \$31{,}167 + \$35{,}200 = \$94{,}367$$

Life Cycle Ownership Costs

a) Honda CityVan

Total life-cycle cost

$$= \$32{,}000 + \left[\frac{22{,}000\ \frac{miles}{year}}{37\ \frac{miles}{gallon}}\right]\left(\$4.25 / gallon\right)\left(8\ years\right)$$

$$+ \left(22{,}000\ \frac{miles}{year}\right)\left(\$.22 / mile\right)\left(8\ years\right)$$

$$= \$32{,}000 + \$20{,}216 + \$38{,}720 = \$90{,}936$$

Life Cycle Ownership Costs

b) Crossover point

Total cost for Ford TriVan = Total cost for Honda CityVan

$$\$28{,}000 + \left[\frac{4.25\ \frac{\$}{gallon}}{24\ \frac{miles}{gallon}} + .20\ \frac{\$}{mile}\right](M\ miles) = \$32{,}000 + \left[\frac{4.25\ \frac{\$}{gallon}}{37\ \frac{miles}{gallon}} + .22\ \frac{\$}{mile}\right](M\ miles)$$

$$\$28{,}000 + \left(.3770\ \frac{\$}{mile}\right)(M) = \$32{,}000 + \left(.3349\ \frac{\$}{mile}\right)(M)$$

$$\left(.0421\ \frac{\$}{mile}\right)(M) = \$4{,}000$$

$$M = \frac{\$4{,}000}{.0421\ \frac{\$}{mile}} = 95{,}012\ miles$$

Life Cycle Ownership Costs

c) Crossover point

$$\text{Crossover point} = \frac{95{,}012\ miles}{22{,}000\ \frac{miles}{year}} = 4.32\ years$$

End-of-Life Phase

- What happens at the end-of-life stage?
- **Closed-loop supply chains** or reverse logistics

- Automaker's design incorporates disassembly, recycling, and reuse

Regulations and Industry Standards

- Product design
  - Food and Drug Administration
  - Consumer Products Safety Commission
  - National Highway Safety Administration

Regulations and Industry Standards

- Manufacturing and assembly activities
  - Occupational Safety and Health Administration (OSHA)
  - Environmental Protection Agency (EPA)
  - State and local agencies

Regulations and Industry Standards

- Disassembly and disposal of hazardous products
  - EPA
  - Department of Transportation
- Design for disassembly

Regulations and Industry Standards

- Nearly all industries have regulations
  - Commercial builders
  - Federal Safe Drinking Water Act
  - Resource Conservation and Recovery Act

International Environmental Policies and Standards

- Organizations and governments guiding businesses
  - U.N. Framework Convention on Climate Change (UNFCCC)
  - International Organization for Standardization (ISO)
  - Elimination of greenhouse gas (GHG)

European Union Emissions Trading System

- To combat climate change
- Reduce industrial GHG emissions
- “Cap-and-trade” principle

ISO 14000

- Environmental management standards
  1) Environmental management
  2) Auditing
  3) Performance evaluation
  4) Labeling
  5) Life cycle assessment

ISO 14000

- Advantages
  - Positive public image, reduced liability
  - Good systematic approach to pollution prevention
  - Compliance with regulatory requirements, opportunities for competitive advantage
  - Reduction in the need for multiple audits

ISO 14000

- Implemented by more than 200,000 organizations in 155 countries
- Environmental and economic benefits
  - Reduced materials/resource usage
  - Reduced energy consumption
  - Lower distribution costs
  - Improved image
  - Improved process efficiency
  - Reduced waste and disposal costs

ISO 14000

- ISO 14001 addresses environmental management systems
- Guidance to minimize harmful effects on the environment