Solutions for Operations and Supply Chain Management The Core 6th Edition by Jacobs

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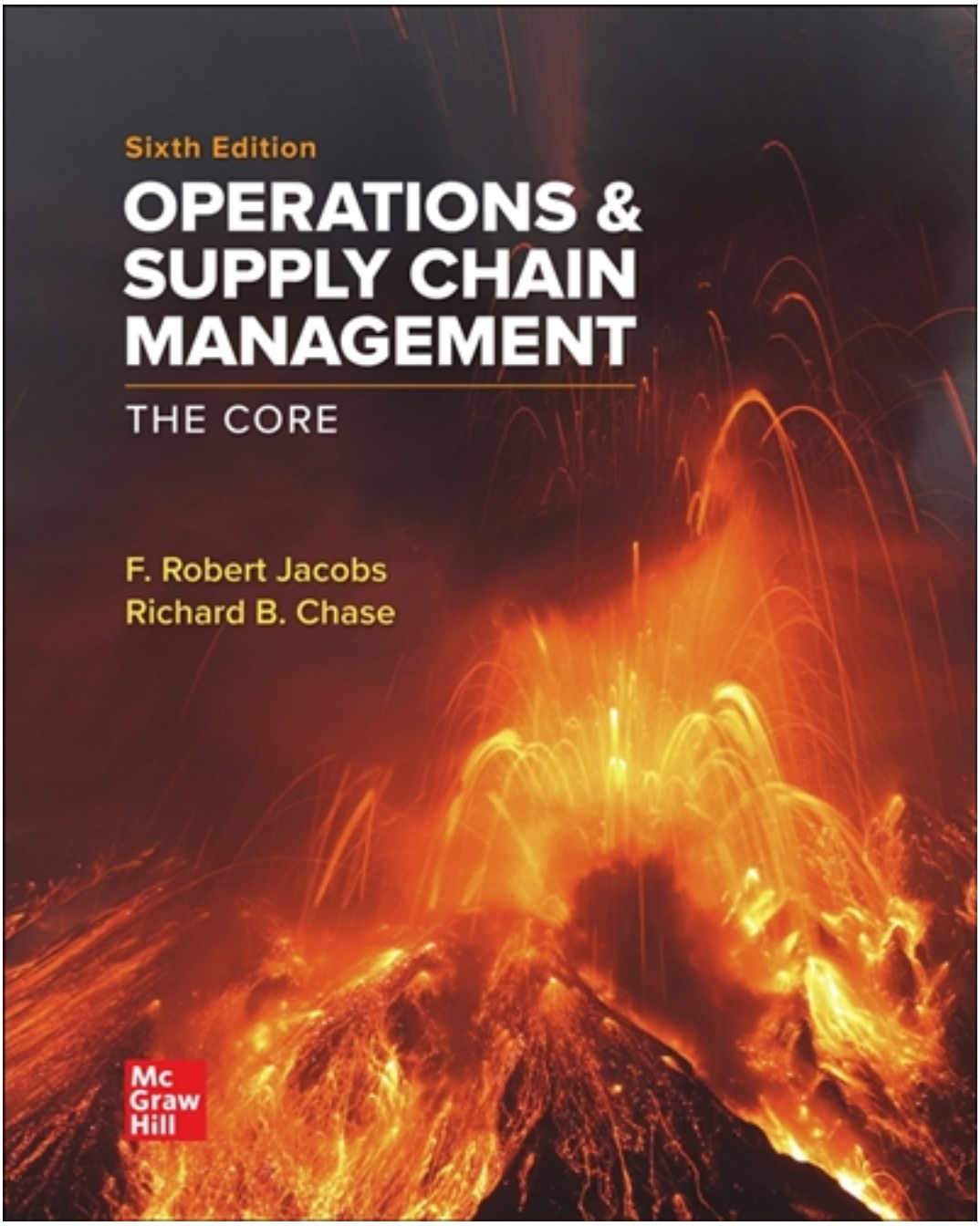

Solutions

CHAPTER 2
STRATEGY AND SUSTAINABILITY

Discussion Questions

1. What is meant by a "triple-bottom-line" strategy? Give an example of a company that has adopted this type of strategy.

   A triple-bottom-line strategy places emphasis on a company's environmental and social responsibilities as well as the traditional bottom line of economic prosperity. It recognizes that the long-term health of the firm is interdependent with the health of the environment and the betterment of society. There are many examples – one is Patagonia. For details see their current sustainability page:

   http://www.patagonia.com/home/

2. Find examples where companies have used features related to environmental sustainability to "win" new customers.

   Car companies use environmental concerns in marketing ads. The development of hybrid and flex-fuel cars is one way they have operationalized those concerns. Consumer goods companies display the "made with recycled material" logo on the packaging. Bottled water manufacturers are using recycled material and advertising bottles made with less plastic.

3. What are the major priorities associated with operations and supply chain strategy? For each major priority, describe the unique characteristics of the market niche with which it is most compatible.

   - *Cost: In most every industry, there is a market segment that is very price sensitive. Firms that can supply goods or services at the lowest price will have an advantage there. This requires extremely efficient operations with a continuous focus on cost minimization. As a result, large production volumes are often required to successfully compete here.*

   - *Quality: Like the low-cost focused customers, most industries will encounter a market segment willing to pay more for a higher quality product. Typically, these goods and services will not be commodity products. Customers may focus on design quality (feature sets, materials, etc.), process quality (fit and finish, reliability, etc.) to differing levels based on the industry.*

   - *Delivery speed and reliability: When a customer has a dire and need for a good or service, companies that can deliver the product the fastest have a distinct advantage. In the business-to-business (B2B) market segment, customers depend on stated delivery windows to achieve reductions in inventory while still meeting strict production windows.*

   - *Changes in volume: Again, this is often important to be a player in many B2B markets. Customers need to know their suppliers can rapidly respond to changes in demand so they can meet the end customer demand swings.*

• Flexibility and new product introduction speed: The high-tech industry is a good example where this is a key competitive advantage. Being able to rapidly respond to advances in technology and correctly gauge customer expectations is key to competing successfully.

4. Why does the "proper" operations and supply chain strategy keep changing for companies that are world-class competitors?

   The top three priorities have generally remained the same over time: make it good, make it fast, and deliver it on time. Others have changed. Part of this may be explained by realizing that world class organizations have achieved excellence in these three areas and are, therefore, focusing attention on some of the more minor areas to gain competitive advantage. The changes in the minor priorities may result from recognizing opportunities or from changes in customer desires or expectations.

5. What do the expressions "order winner" and "order qualifier" mean? What was the order winner for your last major purchase of a product or service?

   Order winners are dimensions that differentiate the product or service or services of one firm from another. Order qualifiers are dimensions that are used to screen a product or service as a candidate for purchase. Order qualifiers get a company's "foot in the door." Order winners are what make the sale. Obviously, answers will vary for the order winners from your last purchase.

6. Pick a company that you are familiar with and describe its operations strategy and how it relates to winning customers. Describe specific activities used by the company that support the strategy (see Exhibit 2.3 for an example).

   Student answers will vary widely based on their experiences and views. It might be helpful for a classroom exercise to assign certain companies to several students/teams and compare their answers in class.

7. At times in the past, the dollar showed relative weakness with respect to foreign currencies, such as the yen, euro, and pound. This stimulated exports. Why would long-term reliance on a lower valued dollar be at best a short-term solution to the competitiveness problem?

   This approach is dependent on economic policies of other nations. This is a fragile dependency. A long-term approach is to increase manufacturing and service industry productivity in order to regain competitive advantage. At a national level, solutions appear to lie in reversing attitudes. At a firm level, competitive weapons are consistent quality, high performance, dependable delivery, competitive pricing, and design flexibility.

8. Identify an operations and supply chain - related "disruption" that recently impacted a company. What could the company have done to have minimized the impact of this type of disruption prior to it occurring?

   The March 2011 tsunami that struck Japan was geographically concentrated but had global impact on multiple firms, many of which had no physical presence at all in the affected area. Examples include firms that had sole source agreements with suppliers in the affected area. The tsunami left these companies scrambling to find new suppliers to feed into their supply chains. These firms could have reduced the impact of the tsunami by having a few high-quality,

dependable suppliers located in different geographical regions. There are many other examples that could be taken from this one event. A simple Internet search will provide plenty of material for discussion. The L.A. ports work slowdown in early 2015 was a man-made disruption for many global firms. Both inbound and outbound shipments were affected – some delayed and others (U.S. produce exports) were ruined. McDonald's resorted to flying over 2 million pounds of frozen French fries into Japan at significant extra cost during this period to keep restaurants open.

The are many examples from the recent pandemic. There were severe shortages of toilet paper made by Proctor and Gamble and Kimberly-Clark and sold through grocery stores. In this case, the companies had been running supply chains with little reserve supply since regular demand was very predictable. Some reserve buffer inventory could have been carried to help when demand dramatically increased. There are many other examples.

9. What do we mean when we say productivity is a "relative" measure?

For productivity to be meaningful, it must be compared with something else. The comparisons can be either intra-company as in the case of year-to-year comparisons of the same measure, or intercompany as in the case of benchmarking. Intercompany comparisons of single factor productivity measures can be somewhat tenuous due to differences in accounting practices (especially when comparing with foreign competitors) and the balance of labor to capital resources. Total factor productivity measures are somewhat more robust for comparison purposes.

Objective Questions

1. Shell Oil Company's motto "People, Planet and Profit" is a real-world implementation of what OSCM concept?

   Triple bottom line

2. A firm's *strategy* should describe how it intends to create and sustain value for _____.

   Its current shareholders

3. What is the term used to describe individuals or organizations that are influenced by the actions of the firm?

   Stakeholders

4. How often should a company develop and refine the operations and supply chain strategy.

   At least yearly

5. What is the term used to describe product attributes that attract certain customers and can be used to form the competitive position of a firm?

   Competitive dimensions

6. What are the two main competitive dimensions related to product delivery?

   Delivery speed and delivery reliability

7. What are the two characteristics of a product or service that define quality?

   Design quality and process quality

8. What is the diagram that shows how a company's strategy is delivered by a set of supporting activities called?

   Activity-system map

9. In implementing supply chain strategy, a firm must minimize its total cost without compromising the needs of what group of people?

   Customers

10. What is defined as the likelihood of disruption that would impact the ability of a company to continuously supply products or services?

    Supply chain risk

11. What are risks caused by natural or manmade disasters, and therefore impossible to reliably predict called?

    Disruption risks

12. Match the following common risks with the appropriate mitigation strategy.

E	Country risks	A:	Detailed tracking, alternate suppliers
D	Regulatory risk	B:	Carefully select and monitor suppliers
A	Logistics failure	C:	Contingency planning, insurance
C	Natural disaster	D:	Good legal advice, compliance
B	Major quality failure	E:	Currency hedging, local sourcing

13. What is the term used to describe the assessment of the probability of a negative event against the aggregate severity of the related loss?

    Risk mapping

14. As Operations Manager, you are concerned about being able to meet sales requirements in the coming months. You have just been given the following production report:

	JAN	FEB	MAR	APR
Units Produced	2300	1800	2800	3000
Hours per Machine	325	200	400	320
Number of Machines	3	5	4	4

Find the average of the monthly productivity figures (units per machine hour).

To answer this, we need to realize that the measure of hours given is per machine, so we must multiply that by the number of machines in each period to get the total machine hours in each period. Those figures are used in the calculations below.

Average productivity: (2300/975 + 1800/1000 + 2800/1600 + 3000/1280)/4

Average productivity (2.36+1.80+1.75+2.34)/4= 2.06 units per machine hour

Note that the average above weights each month the same, although output varies. An alternative answer would be to compute a weighted average productivity figure that is slightly different at 2.04 units per machine hour.

15. Sailmaster makes high-performance sails for competitive windsurfers. Below is information about the inputs and outputs for one model, the Windy 2000.

Units sold	1,217
Sale price each	$1,700
Total labor hours	46,672
Wage rate	$12/hour
Total materials	$60,000
Total energy	$4,000

Calculate the productivity in **sales revenue/labor expense**.

We must do some interim calculations here. Sales revenue is calculated by multiplying units sold by the unit sales price. Labor expense is calculated by multiplying labor hours by the wage rate.

*(1217*1700) / (46672*12) = 3.69*

16. *Live Trap Corporation* received the data below for its rodent cage production unit. Find the **total** productivity?

Output	**Input**	
50,000 cages	Production time	620 labor hours
Sales price: $3.50 per unit	Wages	$7.50 per hour
	Raw materials (total cost)	$30,000
	Component parts (total cost)	$15,350

Total productivity could be expressed two ways here based on how you express output: in units sold, or dollars of sales.

Units sold:
*50,000 / ((620 * $7.50) + 30,000 + 15,350) = 1.00 units sold per dollar input*
Dollars of sales:
*(50000*3.5) / ((620 * $7.50) + 30,000 + 15,350) = 3.5 dollars in sales per dollar input*

17. Two types of cars (Deluxe and Limited) were produced by a car manufacturer last year. Quantities sold, price per unit, and labor hours are given below. What is the labor productivity for each car? Explain the problem(s) associated with the labor productivity.

	QUANTITY	$/UNIT
Deluxe car	4,000 units sold	$8,000/car
Limited car	6,000 units sold	$9,500/car
Labor, Deluxe	20,000 hours	$12/hour
Labor, Limited	30,000 hours	$14/hour

Labor Productivity – units/hour

Model	Output in Units	Input in Labor Hours	Productivity (Output/Input)
Deluxe Car	4,000	20,000	0.20 units/hour
Limited Car	6,000	30,000	0.20 units/hour

Labor Productivity – dollars

Model	Output in Dollars	Input in Dollars	Productivity (Output/Input)
Deluxe Car	4,000($8,000)= $32,000,000	20,000($12.00)= $240,000	133.33
Limited Car	6,000($9,500)= $57,000,000	30,000($14.00)= $420,000	135.71

The labor productivity measure is a conventional measure of productivity. However, as a partial measure, it may not provide all of the necessary information that is needed. For example, increases in productivity could result from decreases in quality, and/or increases in material cost.

18. A U.S. manufacturing company operating a subsidiary in an LDC (less-developed country) shows the following results:

	U.S.	LDC
Sales (units)	100,000	20,000
Labor (hours)	20,000	15,000
Raw materials (currency)	$20,000	20,000 (FC)
Capital equipment (hours)	60,000	5,000

a. Calculate partial labor and capital productivity figures for the parent and subsidiary. Do the results seem misleading?

Labor Productivity

Country	Output in Units	Input in Hours	Productivity (Output/Input)
U.S.	100,000	20,000	5.00 units/hour
LDC	20,000	15,000	1.33 units/hour

Capital Equipment Productivity

Country	Output in Units	Input in Hours	Productivity (Output/Input)
U.S.	100,000	60,000	1.67 units/hour
LDC	20,000	5,000	4.00 units/hour

Yes. You might expect the capital equipment productivity measure to be higher in the U.S. than in a LDC. Also, the measures seem contradictory. Each plant appears to be far more productive than the other on one measure, but much worse on the other.

b. Compute the multifactor productivity figures for labor and capital together. Do the results make more sense?

Multifactor – Labor and Capital Equipment

Country	Output in Units	Input in Hours	Productivity (Output/Input)
U.S.	100,000	20,000 + 60,000= 80,000	1.25 units/hour
LDC	20,000	15,000 + 5,000= 20,000	1.00 units/hour

Yes, labor and equipment can be substituted for each other. Therefore, this multifactor measure is a better indicator of productivity in this instance.

c. Calculate raw material productivity figures (units/$ where $1 = 10 (FC)). Explain why these figures might be greater in the subsidiary.

Raw Material Productivity

Country	Output in Units	Input in Dollars	Productivity (Output/Input)
U.S.	100,000	$20,000	5.00 units/$
LDC	20,000	FC 20,000/$10 = $2,000	10.00 units/$

The raw material productivity measures might be greater in the LDC due to a reduced cost paid for raw materials, which is typical of LDC's, especially if there are local sources for the raw materials.

19. Various financial data for the past two years follow. Calculate the total productivity measure and the partial measures for labor, capital, and raw materials for this company for both years. What do these measures tell you about this company?

		Last Year	This Year
Output:	Sales	$200,000	$220,000
Input:	Labor	30,000	40,000
	Raw materials	35,000	45,000
	Energy	5,000	6,000
	Capital	50,000	50,000
	Other	2,000	3,000

Total Productivity

Year	Output in Dollars	Input in Dollars	Productivity (Output/Input)
Last Year	$200,000	$30,000 + 35,000 + 5,000 + 50,000 + 2,000 = $122,000	1.64
This Year	$220,000	$40,000 + 45,000 + 6,000 + 50,000 +3,000 = $144,000	1.53

Partial Measure – Labor

Year	Output in Dollars	Input in Dollars	Productivity (Output/Input)
Last Year	$200,000	$30,000	6.67
This Year	$220,000	$40,000	5.50

Partial Measure – Raw Materials

Year	Output in Dollars	Input in Dollars	Productivity (Output/Input)
Last Year	$200,000	$35,000	5.71
This Year	$220,000	$45,000	4.89

Partial Measure – Capital

Year	Output in Dollars	Input in Dollars	Productivity (Output/Input)
Last Year	$200,000	$50,000	4.00
This Year	$220,000	$50,000	4.40

The overall productivity measure is declining, which indicates a possible problem. The partial measures can be used to indicate cause of the declining productivity. In this case, it is a combination of declines in both labor and raw material productivity, which were somewhat offset by an increase in the capital productivity. Further investigation should be undertaken to explain the drops in both labor and raw material productivity. An increase in the cost of both of these measures, without an accompanying increase in the selling price might explain these measures.

20. An electronics company makes communications devices for military contracts. The company just completed two contracts. The navy contract was for 2,300 devices and took 25 workers two weeks (40 hours per week) to complete. The army contract was for 5,500 devices that were produced by 35 workers in three weeks. On which contract were the workers more productive?

Contract	Output in Units	Input in Hours	Productivity (Output/Input)
Navy	2300	25(2)40 = 2000	1.15
Army	5500	35(3)40 = 4200	1.31

The workers were more productive on the Army contract.

21. A retail store had sales of $45,000 in April and $56,000 in May. The store employs eight full-time workers who work a 40-hour week. In April the store also had seven part-time workers at 10 hours per week, and in May the store had nine part-timers at 15 hours per week (assume four weeks in each month). Using sales dollars as the measure of output, what is the percentage change in productivity from April to May?

Month	Output in Dollars	Input in Hours	Productivity (Output/Input)	Percentage Change
April	$45,000	(8(40)+7(10))*4 = 1560	28.85	
May	$56,000	1820	30.77	(30.77-28.85)/28.85 = 6.66% increase

22. A parcel delivery company delivered 103,000 packages last year, when its average employment was 84 drivers. This year the firm handled 112,000 deliveries with 96 drivers. What was the percentage change in productivity over the past year?

Year	Output in Packages	Input in Drivers	Productivity (Output/Input)	Percentage Change
Last	103,000	84	1226.2	
This	112,000	96	1166.7	(1166.7 -1226.2)/1226.2 = - 4.85% (decrease)

23. A fast-food restaurant serves hamburgers, cheeseburgers, and chicken sandwiches. The restaurant counts a cheeseburger as equivalent to 1.25 hamburgers and chicken sandwiches as 0.8 hamburger. Current employment is five full-time employees who work a 40-hour week. If the restaurant sold 700 hamburgers, 900 cheeseburgers, and 500 chicken sandwiches in one week, what is its productivity? What would its productivity have been if it had sold the same number of sandwiches (2,100), but the mix was 700 of each type?

Part	Output in Hamburger Equivalents	Input in Hours	Productivity (Output/Input)
700 Hamburgers 900 Cheeseburgers (1.25) 500 Chicken Sandwiches (.80)	2225	200	11.125
700 Hamburgers 700 Cheeseburgers (1.25) 700 Chicken Sandwiches (.80)	2135	200	10.675

Analytical Exercise: The Carbon Footprint Quiz

Consider the following six common products that you use each week: a down-filled jacket, a bottle of laundry detergent, a pair of hiking boots, a half-gallon of milk in a cardboard container, a hybrid compact car, and a six-pack of beer.

Step 1 Assignment

Initially, before doing any calculations, rank the products from 1 to 6 (where 1 is the smallest carbon footprint to 6, the largest) based on your best guess of the item's carbon footprint over one full year of usage.

____ A down-filled jacket

____ A 20-washer-load bottle of laundry detergent

____ A pair of hiking boots

____ A half-gallon of milk in a cardboard container

____ A hybrid company car

____ A six-pack of beer

There are many potential answers.

Step 2: Consider the following additional information about each product.

A down-filled jacket:

- Most textile products sold in the U.S. are produced in Asia or Latin America. Fabric may be made in China, zippers in Japan, and sewing done in Vietnam. Yet all that transportation adds up to less than 1% of the product's total carbon footprint.
- About 47 pounds of CO_2 or about 71% of the total, is generated from producing the polyester for a jacket, which originates with oil.
- Assume that you buy a new jacket every year.

A bottle of laundry detergent:

- The 65-ounce bottle can do 20 washer loads of laundry.
- You do about 100 loads of laundry per year, and the detergent accounts for about 3.1 pounds of CO_2 per week.
- The clothes dryer creates the greatest emissions of about 4.4 pounds per load.

A pair of hiking boots:

- Transportation of shoes typically accounts for only 5 percent of the carbon footprint even though many companies produce their shoes in Asia and sell them in the U.S.
- The materials to make shoes are significant creators of emissions. A total of 106.5 pounds of CO_2 comes from the raw materials used to make a shoe: rubber for the outsold; ethyl vinyl acetate for the midsole, and leather.
- The average cow produces an amount of greenhouse gas equivalent to 4 tons of CO_2 every year, most of that comes not from carbon dioxide, in fact, but from a more-potent greenhouse gas: methane.
- A factory used to make books in China's Guangdong Province produces 8.5 pounds of CO_2 from the electricity used to make a pair of boots.
- You buy a new pair of boots every year.

A half-gallon of milk in a cardboard container:

- The single biggest chunk of emissions from milk production, about 25 percent comes from all that action in the cow's gut: methane. Recall from the leather hiking boot data that cows produce 4 tons of CO_2 equivalent per year. An average cow can produce around 6 gallons of milk per day.
- A big difference in milk emissions depends on whether it is sold in plastic or cardboard containers. Plastic containers, because they take more energy to produce, yield about 1.5 pounds more CO_2 than do cardboard ones.
- You drink about a gallon of milk each week.

A hybrid compact car:

- For every mile it travels, the average car in the U.S. emits about one pound of carbon dioxide.
- The expected life of a midsize sedan is 120,000 miles. A hybrid compact car can cut emissions by about 60 percent.
- About 4 percent of emissions come from making and assembling a car, 12 percent from materials, and about 25 percent from fuel transportation, car maintenance, and disposal.
- You drive about 20,000 miles per year.

A six-pack of beer:

- For a six-pack of beer, a high proportion of the emissions come from the refrigeration of the beer at stores, almost 2 pounds of CO_2 per six-pack.
- Glass bottle production accounts for almost 22 percent of total emissions, which together with refrigeration make up nearly on-half of the total emissions output.
- Producing the barley and malt and transporting the beer account for the other 50 percent of CO_2 emissions.

- You drink about two six-packs of beer a week.

Step 2 Assignment

1. Calculate the yearly carbon footprint for each of the products for a year based on your usage. Keep in mind that some of the data may not be needed for your calculations.
2. Compare your initial ranking with the ranking after doing the calculations.
3. Suggest ways that you could reduce your carbon footprint relative to these six products.

Answer to step 2, question a:

6. A hybrid compact car: 48,000 pounds savings over 120,000 miles, 12,000 pounds of emission per year

120,000 * .6 = 72,000
120,000 – 72,000 = 48,000 savings over 120,000 miles
120,000/20,000 = 6 years expected use of a car
72,000/6 = 12,000 pounds of emissions per year for compact car

5. A ½ gallon of milk in a cardboard container: 7.30 pounds, 759.2 pounds per year

Cows produce 4 tons of carbon per year = 8000 pounds
8000 / 365 = 21.92 pounds per day
6 gallons of milk per day = 21.92 pounds
21.92 / 12 = 1.826 pounds per ½ gallon
1.8266 = 25% X
X = 7.30 pounds per ½ gallon

7.30 * 2 * 52 = 759.2 pounds per year

4. A six-pack of beer: 7.14 pounds, 742.56 pounds per year

Refrigeration = 2 pounds per six-pack
Glass bottle production = .22%
Refrigeration % = .50 - .22 = 28%
28% * X = 2 pounds, where X is total emissions
X = 7.14 pounds per six-pack
7.14 * 2 * 52 = 742.56 pounds per year

3. A pair of leather hiking boots: 233 pounds per year

China production - 8.5 per pair
Material - 106.5 per shoe
Transportation - .05% of the total
8.5 + 2*(106.5) + .05X = X
X = 233.16

2. A 20-washer-load bottle of laundry detergent: 32.30 pounds per bottle, 161.1 pounds per year

(Note: detergent has nothing to do with drying. Clothes can be line dried)
100 loads per year / 52 = 1.92 loads per week
1.92 loads = 3.1 pounds
3.1 * 52 = 161.1 pounds per year
20 loads bottle / 1.92 loads per week = 10.42 weeks of detergent per bottle
10.42 * 3.1 = 32.30 pounds per bottle

1. A down filled jacket: 66.2 pounds per year

47 = 71% * X
X = 66.20

Step 2 Question b:
Many possible answers to this question.

Step 2 Question c:
Many possible answers possible.
Here are some ideas:

1. *The car – since this is the highest, one could think of using alternate transportation. Public transportation, riding a bike, or walking might be good ideas.*
2. *For milk – one might think of an alternate product: Soy milk, almond milk, and many others.*
3. *For beer – drink draft beer since this does not require the glass bottles and it is more efficient relative to refrigeration. Of course, drinking at the brewery results is less transportation.*
4. *Leather Hiking Boot – possible start to use boots made of material other than leather.*
5. *Laundry detergent – Wash less often (bigger loads). Note, there is no need for using the dryer, since clothes can be line dried.*
6. *Down Filled Jacket – it is possible to buy jackets that use recycled polyester and recycled duck down (Patagonia advertises this). Could by jackets made of organic cotton, silk, or wool. Might also extend the life of the jacket by only buying a new one every two years.*