

**PRACTICAL LEAN ACCOUNTING**  
Questions and Problems for Students

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## **PRACTICAL LEAN ACCOUNTING**

### Chapter 1: Why is Lean Accounting Important?

1. Lean accounting ...
  - A) identifies the financial benefits of lean improvement initiatives.
  - B) adds transactions to provide better information.
  - C) is short-term oriented.
  - D) focuses on internal costs rather than value creation.
2. Traditional standard costs ...
  - A) are used to identify the financial benefits of lean initiatives.
  - B) directly address the drivers of customer value.
  - C) motivate long-term improvement from lean initiatives.
  - D) provide misleading information for decision-making.
3. Product Q is manufactured in a lean production cell that has three processes: Stamping, Fabrication, and Assembly. Stamping requires 1 minute, fabrication requires 4 minutes, and assembly requires 3 minutes. The maximum number of units of product Q that can be produced by this cell in an hour is ...
  - A) 7.5
  - B) 15
  - C) 30
  - D) 8
4. Product Q is manufactured in a lean production cell that has three processes: Stamping, Fabrication, and Assembly. Stamping requires 1 minute, fabrication requires 4 minutes, and assembly requires 3 minutes. Each unit of Q uses \$10 worth of direct materials. The standard cost for direct labor is \$15 per direct labor hour and the standard rate for overhead is \$45 per direct labor hour. The actual conversion costs associated with running the lean production cell are \$75 per hour. The standard cost of a unit of product Q is ...
  - A) \$ 8.00
  - B) \$ 15.00
  - C) \$ 18.00
  - D) \$ 20.00
5. Product Q is manufactured in a lean production cell that has three processes: Stamping, Fabrication, and Assembly. Stamping requires 1 minute, fabrication requires 4 minutes, and assembly requires 3 minutes. Each unit of Q uses \$10 worth of direct materials. The standard cost for direct labor is \$15 per direct labor hour and the standard rate for overhead is \$45 per direct labor hour. The actual conversion costs associated with running the lean production cell are \$75 per hour. If the cell is running at full capacity, the “real” lean production cost per unit of Q is ...
  - A) \$ 8.00
  - B) \$ 15.00
  - C) \$ 18.00
  - D) \$ 20.00

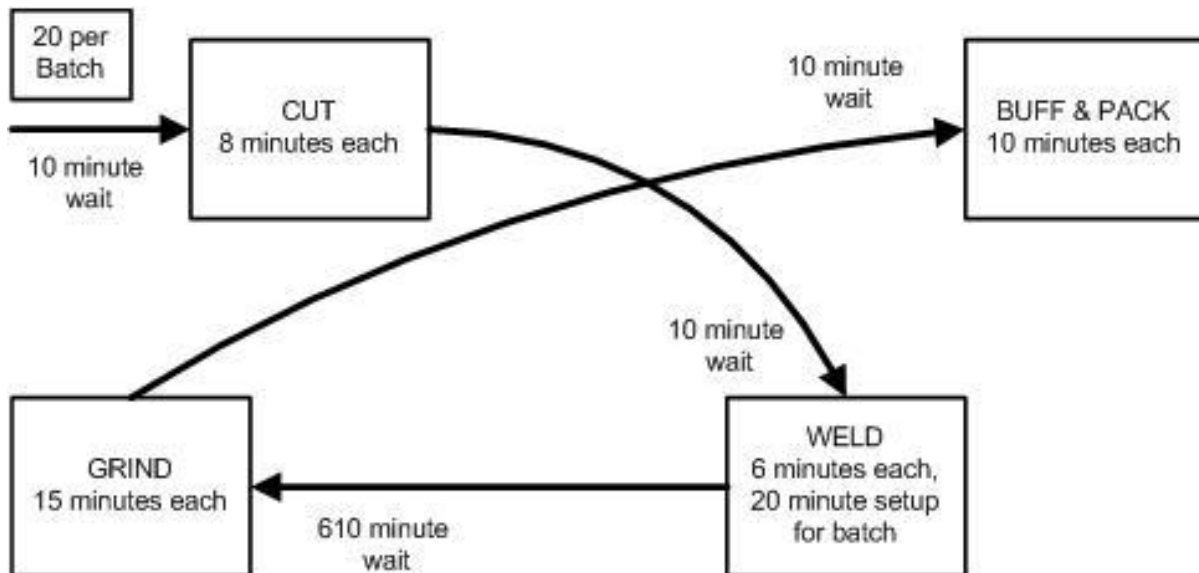
6. Absorption costing ...
  - A) motivates lean behavior.
  - B) encourages overproduction.
  - C) leads to improved cash flow.
  - D) provides accurate product costs for decision-making.
7. Which of the following is a flaw associated with traditional accounting performance measures?
  - A) Traditional measures are reported too frequently. Often they are reported on a monthly basis.
  - B) Traditional measures are primarily financial measures, hiding rather than revealing the drivers of customer value and operational problems.
  - C) Traditional measures are too simple to capture the complexities of modern production.
  - D) A, B, and C are all flaws associated with traditional accounting performance measures.
8. Waste in accounting processes ...
  - A) is inevitable because accounting does not add value from a customer perspective so there's nothing that can be done about it.
  - B) cannot be eliminated because of the provisions of the Sarbanes-Oxley Act.
  - C) is best attacked by computerizing and automating existing accounting processes.
  - D) cannot be reduced at the expense of financial and operational control.
9. Lean accounting decision-making methods focus on ...
  - A) flow through the value stream and contribution to value stream profitability.
  - B) gross profit maximization and standard product costs.
  - C) sales growth and individual asset utilization.
  - D) cost reduction and earnings per share.
10. Lean accounting focuses on ...
  - A) shareholder value.
  - B) customer value.
  - C) internal costs.
  - D) supplier costs.

Discussion questions and problems.

According to James Womack and Daniel Jones, the principles of lean management are:

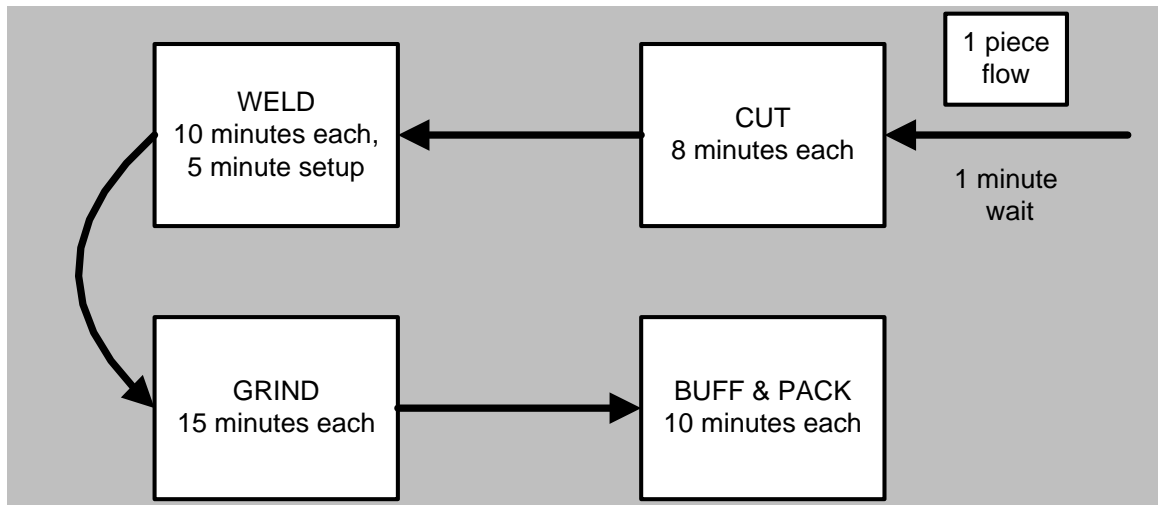
- Identify customer **value**
  - Identify the **value stream**, the set of inter-connected activities that create value for customers.
  - Make value **flow** without interruption through the value stream, at the rate demanded by the customers (**pull**).
  - Continually strive for **perfection**.
1. What problems occur when traditional accounting is used with lean management? Why do these problems occur?
  2. How can traditional accounting motivate people to use non-lean procedures?

3. Acme Metal produces gear shafts. Currently, the gear shafts are produced in batches of twenty. Materials necessary to produce one batch of twenty are brought to the cutting department, where they sit for an average of 10 minutes before cutting takes place. It takes eight minutes to cut the materials for each unit. Once the entire batch is cut, it is moved to the welding department. After a ten-minute wait, a computerized welding machine is setup to weld the parts in the batch. The 10-minute wait time includes travel time from cutting and is in addition to the time required to setup the welder. After the entire batch of 20 is welded, it is moved to the grinding department. Due to the backlog in grinding, it takes an average of 10 hours (plus the 10 minute travel time between departments) before work begins on the batch in the grinding department. After grinding is completed, the batch moves to buffing and packing. When the entire batch is completed the parts are shipped to the customer or moved to the finished goods warehouse. At any one time there is usually one batch being worked on in each department, one batch waiting at the welding department and two batches waiting at the grinding department.



- A) What is the lead-time (throughput time) for Acme Metal to produce a batch of 20 gear shafts?
- B) How many gear shafts can Acme Metal produce per hour?
- C) How many gear shafts on average are in work in process?
- D) The direct material cost averages \$75 for each gear shaft. Assume that direct labor time equals the process time for each process (e.g., the direct labor time for welding is 6 minutes per unit). If Acme Metal has a standard direct labor rate of \$20 per hour, and they assign overhead at a standard rate of \$180 per direct labor hour, what is the standard cost for each gear shaft?
4. Acme Metal has now created a cell to produce their gear shafts. Rather than producing gear shafts in batches of 20, they now produce one at a time in a lean cell. It takes one minute to bring the materials needed to produce each gear shaft to the beginning of the cell. Rather than place the Arc Welder in the cell, Acme Metals has used a smaller welder that requires only five minutes to setup. However, the welding process takes ten minutes per

unit on the smaller welding machine compared to six minutes per unit on the old machine. Standard work-in-process in the cell is one gear shaft in each process, one gear shaft waiting in front of the welding process, and one gear shaft waiting in front of the grinding process.



- A) What is the lead-time (throughput time) for Acme Metal to produce 20 gear shafts?
- B) How many gear shafts can Acme Metal produce per hour?
- C) How many gear shafts on average are in work in process?
- D) The direct material cost averages \$75 for each gear shaft. Assume that direct labor time equals the process time for each process (e.g., the direct labor time for welding is 10 minutes per unit). If Acme Metal has a standard direct labor rate of \$20 per hour, and they assign overhead at a standard rate of \$180 per direct labor hour, what is the standard cost for each gear shaft?
- E) Compare the costs of producing the gear shafts (direct materials, direct labor, and overhead) using the process described in problem three with the costs using the process described in problem 4. Which costs are likely to be lower? Which are likely to be higher? Are the differences likely to be small or large? Which costs remain the same? What do you think the overall change in cost is likely to be?

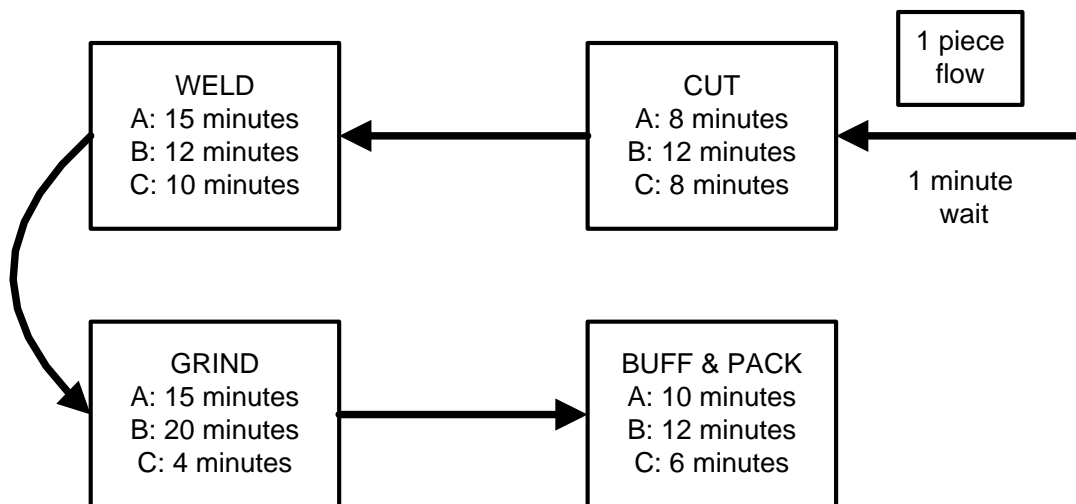
5. The following information applies to MissileCo's operations for the past quarter:

	<u>Month 1</u>	<u>Month 2</u>	<u>Month 3</u>
Sales volume (units)	40	40	40
Sales price per unit	3,000	3,000	3,000
Production volume (units)	40	50	?
Direct material cost per unit	1,000	1,000	1,000
Variable conversion cost per unit	200	200	200
Fixed conversion costs (per month)	50,000	50,000	50,000
SG&A expenses (total per month, fixed)	10,000	10,000	10,000

There were no inventories of direct materials or work-in-process.

At the beginning of month 1 MissileCo had 10 units in finished goods inventory at a value of \$24,500 (\$2,450 each). In month 3, MissileCo embarks on a lean transformation and wants to end month 3 with 4 units of product in ending finished goods inventory.

- A) Prepare an Income Statement for MissileCo Company for months 1, 2 and 3 based on generally accepted accounting principles (GAAP). Assume the company uses the FIFO method to value inventory.
  - B) Which month was MissileCo's best month? Explain your answer.
  - C) Comment on the financial impact of lean improvements as reported under generally accepted accounting principles. Do GAAP statements accurately reflect the costs and benefits of a lean transformation?
6. Acme Metal is now producing two types of gear shafts, A and B in the same production cell. They are thinking of adding a third type, C. Acme Metal's management must decide whether they should produce type C in the cell, outsource its production, or not offer type C at all.



The demand for type A and B gear shafts average 60 per week each (12 per day). Type A shafts sell for \$350 and type B shafts sell for \$385. Acme's managers estimate the demand for type C shafts at 20 per week initially, at a selling price of \$220 per shaft. They can contract production of shaft C offshore for \$150 per shaft delivered, but they will have to buy in lots of 200 shafts.

The direct material cost is \$75 per shaft, regardless of type. Acme Metal runs one 8-hour shift. It costs \$500 per hour (\$4,000 per 8-hour day) to run the cell, including direct and indirect labor. Acme Metal's standard cost rate for direct labor is \$20 per hour and their standard overhead cost rate is \$180 per hour.

- A) What are the standard costs per shaft (material, labor and overhead) for types A, B, and C?
- B) Based on the material cost and the cost of running the cell, what are the costs of type A, B, and C gear shafts? (Hint: assume the cell is producing one type of gear shaft for an hour).
- C) Which unit costs are more realistic, the standard costs you computed in part A or the costs you computed in part B?
- D) Does Acme have the capacity to produce type C shafts in the cell along with types A and B?

- E) What recommendation (Produce C, outsource C, not offer C) would you make to Acme management?
  - F) Suppose an additional 3 minutes in welding and an additional 3 minutes in buffing for type B gear shafts would reduce the grinding time by 2 minutes. How would the standard cost of the type B gear shaft change? From an operational perspective, should Acme adopt the proposed process change? Is the signal from the standard cost system consistent with the operational perspective?
7. What are the benefits lean accounting should provide to a lean organization or an organization engaged in a lean transformation? Why should such an organization adopt lean accounting?
8. Does accounting provide value from the perspective of the customer?
9. Acme Metal had a routing slip to track each batch of 20 gear shafts they were producing in the process described in problem 3 above. A transaction was recorded to issue materials into production, and another transaction was recorded each time the job moved from one production department to another. These transactions were used to ensure information was available on the location of each batch, at any time, and to ensure that the proper quantity and cost of gear shafts was available for financial reporting. Acme Metal has now adopted cellular manufacturing as described in problem 4 above. Describe a way that Acme Metal can change its accounting system to meet its control and reporting objectives at a lower cost.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 2: Maturity Path to Lean Accounting

1. Lean organizations achieve control through ...
  - A) transaction records and monitoring costs.
  - B) visual controls within stable operating processes.
  - C) incentive awards and bonuses.
  - D) relying on people to “do the right thing” and codes of ethics.
2. Which of the following is an attribute associated with a manufacturing company that has moved beyond the pilot stage and achieved a widespread lean transformation?
  - A) Successful pilot lean cells are in place.
  - B) Short setup times and quick changeovers to produce different products.
  - C) Manufacturing is managed by value stream.
  - D) Standardized work has been created.
3. The earliest stage at which value stream direct costing can replace standard costing is ...
  - A) before the lean transformation begins in production.
  - B) the “lean enterprise” stage, when lean thinking and a continuous improvement culture has spread throughout the organization.
  - C) the “manage by value stream” stage, when lean production (manufacturing) is widespread.
  - D) at the pilot stage, when the lean transformation begins in production.
4. The earliest stage at which value stream costing can be extended outside the company to incorporate suppliers, distributors, and even customers is ...
  - A) before the lean transformation begins in production.
  - B) the “lean enterprise” stage, when lean thinking and a continuous improvement culture has spread throughout the organization.
  - C) the “manage by value stream” stage, when lean production (manufacturing) is widespread.
  - D) at the pilot stage, when the lean transformation begins in production.
5. Lean performance measurements can be created, displayed and used in production cells ...
  - A) before the lean transformation begins in production.
  - B) the “lean enterprise” stage, when lean thinking and a continuous improvement culture has spread throughout the organization.
  - C) the “manage by value stream” stage, when lean production (manufacturing) is widespread.
  - D) at the pilot stage, when the lean transformation begins in production.
6. An organization can be described as a lean enterprise when ...
  - A) lean thinking and a continuous improvement culture has spread throughout the organization.
  - B) a few pilot lean cells are in place.
  - C) a consultant is hired to help implement 5S (workplace organization) and a product or product family is selected for a lean pilot project.
  - D) most production occurs in lean cells using lean methods, and continuous improvement teams have been trained and established.



7. Which of the following statements about target costing is **false**?
  - A) Target costing begins with an understanding of customer needs and what they value.
  - B) Target costing applies lean thinking to product, service, and process design.
  - C) Target costing results in improvement initiatives to profitably deliver value to customers.
  - D) Target costing computes the budget or standard cost “target” for a product or service.
8. Which of the following statements best characterizes lean accounting?
  - A) Lean accounting applies the principles of lean thinking to accounting processes and provides the measurements and reporting to support a lean management system.
  - B) Lean accounting is the term used to describe a set of techniques and tools that can be used in lean production settings.
  - C) Lean accounting is the automation of accounting processes so that accounting can be performed with fewer people.
  - D) Lean accounting is a label applied to any accounting practices used by an organization that applies lean tools and lean management to its production processes.

Discussion questions.

1. If lean accounting reinforces the lean transformation of production and motivates continuous improvement, why can't companies switch to lean accounting before they undertake the lean transformation of production.
2. Describe the three basic stages of maturity for lean manufacturing. Identify two accounting changes that can be implemented at each stage.
3. Some writers and consultants make a distinction between lean accounting and accounting for lean. Where a distinction is made, lean accounting refers to applying lean thinking to accounting processes, and accounting for lean refers to measures and reporting supporting lean thinking and motivating continuous improvement of value streams. Consider each of the five bullet points on page 19. Do they refer to lean accounting, accounting for lean, or both? Explain your choices.
4. Is lean accounting a series of methods and tools? Are there any benefits or dangers associated with regarding lean accounting as a series of tools?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 3: Cell Performance Measurements

1. Traditional accounting performance measurements ...
  - A) are reported on a timely basis.
  - B) motivate overproduction.
  - C) require few resources for data gathering.
  - D) are mostly non-financial measures.
2. Lean production cell measures ...
  - A) are numerous.
  - B) are not reported on a timely basis.
  - C) are usually presented visually in the production cell.
  - D) are usually tracked, compiled and reported by computer.
3. Which of the following measures is **not** part of BMA, Inc.'s starter set of production cell/process measures?
  - A) Day-by-the-hour production.
  - B) WIP-to-SWIP
  - C) EBITDA
  - D) OEE (operational equipment effectiveness).
4. The day-by-the-hour report ...
  - A) shows whether or not production is occurring at the rate of customer demand.
  - B) shows the length of time equipment is unavailable due to breakdowns.
  - C) shows the number of defective products or service errors made each hour.
  - D) shows the deliveries to customers made by the promised date.
5. Takt time is ...
  - A) the maximum possible rate of production.
  - B) the time production must begin to deliver to the customer on time.
  - C) the rate at which product must be produced to meet customer demand.
  - D) the time the customer expects to receive the product.
6. Which of the following is **not** a purpose of the day-by-the-hour report?
  - A) To motivate the operating personnel to produce at the maximum rate possible.
  - B) To provide fast feedback when problems in the cell need to be fixed quickly.
  - C) To keep the operating personnel focused on maintaining a consistent level of output in line with customer demand.
  - D) To gather data about problems so root causes can be determined and the problems can be permanently corrected.
7. First time through is ...
  - A) the time it takes to produce a product the first time it is produced.
  - B) the proportion of products produced from start-to-finish without defects or rework.
  - C) the time it takes to produce one complete unit of a product after changing over from a previous product.
  - D) the proportion of products passing final inspection.

8. Aluminum Slugger makes softball bats. In one hour, 50 bats went through production. Two of the bats were misshaped and they had to be scrapped. The remaining 48 bats were sent to final inspection and three of those bats had to be sent back for rework in sanding and buffing before they passed final inspection. The first time through (FTT) rate for Aluminum Slugger is ...
- A) 96.00%.
  - B) 94.00%.
  - C) 93.75%.
  - D) 90.00%.
9. Natural Tee Company produces T-shirts using all cotton fabric and natural dyes. The T-shirts production cell has three workstations: Dyeing, Cutting, and Sewing. The first time through (FTT) rates for each workstation are: Dyeing 90%, Cutting 98%, and Sewing 97%. The overall FTT rate for the production cell is ...
- A) 85.00%.
  - B) 85.56%.
  - C) 90.00%.
  - D) 95.00%.
10. The purpose of the WIP-to-SWIP measure is ...
- A) to minimize inventory.
  - B) to show whether or not production is occurring at the rate of customer demand.
  - C) to show whether or not standard work is being performed correctly.
  - D) to show whether or not the lean pull system is working correctly.
11. Ideally, the value for WIP-to-SWIP should be ...
- A) 1.0, a 1:1 ratio.
  - B) as high a number as possible. Higher is always better.
  - C) as close to zero as possible. Lower is always better.
  - D) unchanged for a cell from period to period, the ideal value for a particular cell depends on the nature of the product.
12. The metric that tracks the ability of a machine to make a product on time and to the right quality is ...
- A) TPM (total productive maintenance).
  - B) FTT (first time through).
  - C) OEE (operational equipment effectiveness).
  - D) WIP-to-SWIP (work-in-process to standard work-in-process)
13. Operational equipment effectiveness is the product of three measures. Which of the following measures is **not** used in calculating OEE?
- A) Availability
  - B) On time delivery
  - C) Performance Efficiency
  - D) Quality
14. Which of the following statements is true regarding cell performance measurements?
- A) Cell measures should be limited to four primary measures.
  - B) Lean cell measures should initially be reported in tandem with traditional measures.
  - C) Cell measures are for the workers alone. Supervisors and managers should not use them.
  - D) The measures should be used to reveal and fix problems, not to assign blame.

Use the following information to answer questions 15 – 18

A stamping machine used to produce part P has a rated run speed of 1,000 parts per hour. It is scheduled to run 8 hours per day, five days per week, with all preventive maintenance completed outside the 8-hour shift. During the past week, the stamping machine was unavailable for six hours while changeovers took place. The machine was unavailable for three hours while two unscheduled repairs took place, and adjustments for quality problems stopped production another four times. It took 15 minutes to resolve each quality problem and resume production. While the stamping machine was running, it produced 980 parts per hour, a total of 29,400 parts for the week, but 2,352 parts were defective and had to be scrapped.

15. The stamping machine's availability for the week was ...
  - A) 17.86%.
  - B) 75.00%.
  - C) 85.00%.
  - D) 90.00%.
16. The stamping machine's performance efficiency for the week was ...
  - A) 67.62%.
  - B) 73.50%.
  - C) 90.16%.
  - D) 98.00%.
17. The stamping machine's quality for the week was ...
  - A) 67.62%.
  - B) 90.16%.
  - C) 92.00%.
  - D) 98.00%.
18. The stamping machine's OEE (operating equipment effectiveness) for the week was ...
  - A) 16.10%.
  - B) 67.62%.
  - C) 76.64%.
  - D) 81.14%.

Discussion questions and problems.

1. The accounting performance measures traditionally used to evaluate operating performance include machine utilization rates, direct-to-indirect labor ratios, and rate and usage variances from standard material, labor, and overhead quantities and rates. These measures were developed to monitor and control mass production. Why don't they work in lean production environments?
2. What is the purpose of the Day-by-the-Hour report?
3. Suppose on a Day-by-the-Hour report there is an hourly period where actual production was significantly higher than the target. Is this a problem? Should we see a problem and an action to be taken described on the report? Why or why not?

4. Digital Design has a production cell producing computer chips. The circuit designs for the chips are etched onto silicon wafers in a fabrication process. Circuits for 200 chips are etched onto each wafer. The circuits are tested, and any that fail are marked. Digital design has a 20 percent failure rate for circuits in its fabrication process. After testing, the wafer is cut into die, each containing the circuits for an individual chip, and the marked die with failed circuits are scrapped. Wire connectors are attached to the good die and they are mounted in a protective housing and tested. The two percent of the chips that fail the mounting test are reworked to correct the problems. Following mounting, the chips are subjected to a final burn-in test. Five percent of the chips tested in burn-in fail the test and they are scrapped. Compute the first-time-through rate for Digital Design's chip production cell.
5. Happy Feet, Inc. makes stockings and hosiery. One production cell has the following workstations: Knitting, Toe closing, Ironing, Packaging and final inspection. All defective stockings are scrapped because rework is too costly relative to the selling price of the stockings. The defect rates for each workstation are: Knitting 2%, Toe closing 5%, Ironing 0.5%, Packaging and Final Inspection 1%. Compute the overall first time through rate for the production cell.
6. What is the purpose of the WIP-to-SWIP report? Describe what it means for operations under the following circumstances: the value of WIP-to-SWIP is greater than one, the value of WIP-to-SWIP is equal to one, or the value of WIP-to-SWIP is less than one.
7. Pa-Ted Spring Company makes springs, multi-slide forms, wire forms and small assemblies. Their NuCoil 400 machine produces springs from a spool of metal wire in a single step process. Pa-Ted operates its machines on eight-hour shifts, five days per week. Preventive maintenance is performed outside the shift. In the most recent week, the NuCoil 400 was set-up to produce six different springs. Together, the set-ups took eight hours. The NuCoil 400 was down twice during the week, once for 15 minutes to clear a coil jam, and once for 45 minutes to repair a wire break. The NuCoil 400 is rated to produce 750 springs per hour. It produced 720 springs per hour during the twenty hours it was up and running during the week. Two percent of the springs produced during the week were defective and had to be scrapped. The machine was idle for 11 hours during the week due to lack of customer demand. Compute the following for the NuCoil 400 for the most recent week:
  - A) Availability.
  - B) Performance Efficiency.
  - C) Quality.
  - D) OEE (Operating equipment effectiveness).
8. What is the purpose of posting each of the following support measurements in a production cell?
  - A) Cross-training chart.
  - B) Five-S audit scores.
  - C) Safety records (accidents, time lost).
  - D) Set-up or changeover times.
  - E) Absenteeism.
9. How do lean cell measures support lean production and motivate continuous improvement? What do they get "right" that traditional accounting measures do not?

10. How are lean cell measures used differently than traditional accounting measures? Is the problem with traditional accounting measures in a lean environment more a problem with how the measures are used than the measures themselves? Could we use traditional accounting measures in a lean way rather than changing measures?
11. Do the cell performance measures have anything to do with accounting, or are they a concern only for operations? How do the cell performance measures relate to accounting and financial reporting?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 4: Financial Benefits of Lean Manufacturing

1. All of the following are financial results typical for early stages of a lean transformation at a manufacturing company except ...
  - A) Revenue stays roughly the same, or increases slightly due to a reduced backlog.
  - B) Costs stay roughly the same, or decrease slightly due to reduced overtime and scrap costs.
  - C) Operating profits are lower due to the effect of lower inventories.
  - D) Operating profits are lower due to much higher material costs.
2. The lean box score has three categories. Which of the following is **not** a category presented in the lean box score?
  - A) Financial measures.
  - B) Lean measures.
  - C) Operational measures.
  - D) Resource capacity measures.
3. All of the following are operational measures recommended for inclusion in a lean box score except ...
  - A) Dock-to-dock days.
  - B) First time through.
  - C) Operating equipment effectiveness.
  - D) Sales per Person.
4. Tru-Shot makes digital cameras. They are using the circuit board contained in each camera as the control part to measure dock-to-dock days. On September 30, they have 4,200 circuit boards in materials inventory, 2,500 cameras waiting for processing or in process at various workstations and 500 cameras waiting for final inspection. All good cameras are shipped to customers (retail stores) immediately after final inspection. Tru-Shot shipped an average of 400 cameras per working day during September. Tru-Shot's dock-to-dock days for September would be ...
  - A) 19 days.
  - B) 18 days.
  - C) 7.5 days.
  - D) 6.25 days.
5. On-time shipment is ...
  - A) The proportion of materials delivered to the production cells according to MRP schedule.
  - B) The proportion of customer orders (or order line items, or units of product) shipped (or delivered to the customer) on time as requested by the customers.
  - C) The total orders that need to ship by the end of a month to meet budgeted sales targets.
  - D) The percentage of actual shipments compared to shipments that could have been made in a one-piece-flow process.

6. Old Burnside Ice Company supplements its ice business by producing beer. The brewery value stream occupies 30% of the space in a 10,000 square foot production area, and kegs and bottles of beer awaiting shipment occupy 50% of a 12,000 square foot refrigerated storage area. Grain and other materials occupy a separate 400 square foot storeroom. A buyer and a marketing/sales person share a 150 square foot office area. The floor space occupied by the Brewing value stream is ...
- A) 3,000 square feet.
  - B) 9,000 square feet.
  - C) 9,400 square feet.
  - D) 9,550 square feet.
7. Old Burnside Ice Company supplements its ice business by producing beer. There are four people directly involved in beer production: two brew-masters, an assistant and a bottler. In addition, a buyer and a marketer/seller work full time on beer, and four delivery people work 75% of the time delivering beer and the balance of the time delivering ice. If Old Burnside's beer sales were \$120,000 for October, the sales per person for October in the Brewery value stream are ...
- A) \$30,000.
  - B) \$20,000.
  - C) \$13,333.
  - D) \$12,000.
8. What costs should be included when computing average cost per unit for a value stream?
- A) Direct materials and direct labor only.
  - B) Direct materials, direct labor and indirect manufacturing costs within the value stream.
  - C) Direct materials, direct labor, and an allocation of plant wide manufacturing costs.
  - D) Direct materials, direct labor, and all manufacturing, selling and administrative costs directly associated with the value stream.
9. Which of the following is **not** a recommended item in the **financial** section of the box score?
- A) Sales.
  - B) Sales per person.
  - C) Conversion costs.
  - D) Value stream profits.
10. If the value stream box score is being used for planning, the \_\_\_\_\_ column represents the results if planned improvement initiatives provide the expected benefits.
- A) current state
  - B) future state
  - C) change from current state
  - D) long-term future state



11. For purposes of capacity analysis, productive capacity is defined as ...
  - A) all theoretically available time not spent on changeovers, rework, inspections, planning, administration and other activities that are non-productive from the customers' perspective.
  - B) time scheduled for work by company policy that is not spent on changeovers, rework, inspections, planning, administration and other activities that are non-productive from the customers' perspective.
  - C) time spent creating product or services at the pull of the customer.
  - D) time available for additional production after accounting for all current productive and non-productive capacity.
  
12. Brand X Packaging has a folding machine that can produce 1,000 boxes per hour. Although the machine could be run 24 hours per day, Brand X currently runs a single eight-hour shift. During an average eight-hour shift, On average, the folding machine spends two hours in changeovers from one type of box to another, twenty minutes in scheduled maintenance, and forty minutes in unscheduled down-time to correct jams and other problems. Customers demand an average of 4,000 boxes per day. The percentage of unused available capacity for Brand X's folding machine is ...
  - A) 12.5%
  - B) 25.0%
  - C) 50.0%
  - D) 70.8%

#### Discussion questions and problems

1. List some financial results that typically occur in early stages of the lean transformation of a manufacturing company.
2. A lean transformation can often lead to dramatic changes in operating performance in a very short period of time while financial performance changes very little. Explain how these seemingly contradictory results can occur together.
3. What is the main purpose of the lean box score?
4. What operational measures are recommended for inclusion in the lean box score? Describe what the purpose of each measure in evaluating value stream performance.
5. Should on-time shipment be based on the date the customer requested or the date the customer was promised? Should the measure be based on number of orders, line items, units, or dollar values of products?
6. NewEnergy produces a number of products, including windmill rotor blades. The Rotor Blade value stream uses 12,000 square feet of a 30,000 square foot factory floor. Another value stream uses another 12,000 square feet of the factory floor, and the remaining space is currently vacant. Materials for the Rotor Blade value stream occupy 4,000 square feet and finished rotor blades occupy 1,000 square feet in a 20,000 square foot warehouse adjacent to the production facility. The warehouse is 25% vacant. There is a 10,000 square foot office on the floor above the factory. Eight hundred square feet of office space are occupied by sales, engineering, and purchasing personnel assigned to the Rotor Blade value stream, 5,000 thousand square feet are occupied by corporate officers and shared

meeting space, and the balance is occupied by personnel assigned to other value streams. Compute the floor space measure for the Rotor Blade value stream.

7. What are the five items of data recommended for inclusion in the financial section of the value stream box score? What is the purpose of each item?
8. What is the purpose of having a column for the long-term future state on the value stream box score? Is it possible to develop a long-term future state without knowing the specific improvement initiatives that will be required to achieve it?
9. Why could reducing excess resource capacity spell the end of lean? What choice other than reducing excess capacity does a company have?
10. Faria Corporation produces tachometers. The final assembly step is a manual process requiring 90 seconds per tachometer. Faria has two assemblers working a single eight-hour shift with two paid 15-minute breaks. An unpaid half-hour lunch break divides the shift into two four-hour sections. The workers spend 12 minutes per day in production meetings, 15 minutes per day cleaning their work areas, and five minutes per day completing reports. Four out of every 100 tachometers they produce require an additional 90 seconds of re-work time. Final Assembly produced 1,150 tachometers during the most recent week. Compute the percentage of productive, non-productive, and available time in Faria's current final assembly operation.
11. Caspian Corporation – Motors Value Stream: Current State.

Caspian Corporation's Motors Value Stream produces specialized electric motors for original equipment manufacturers. The Motors Value Stream production process is shown in the current state value stream map.

Customer service receives an average of 288 orders per month from customers. Each order is typically for 5-10 motors. Overall demand for motors averages 2,176 per month at an average price of \$396 per motor. Customer service sends the sales orders, along with drawings for the appropriate motor ordered to the Machining Department. A rush order is sent from Machining to Parts Fabrication if needed parts aren't available in inventory.

Caspian runs eight-hour shifts interrupted by a half-hour unpaid lunch break (e.g., 7:30 AM – 4:00 PM with an unpaid lunch break from 11:30 AM – Noon). They have two shifts in all production departments except shipping. Workers also have two 15-minute breaks per shift. Caspian's machinery is semi-automatic and can run during employee breaks, but machines are not run during the lunch break, meetings at the beginning of the shift, or 5S and clean-up times at the end of each shift. A month has twenty working days (four 5-day weeks).

**Parts Fabrication:** Two production cells with four machines each. Two workers staff each cell each shift. Another three workers are floaters, providing assistance when and where needed. Parts are fabricated for three value streams. Thirty-five percent of Parts Fabrication capacity is devoted to the Motors Value Stream. They produce to a schedule generated from the MRP system based on sales forecasts adjusted for rush orders received from value streams that are short of parts. Each part may require work on more than one machine. The total machine cycle time for fabricating each part averages 180 seconds. The labor cycle time required for fabricating each part averages 120 seconds. Parts are produced in batches of 30. Changeover

time from a batch of one part to another requires 2,400 seconds of labor and machine time. 8,880 good parts per month are needed for the Motors Value Stream.

Each part is inspected upon completion. Inspections take 10 seconds per part. Defective parts equal to 2 percent of good production are found and scrapped. One percent of total worker time and one percent of total machine time is downtime. The final 15 minutes of each shift are spent in 5S and cleanup. The workers staffing the cells (not the floaters) perform the 5S and cleanup, and no machines are running during this time. There is a 30-minute production meeting for each shift each week attended by all employees.

**Machining:** Three machines in one production cell staffed with three workers per shift. The primary engine parts are machined to the customer specifications. Their production schedule is determined by sales orders received from customer service and by parts availability. Each part may require work on more than one machine. The total machine and labor cycle times for machining are both 150 seconds. Parts are machined in batches of 10. Changeover time from a batch of one part to another requires 1,800 seconds of labor and machine time. 8,704 good parts are needed each month.

Each part is inspected upon completion. Inspections take 10 seconds per part. Defective parts equal to 4 percent of good production are discovered, 2 percent can be reworked and become part of good production and the other 2 percent must be scrapped. Five percent of total worker time and five percent of total machine time is downtime. The final 15 minutes of each shift are spent in 5S and cleanup. The workers staffing the cells perform the 5S and cleanup, and no machines are running during this time. There is a 30-minute production meeting for each shift each week attended by all employees.

**Anodizing:** Seventy percent of the parts are sent to an outside vendor for anodizing. The anodizing process has a one-day lead-time. Reliability is 100%.

**Assembly:** Manual process with two production cells. The production cells are each staffed by one worker each shift, with one floater each shift providing assistance as needed. The motors are assembled using parts from machining and components provided by outside vendors. The assembly cycle time is 600 seconds per motor. The average batch size for motor assembly is two. Changeover time from assembling a batch of one model motor to another requires 300 seconds of labor time. Each month 2,176 good motors are needed for customers.

Each motor is inspected upon completion. Inspections take 360 seconds per motor. Nine percent of the motors require rework before they can pass inspection. Five percent of total worker time is downtime. The final 15 minutes of each shift are spent in 5S and cleanup. The workers staffing the cells (not the floaters) perform the 5S and cleanup. There is a 30-minute production meeting for each shift each week attended by all employees.

**Shipping:** Two people on one shift. Orders are packed along with the shipping documents. Shipping provides service to three value streams, with 33 percent of shipping's capacity devoted to the Motors Value Stream. Shipments are made weekly. It takes an average of 90 seconds per motor to pack an order for shipment. Nine percent of orders prepared for shipping have errors that require rework in Shipping. Eight percent of customer orders are shipped late. Shipping workers spend the final 15 minutes of each day in 5S and cleanup. There is a 30-minute weekly meeting attended by all employees.

The following table shows the monthly costs in the value stream.

Value stream costs	People	Material cost	Outside Process	Labor cost	Machine Costs	Other Costs
Parts Fabrication*	3.85	96,068		11,504	4,548	2,968
Machining**	6.00			20,888	8,964	5,404
Anodizing			37,512			
Assembly	6.00	171,448		17,928		1,528
Shipping*	.66			1,972		660
Material handling	2.00			5,976		160
Maintenance	2.00			5,976		200
Prod. Engineering	2.00			6,528		160
Quality assurance	3.00			9,792		240
Accounting	1.00			3,264		40
Manager & Supervisors	4.00			16,240		320
Sales & Marketing	10.00			40,600		4,048
Customer service	3.00			9,792		120
Purchasing	1.00			3,264		40
Occupancy (15,000 sq. ft.)						86,400
Total	44.51	267,516	37,512	153,724	13,512	102,288

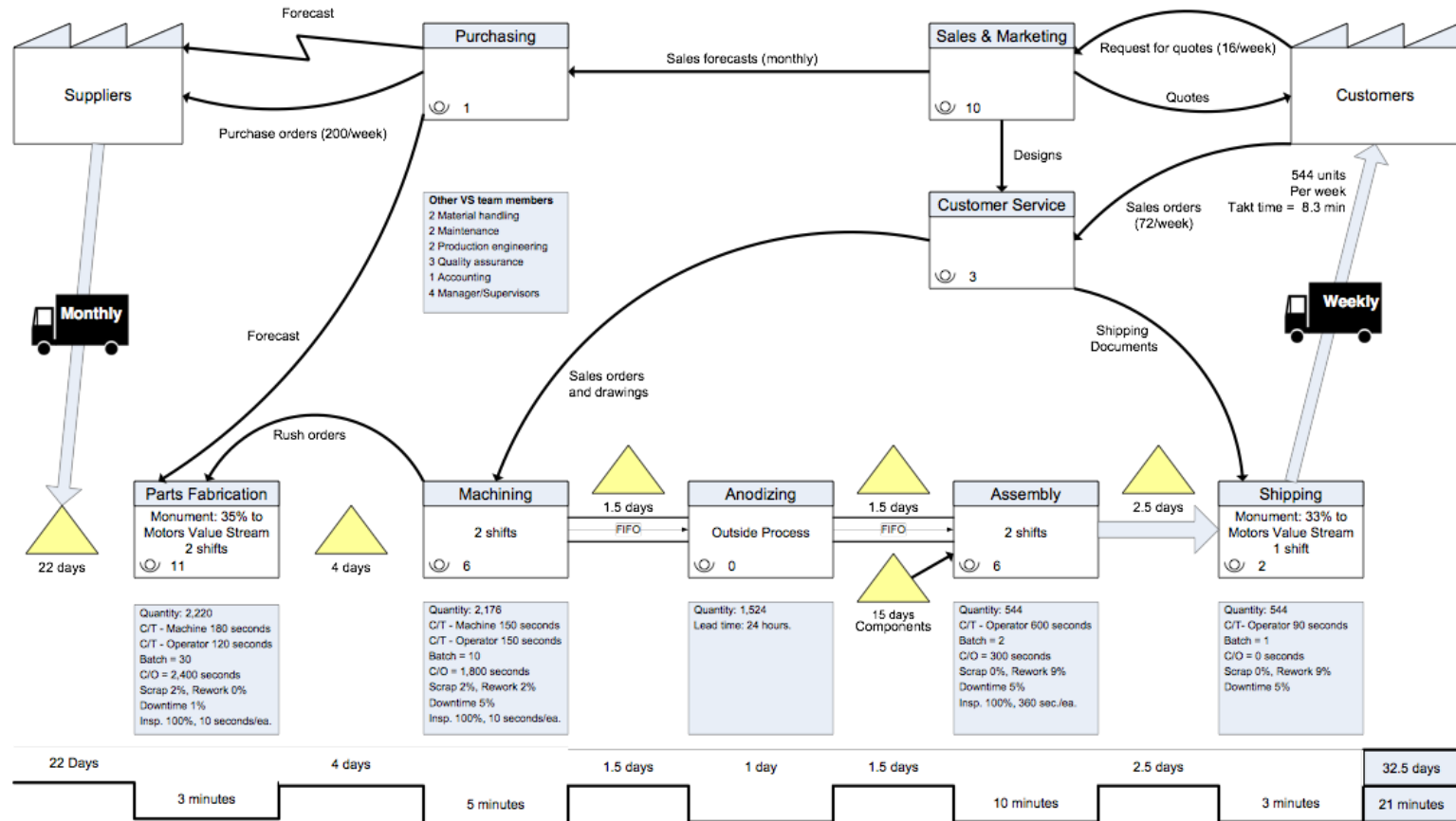
\*Only the Motors Value Stream's portion of people and costs are included in this table.

\*\*Labor cost includes overtime pay. Workers earn \$2,988 per month in regular time. Overtime pay at \$30 per hour should not be needed if unused labor capacity is available.

Required:

- A) Using the above information and the information on the current state value stream map, create a current state value stream box score for Caspian's Motors Value Stream. Explain your calculations in a column to the right of your box score.
  - a. Include Dock-to-dock days, First time through, On-time shipment, Floor space, Sales per person, Average cost per unit, and Accounts receivable days as your operational measures. Use working days (20) rather than calendar days to calculate accounts receivable days.
    - i. Assume the book value of accounts receivable is \$1,551,132.
  - b. Include Inventory value, Revenue, Material costs, Conversion Costs, Value stream profit, Return on sales percentage, and Cash flow (Value stream profit plus non-cash expenses) as your financial measures.
    - i. Assume the book value of inventory is \$534,500.
    - ii. Assume all machine costs and 80% of occupancy costs represent depreciation.
- B) Report productive, non-productive, and unused available capacity for Employees and for Machines based on a capacity analysis of Parts Fabrication, Machining, Assembly, and Shipping. You can ignore Sales, Customer Service, Purchasing, and supporting activities (maintenance, etc.). You may want to review Chapter 21 before responding to this requirement.

Caspian Corporation – Motors Value Stream  
Current State



## 12. Caspian Corporation – Motors Value Stream: Future State.

Caspian Corporation's Motors Value Stream has implemented some improvements. The improved Motors Value Stream production process is shown in the future state value stream map. The impacts of the changes are summarized below.

The number of orders received by Customer service and the overall demand for motors are unchanged at 288 orders per month for a total of 2,176 motors at an average price of \$396 per motor.

**Parts Fabrication:** A *kanban* system signals purchasing when additional materials are needed. The *kanban* system combined with more frequent shipments from suppliers reduces materials inventory from 22 days to 12. Parts Fabrication now produces to refill a parts supermarket for Machining. Changeover time is reduced from 2,400 seconds (all external) to 300 seconds of internal time plus 300 seconds of external time (work that can be performed by employees while the machine is still running on the prior part). The changeover time reduction allows Parts Fabrication to cut batch sizes from 30 to 10. Rush orders from machining are eliminated, even though the parts supermarket has only 2 days worth of parts compared to the 4 days worth that were formerly in work in process ahead of Machining. Quality improvements cut the scrap rate in half, to an amount equal to one percent of good production. 8,792 good parts are needed for the Motors Value Stream each month.

**Machining:** A *heijunka* system smoothes the production sequencing of customer orders received from customer service. Changeover time is reduced from 1,800 seconds (all external) to 480 seconds of internal time plus 420 seconds of external time (work that can be performed by employees while the machine is still running on the prior part). Parts are still machined in batches of 10. Downtime for machines and workers is reduced from 5 percent of total time to 2 percent of total time, and the scrap rate is cut in half (from 2 percent to one percent of good production) due to improvements in preventive maintenance processes. 8,704 good parts are still needed each month.

**Anodizing:** No changes.

**Assembly:** Changeover time is now 150 seconds, half of what it was in the current state. Process improvements reduce rework from 9 percent to 5 percent, and downtime is reduced from 5 percent of total time to 3 percent of total time.

**Shipping:** No changes in operations. Shorter lead times have improved on-time performance. Only 5 percent of motor shipments are late.

The following table shows the future state monthly costs in the value stream.

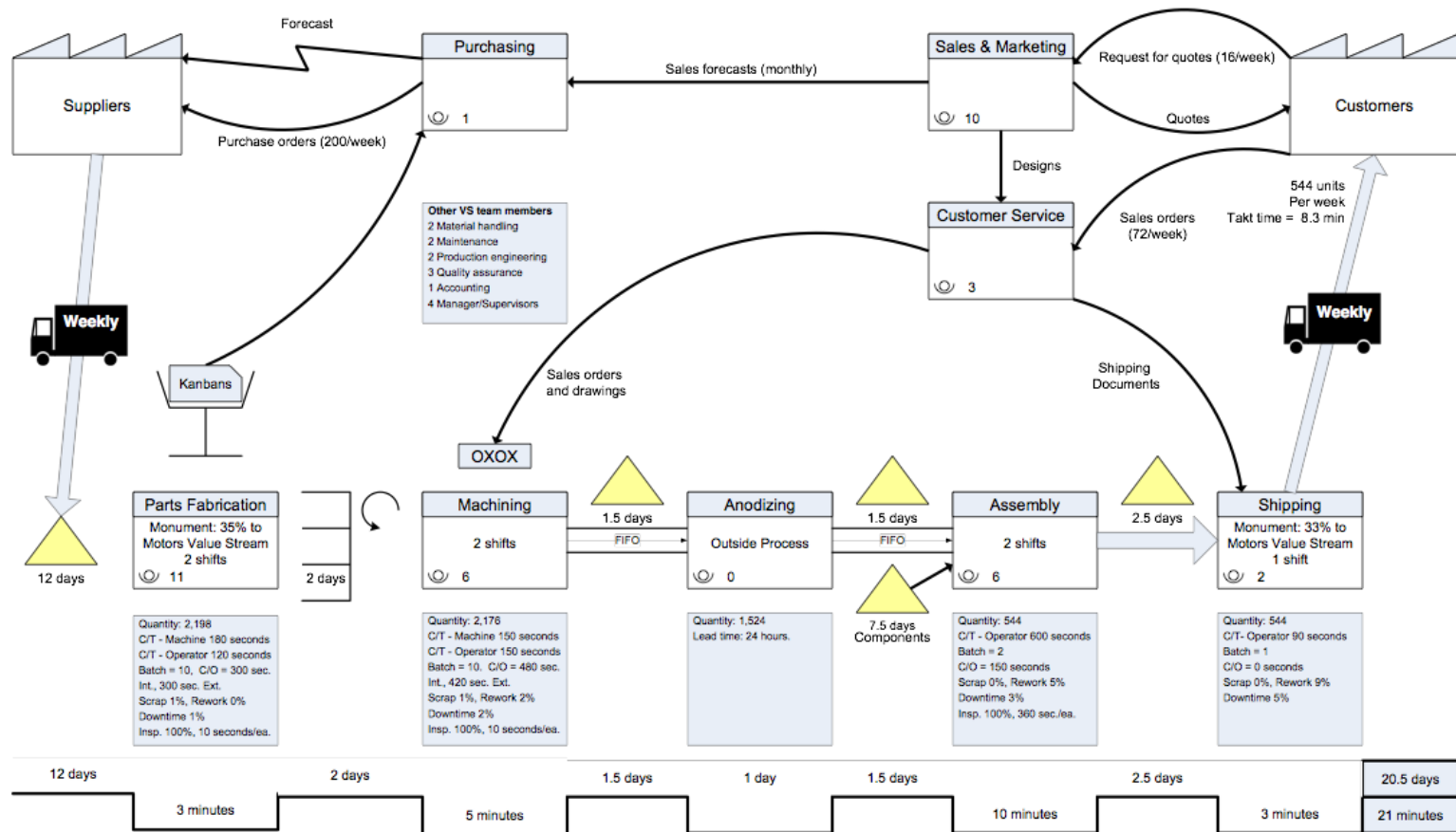
Value stream costs	People	Material cost	Outside Process	Labor cost	Machine Costs	Other Costs
Parts Fabrication*	3.85	94,184		11,504	4,548	2,968
Machining	6.00			17,928	8,964	5,404
Anodizing			37,512			
Assembly	6.00	171,448		17,928		1,528
Shipping*	.66			1,972		660
Material handling	2.00			5,976		160
Maintenance	2.00			5,976		400
Prod. Engineering	2.00			6,528		160
Quality assurance	3.00			9,792		240
Accounting	1.00			3,264		40
Manager & Supervisors	4.00			16,240		320
Sales & Marketing	10.00			40,600		4,048
Customer service	3.00			9,792		120
Purchasing	1.00			3,264		40
Occupancy (13,500 sq. ft.)						77,760
Total	44.51	265,632	37,512	150,764	13,512	93,648

\*Only the Motors Value Stream's portion of people and costs are included in this table.

Required:

- A) Using the above information and the information on the future state value stream map, add a future state column to the value stream box score you created in problem 11 for Caspian's Motors Value Stream. Explain your calculations in a column to the right of your box score.
  - a. Include Dock-to-dock days, First time through, On-time shipment, Floor space, Sales per person, Average cost per unit, and Accounts receivable days as your operational measures. Use working days (20) rather than calendar days to calculate accounts receivable days.
    - i. Assume the book value of accounts receivable is \$1,427,184.
  - b. Include Inventory value, Revenue, Material costs, Conversion Costs, Value stream profit, Return on sales percentage, and Cash flow (Value stream profit plus non-cash expenses) as your financial measures.
    - i. Assume the book value of inventory is \$353,518.
    - ii. Assume all machine costs and 80% of occupancy costs represent depreciation.
- B) Report productive, non-productive, and unused available capacity for Employees and for Machines based on a capacity analysis of Parts Fabrication, Machining, Assembly, and Shipping. You can ignore Sales, Customer Service, Purchasing, and supporting activities (maintenance, etc.). You may want to review Chapter 21 before responding to this requirement.
- C) What is (are) the most significant change(s) in performance from the current state to the future state? Explain your choice(s).
- D) Do you believe the change in financial performance corresponded to the change in operating performance? Explain your answer.
- E) What would you suggest as the next steps the Motors Value Stream should take to further improve operational and financial results? Briefly explain your choices.

Caspian Corporation – Motors Value Stream  
Future State





## **PRACTICAL LEAN ACCOUNTING**

### Chapter 5: Eliminating Wasteful Transactions

1. Companies converting to lean production while maintaining conventional accounting methods may find ...
  - A) they have fewer transactions to record because they have increased batch sizes to reduce waste.
  - B) they have more transactions to record because they receive materials more frequently, produce in smaller batches, and make more frequent shipments to customers.
  - C) the lean transformation has no effect on the number of transactions recorded.
  - D) unfavorable efficiency variances are smaller than they are under conventional mass production.
2. One purpose for tracking each inventory move with transactions is to be able to locate jobs or orders within the production process and expedite late or urgent orders. Which of the following is a characteristic of lean production that eliminates the need for this detailed tracking?
  - A) Reduced cycle times.
  - B) Radio frequency ID tags.
  - C) MRP systems fully implemented.
  - D) Safety stock of finished goods inventory.
3. Which of the following is **not** a characteristic of the “lean pilots in place” stage of lean implementation?
  - A) Cycle times are lower than pre-lean levels.
  - B) Inventory turns are higher than pre-lean levels.
  - C) MRP systems have been implemented, to control production and inventory, at least in the pilot cells.
  - D) Lean operational performance measures (such as day-by-the-hour, first time through, etc.) are use to control day-to-day operations and stimulate continuous improvement in cells.
4. All of the following are identified as transaction heavy operational processes to target for transaction elimination at the “lean pilots in place stage except ...
  - A) tracking all actual material usage to jobs using work orders
  - B) tracking all production labor in detail to jobs using work orders
  - C) tracking all inventory movement from receipt to sale or disposal by recording a transaction for each move.
  - D) tracking all indirect labor to production cells using value stream maps.
5. What must be in place to eliminate detailed labor tracking?
  - A) All production is converted to cellular production.
  - B) Accurate labor routings ensuring reasonably accurate labor hours in standard costs.
  - C) Accurate labor routings, cell performance measures in place, and day-by-the-hour reporting in all work areas.
  - D) All reported labor variances are less than plus or minus 2% of standard labor cost for thirteen consecutive weeks.

6. Labor variance reports ...
  - A) are required until a company stops using standard costing.
  - B) discourage the production of excess inventory.
  - C) should be introduced as soon as lean pilots are in place.
  - D) should be eliminated as soon as possible in the transformation to lean production.
7. Backflushing to the cost of materials using the standard material cost for actual production can replace recording the actual amount and cost of material used at each production step as soon as ...
  - A) All reported direct material variances are less than plus or minus 2% of standard material costs for thirteen consecutive weeks.
  - B) Bills of materials and material routings are accurate.
  - C) Bills of materials and material routings are accurate, **and** there are accurate records for scrap and rework.
  - D) Production cycle times are less than five working days for all products.
8. What must be in place to replace annual physical inventory counts with cycle counting?
  - A) Accurate labor routings and bills of materials.
  - B) Accurate labor routings and bills of materials, **and** accurate records for scrap and rework.
  - C) Inventory is controlled by kanban systems.
  - D) Annual inventory turns must be greater than twelve.

#### Discussion questions and problems

1. Why are work-order scheduling and detailed material and labor tracking performed in traditional batch manufacturing companies? How will managers know when they can stop using the detailed scheduling and tracking?
2. Explain how a lean transformation can lead to an increase in transactions.
3. What key manufacturing characteristics are associated with the “lean pilots in place” stage of maturity?
4. What key information characteristics are associated with the “lean pilots in place” stage of maturity?
5. How can work order scheduling and labor tracking be streamlined in the lean pilot stage?
6. What is backflushing? How does backflushing reduce waste?
7. Some companies use cycle counting to count each inventory item over the course of a year. In lean accounting cycle counts are done repeatedly on a sample of items, and not all inventory items are counted. Compare these approaches to achieving overall inventory accuracy.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 6: Lean Financial Accounting

1. Which of the following is **not** a reason for eliminating financial transactions in a company undertaking a lean transformation?
  - A) Lean companies have a greater appetite for risk.
  - B) Lean thinking and lean tools apply to accounting processes as well as production processes tools.
  - C) Tracking and recording transactions is wasteful.
  - D) Lean companies want to replace financial control through transactions with visual control of operations.
2. Financial accounting processes that are good candidates for waste elimination early in a lean transformation include ...
  - A) the purchasing – accounts payable – payment process.
  - B) the sales – accounts receivable – collection process.
  - C) the month end closing process.
  - D) all of the above.
3. One way to eliminate waste in the purchasing – accounts payable – payment process is to ...
  - A) Manually match purchase orders, receiving reports, and invoices (three-way match).
  - B) Increase the number of suppliers per key material or component to encourage competition.
  - C) Use blanket purchase orders with key suppliers.
  - D) Pay each invoice on receipt rather than paying on monthly statements.
4. One way to eliminate waste in the sales – accounts receivable – collection process is to ...
  - A) discourage the use of blanket purchase orders by key customers.
  - B) mail invoices separately rather than including invoices with shipping documents.
  - C) deliver to customers in large shipments rather than offering daily deliveries based on kanban orders.
  - D) encourage automated wire transfer payments for deliveries or actual customer usage based on the kanban system.
5. Reducing the number of cost centers and simplifying the chart of accounts ...
  - A) reduces the accuracy of monthly financial statements.
  - B) helps eliminate waste from the monthly closing process.
  - C) Lengthens the time required for the monthly closing process.
  - D) Is an obstacle to making the transition to value stream costing.
6. \_\_\_\_\_ is a technique to help people understand flow and waste in accounting processes.
  - A) Value stream mapping
  - B) Process mapping
  - C) Value stream box score reporting.
  - D) Departmental variance analysis reporting.

7. All of the following are recommended steps for mapping accounting processes except ...
  - A) identify the highest cost variance in the accounting department.
  - B) assign an improvement team.
  - C) start with the customer.
  - D) identify tasks within the process.
8. All of the following were steps taken to support kaizen in the accounts payable process by the company presented in the chapter except ...
  - A) establish a performance improvement team.
  - B) start with the customer.
  - C) develop performance measurements.
  - D) develop future state process maps.

#### Discussion questions and problems

1. From a lean perspective, are accounting processes completely waste? If so, why not simply eliminate them? Why is so much time and effort spent on accounting processes?
2. Can lean tools be applied to accounting processes?
3. How is it possible for operational control to lead to financial control?
4. Provide one example of an operational control that reduces or eliminates the transaction records needed for financial control of purchases and accounts payable.
5. Briefly describe the progression from a manual three-way match of documents for all payments to an automated system paying on the backflush from the bill of materials.
6. How can the use of purchasing cards eliminate waste in accounts payable?
7. Why do companies need to close their books on a monthly basis? How can lean accounting satisfy the needs that gave rise to monthly closings while simplifying the closing or completely eliminating the need for the monthly closing?
8. Do accounting processes have customers? Can you identify customers for the following processes: accounts receivable, accounts payable, monthly reporting?
9. Identify lean two tools that can be applied to improving accounting processes, and briefly explain how the tools work together.
10. Why did the example company in this chapter create a box score for the accounts payable process? How did the box score contribute to the improvement process?

## 11. The accounts payable process at Brand X Corporation – Current State.

Brand X Corporation's accounting department works Monday-Friday in a single eight-hour shift, 9:00 AM – 5:00 PM with a half hour paid lunch break and two fifteen minute paid breaks per day, so they are available for work 7.0 hours each day. The accounting clerks and mail clerks spend thirty minutes per week in meetings and one hour per week on administrative tasks, supplying information for other internal reports. In a typical month with twenty working days, they process 4,000 invoices (200 per business day). The accounting department personnel mapped their existing process. Their current state process map is shown on page 31.

**Record Invoices** – Accounting receives 4,000 invoices per month (200 per business day) from various suppliers. It takes an average of two minutes to open each invoice and enter information from the invoice into the accounting system. One staff member was assigned to this process.

**Match Invoice, Purchase Order, and Receipt** – Once the invoice is entered the information is compared to information already in the system from the purchase order and the receiving report. The comparison takes an average of three minutes. Eighty eight percent of the time, the invoice information matched the purchase order and receiving report, and the invoice is forwarded for payment approval. Twelve percent of the time a discrepancy is found, and the invoice is set aside until the discrepancy can be resolved. Three staff members were assigned to this process. There were 200 recorded invoices waiting to be matched.

**Resolve Mismatched Invoices** – It takes an average of twenty minutes to resolve each mismatched invoice. Once the discrepancy is resolved, the entry in the accounting system is adjusted accordingly and the invoice is forwarded to the manager who originally made the requisition for payment approval. The same three staff members who match invoices perform the resolution of mismatched invoices. There were 160 mismatched invoices awaiting resolution.

**Approve Payment** – The managers who originally submitted the requisition review the matched invoices and approve them for payment. This takes two minutes per invoice. The managers do this daily. There were 200 invoices waiting for approval.

**Print and Sign Checks** – Checks are printed once per week. It takes one minute for a secretary to setup the printing run and 5 seconds of machine time per invoice to print the check and supporting document. On average there were 500 approved invoices waiting for checks to be printed. Immediately following the print run, the Treasurer reviews the printed checks and runs them through a check signature machine. The review and signing process takes 9 seconds per check of labor time and one second to run through the check signing machine.

**Mail** – Immediately following the signature run, the signed checks are stuffed in envelopes, sealed, and run through a postage meter. The process takes twelve seconds per check. A shared mail clerk (20 percent allocated to accounts payable) performs this process.

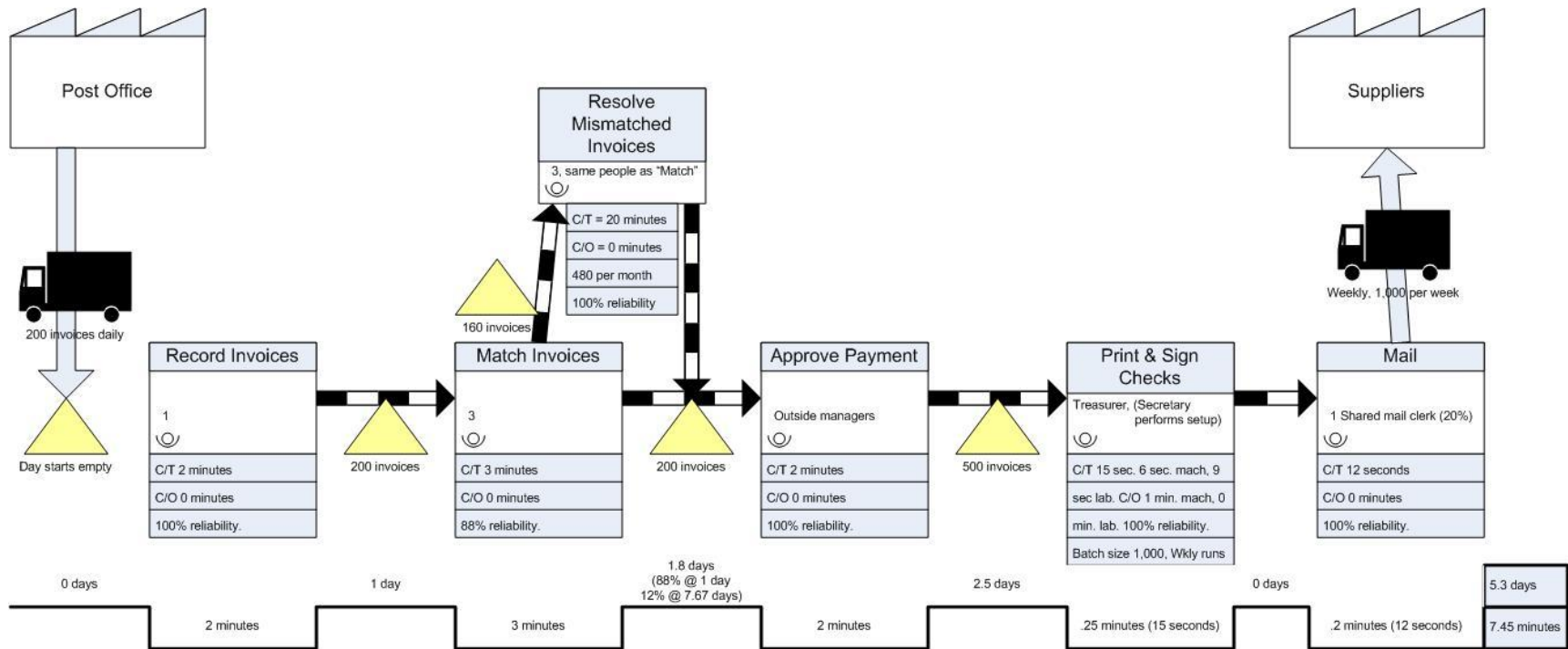
**Costs** – The accounting clerks and the mail clerk earned \$3,600 per month in salary and benefits. The accounting department personnel decided not to calculate a cost of the time spent by managers and the Treasurer on the accounts payable process. Instead they decided to include "Outside Managers' Time" as an operational measure. Due to delays in processing mismatched invoices, Brand X Corporation was losing \$2,000 per month in discounts, adding to their purchase costs. It cost \$.60 in postage, printing and stationery per invoice paid. Other

costs (telephone, computers and equipment, office space and furniture, heat light and power) for the accounts payable process were estimated at \$1,000 per month.

**Required:**

- A. Create a current state for the accounts payable process at Brand X Corporation. Include the following:
- a. Operational Metrics
    - i. **Throughput** – (essentially dock-to-dock time) measured in business days
    - ii. **First time through** – assume all tasks except matching are error free.
    - iii. **Outside Managers' Time** – the time spent by outside managers the treasurer, and the treasurer's secretary.
    - iv. **Productivity** – Invoices per person (the accounting clerks and the fractional time the mail clerk devotes to the accounts payable process).
  - b. Labor Capacity utilization (Ignore the Approve Payment and Print & Sign Checks processes performed by the treasurer, the treasurer's secretary, and managers outside accounting). You may wish to wait until chapter 21 is covered to complete this requirement.
    - i. **"Productive"** – Percentage of time spent on invoice processing tasks other than mismatches, even though invoice processing itself is non-value added from a customer perspective. Exclude paid breaks from your calculation of total available hours.
    - ii. **Non-productive** – Percentage of time spent on mismatches and tasks other than invoice processing.
    - iii. **Available capacity**
  - c. Financial Metrics
    - i. **Employee compensation** – Including the Supervisor's salary and benefits.
    - ii. **Discounts not taken**
    - iii. **Other costs**
    - iv. **Total cost** – The sum of the above three costs.
    - v. **Cost per invoice**
- B. Brainstorm. Suggest ways that Brand X Corporation could improve their accounts payable process.

## Brand X Corporation Accounts Payable Process – Current State



## 12. The accounts payable process at Brand X Corporation – Future State.

Brand X Corporation's accounting department worked to improve the accounts payable process presented above in the current state. They found that forty percent of the invoices being processed could be replaced by issuing purchasing cards to ten managers for small purchases of materials and supplies. Ten monthly p-card statements eliminated the need for recording, matching and approving 40 percent of the invoices. Another 40 percent of the invoices were for routine purchases from suppliers that were automatically approved by the requisitioning manager once the matching had taken place. A sorting process was added to separate the invoices into routine and non-routine purchases. The routine invoices bypass the approval process and an authorized signature was automatically printed on the check for matched routine purchases. Recording and matching were combined into a single process. Time per week spent on administration and meetings by the accounting clerks and mail clerk was unchanged from the current state. The future state process map is shown on page 34.

**Sort Invoices** – Each day the mail clerk sorts the incoming invoices. A combined total of 20 percent of the mail clerk's time is allocated to accounts payable for the Sort Invoice and Mail operations. Because of the use of P-Cards, only 120 invoices arrive daily. The sorting process takes 12 seconds per invoice. Two-thirds of the sorted invoices are for routine purchases.

**Record and Match Invoices** – The sorted invoices are recorded and matched with purchase order and receipt data. It takes an average of five minutes to record and match each invoice to information already in the system from the purchase order and the receiving report. For the 2/3 of invoices from routine purchases the invoice information matches the purchase order and receiving report ninety percent of the time and a signal is sent to print a check and supporting document. For the 1/3 of invoices representing non-routine purchases invoice information matches the purchase order and receiving report eighty percent of the time, and the matched invoice is forwarded for payment approval. The mismatched invoices are set aside until the discrepancy can be resolved. The four accounting clerks from the Record, and Match processes in the current state perform the combined process in the future state. There were 120 sorted invoices waiting to be recorded and matched.

**Resolve Mismatched Invoices** – It takes an average of fifteen minutes to resolve discrepancies on invoices for routine purchases, and thirty minutes to resolve discrepancies on invoices for non-routine purchases. Once the discrepancies are resolved, the entry in the accounting system is adjusted accordingly and a signal is sent to print checks complete with an authorized signature for invoices for routine purchases. Resolved invoices for non-routine purchases are forwarded to the manager who originally made the requisition for approval for payment. The same four staff members who record and match invoices perform the resolution of mismatched invoices. There were 120 mismatched invoices awaiting resolution.

**Approve Payment** – The managers who originally submitted the requisition review the matched invoices for non-routine purchases and approve them for payment. This takes two minutes per invoice. The managers do this daily. There were 40 invoices waiting for approval.

**Print and Sign Checks** – Checks are printed every day. It takes one minute to setup the printing run and 5 seconds of machine time per invoice to print the check and supporting document. On average there were 120 approved invoices waiting for checks to be printed, 80 for routine purchases that received automatic approval are printed with an authorized signature, and 40 for non-routine purchases that are printed without a signature. Immediately following the print run, the Treasurer reviews the printed checks for non-routine purchases and runs them



through a check signature machine. The review and signing process takes 9 seconds per check of labor time and one second to run through the check signing machine.

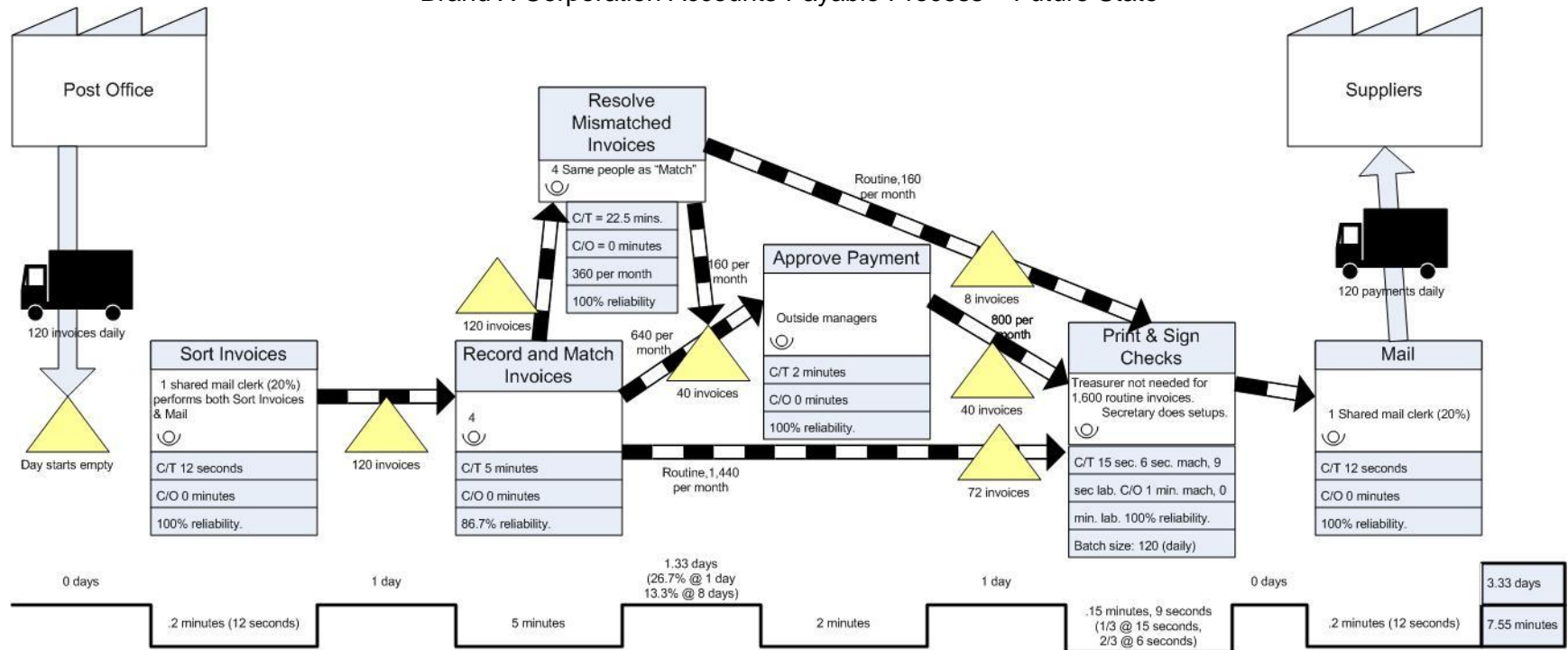
**Mail** – Immediately following the signature run, the signed checks are stuffed in envelopes, sealed, and run through a postage meter. The process takes twelve seconds per check. A shared mail clerk (20 percent allocated to accounts payable) performs this process.

**Costs** – The future state process cut the amount of lost discounts in half, to \$1,000 per month. The accounting clerks and the mail clerk earned \$3,600 per month in salary and benefits. The accounting department personnel decided not to calculate a cost of the time spent by managers and the Treasurer on the accounts payable process. Instead they decided to include “Outside Managers’ Time” as an operational measure. It cost \$.60 in postage, printing and stationery per invoice paid. Other costs (telephone, computers and equipment, office space and furniture, heat light and power) for the accounts payable process were estimated at \$1,000 per month.

**Required:**

- A. Add a column showing the future state measures to the Box Score you created in problem 11 for the accounts payable process at Brand X Corporation. (If you did not do problem 11, create a scorecard for the future state). Include the following:
  - a. Operational Metrics
    - i. **Throughput** – (essentially dock-to-dock time) measured in business days
    - ii. **First time through** – assume all tasks except matching are error free.
    - iii. **Outside Managers’ Time** – the time spent by outside managers the treasurer, and the treasurer’s secretary.
    - iv. **Productivity** – Invoices per person (the accounting clerks and the fractional time the mail clerk devotes to the accounts payable process).
  - b. Labor Capacity utilization (Ignore the Approve Payment and Print & Sign Checks processes performed by the treasurer, the treasurer’s secretary, and managers outside accounting). You may wish to wait until chapter 21 is covered to complete this requirement.
    - i. **“Productive”** – Percentage of time spent on invoice processing tasks other than mismatches, even though invoice processing itself is non-value added from a customer perspective. Exclude paid breaks from your calculation of total available hours.
    - ii. **Non-productive** – Percentage of time spent on mismatches and tasks other than invoice processing.
    - iii. **Available capacity**
  - c. Financial Metrics
    - i. **Employee compensation** – Including the Supervisor’s salary and benefits.
    - ii. **Discounts not taken**
    - iii. **Other costs**
    - iv. **Total cost** – The sum of the above three costs.
    - v. **Cost per invoice**
- B. Comment on the changes in the metrics. Do you believe the scorecard metrics accurately reflect the change in the accounts payable process at Brand X Corporation? Explain and support your reasoning.
- C. How could Brand X Corporation take better advantage of the improvements they have made in the accounting payable process?
- D. Suggest a way Brand X Corporation could improve the future state accounts payable process.

## Brand X Corporation Accounts Payable Process – Future State



## **PRACTICAL LEAN ACCOUNTING**

### Chapter 7: Managing by Value Stream

1. A value stream is ...
  - A) a supply chain made up of inter-related companies.
  - B) a vertically integrated organization.
  - C) another name for an assembly line.
  - D) a set of related activities performed to create and deliver value to a group of customers.
2. An order-fulfillment value stream ...
  - A) encompasses activities focused on getting new customers for existing products and services.
  - B) encompasses activities focused on producing and delivering existing products and services to current customers.
  - C) encompasses activities focused on designing new products and services for new customers.
  - D) encompasses activities focused on identifying more existing products and services that provide value for current customers.
3. A set of activities to design and develop new products or services is ...
  - A) a customer acquisition value stream.
  - B) an order fulfillment value stream.
  - C) a new product development value stream.
  - D) a customer development value stream.
4. A set of activities to get new customers for existing products and services is ...
  - A) a customer acquisition value stream.
  - B) an order fulfillment value stream.
  - C) a new product development value stream.
  - D) a customer development value stream.
5. Focus in the context of managing an order-fulfillment value stream means that ...
  - A) everyone in the value stream is asked to focus only on their specific task.
  - B) a team or manager is responsible for the entire value stream.
  - C) managers intervene only when value stream performance deviates from budget.
  - D) value stream profitability is ignored as long as quality and delivery meets or exceeds expectations.
6. Value stream management simplifies performance reporting because ...
  - A) reporting is organized around a small number of units (value streams) of manageable size with clear lines of responsibility.
  - B) value stream management only works in simple settings with simple products and services.
  - C) it is too costly to provide complex reports even though they would be helpful.
  - D) it does not use MRP systems, and complex reports are too difficult to generate without access to MRP systems.

7. When organizing by value stream, the problem of an individual with unique skills required by many value streams can be best addressed by ...
  - A) creating a separate value stream for that skill.
  - B) reverting to departmental organization.
  - C) cross training people.
  - D) hiring more people.
8. In value stream management a monument is ...
  - A) a statue commemorating the decision to adopt lean management.
  - B) the display board containing the value stream reports.
  - C) the most important value stream in the organization.
  - D) a machine that serves more than one value stream.
9. Which of the following is **not** a factor to consider in identifying value streams?
  - A) The current location in the plant of the equipment used to produce the products or services.
  - B) The customers served by the products or services.
  - C) The materials used in the products.
  - D) The size of the products.
10. Which of the following is **not** a recommended action to aid in identifying value streams?
  - A) "Staple" yourself to an order, and physically walk through the fulfillment process for the order.
  - B) Prepare a sales matrix and group products into value streams by sales volume.
  - C) Prepare a production flow matrix, and group products or product families with similar production flows into value streams.
  - D) Draw current state value stream maps to help understand the material and information flow of a prospective value stream.

#### Discussion questions and problems

1. Why can departmental organization be an obstacle to lean improvement?
2. Do conventionally managed companies typically focus on value streams?
3. Why do lean companies focus on value streams?
4. How do focus and accountability apply to value stream management?
5. As technological advances enable more complex products and services, can we simplify organization and reporting? Is simplification a danger or a necessity? Is simple easy?
6. Associated Alloy has a Chemical Engineer whose skills are required by each of its four value streams. How should Associated account for the engineer in its organization?
7. Main Street Metal Works has a heat treatment oven used by three of its four value streams. How should Main Street Metal Works account for the heat treatment oven in its organization?

8. The production flow matrix for Superior Metal Parts is shown below. Arrange the product families into three value streams.

		Production Steps															
		Order Entry	Schedule	Lathe	Grind	Shape	Hob	DeBurr	Heat Treat	ID Grind	OD Grind	Ctr Grind	Surface Grind	Outside Plating	Test	Pack & Ship	Invoice
Product Families	148	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
	204	x	x		x		x				x		x			x	x
	369	x	x	x	x				x			x	x	x	x	x	x
	561	x	x	x	x		x	x	x	x	x	x		x	x	x	x
	603	x	x		x			x	x			x	x	x	x	x	x
	629	x	x		x		x				x		x	x		x	x
	738	x	x	x	x			x	x			x	x		x	x	x
	872	x	x		x		x				x		x			x	x
	917	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 8: Value Stream Performance Measurements

1. The purpose of value stream measurements is to ...
  - A) motivate efforts to continuously improve the performance of the entire value stream.
  - B) assess the capabilities of the management team.
  - C) provide daily information to improve the performance of each cell in the value stream.
  - D) provide financial performance data on the value stream to roll up for divisional and corporate reporting.
2. One of the “starter set” measures recommended for value stream level performance is ...
  - A) operation equipment effectiveness.
  - B) EBITDA (earnings before interest, taxes, depreciation, and amortization).
  - C) WIP-to-SWIP.
  - D) dock-to-dock time.
3. The sales per person measure for a value stream (for a week) should be computed by ...
  - A) dividing weekly value stream sales by the number of employees assigned to the value stream that week.
  - B) dividing weekly value stream sales by the number of employees usually in the value stream excluding part time employees and temporarily assigned employees.
  - C) dividing weekly value stream sales by the full time equivalent number of employees engaged in direct labor (direct labor hours / 40, for example).
  - D) computing the anticipated sales value of weekly production and dividing by the full time equivalent number of employees engaged in direct labor (direct labor hours / 40, for example).
4. The measure that shows the percentage of products or services produced without defects or rework is ...
  - A) sales per person.
  - B) on-time delivery.
  - C) dock-to-dock time.
  - D) first time through.
5. The measure that shows the rate of material flow through the value stream is ...
  - A) sales per person.
  - B) on-time delivery.
  - C) dock-to-dock time.
  - D) first time through.
6. Terra Cotta Company’s Clay Pot value stream shipped 1,200 pots last week. At the end of the week they had sufficient clay on hand to produce 2,800 pots. They had 1,600 pots in work in process, and 2,000 finished pots awaiting shipment. The Clay Pots value stream works a five-day week. The dock-to-dock time for the Clay Pot value stream is ...
  - A) 6.7 days.
  - B) 8.3 days.
  - C) 15 days.
  - D) 26.7 days.

7. Excelsior Manufacturing's small component value stream has four cells with the following first time through rates: Cutting, 85%; Fabrication, 90%; Assembly, 90%; Finish, 95%. The first time through for the value stream (to the nearest whole percent) is ...
- A) 60%.
  - B) 65%.
  - C) 85%.
  - D) 90%.
8. The purpose of the average cost per unit is to measure ...
- A) the ability of the value stream to produce to customer demand.
  - B) process capability and the success of standard work.
  - C) overall process improvement in the value stream.
  - D) material and product flow through the value stream.
9. Average cost per unit is measured by ...
- A) dividing total value stream costs by units shipped.
  - B) dividing total value stream costs by units produced.
  - C) dividing total direct material and direct labor costs in the value stream by units shipped.
  - D) dividing total direct material and direct labor costs in the value stream by units shipped.
10. The purpose of the accounts receivables days is to measure ...
- A) the ability of the value stream to produce to customer demand.
  - B) the speed of material and product flow through the value stream.
  - C) the speed of cash flow in the value stream.
  - D) overall process improvement in the value stream.
11. Hi-Value Heater Company's Portable Heater value stream had sales of \$47,000. There were twenty working days in the month. The accounts receivable balance at the end of the month was \$63,000. Accounts receivable days (as measured in working days) for the Portable Heaters value stream is ...
- A) 14.9 days.
  - B) 22.4 days.
  - C) 26.8 days.
  - D) 40.2 days.
12. Which of the following is **not** suggested as supporting information often reported at the **value stream** level?
- A) Cross-training matrix
  - B) Five S scores
  - C) Improvement project participation
  - D) Safety cross
13. An approach many companies have used to help ensure value stream measures promote continuous improvement is to ...
- A) create a no-blame environment.
  - B) have the value streams compete for best scores on the measures.
  - C) leave the choice of improvement method up to each value stream manager.
  - D) adopt the "starter set of measures regardless of corporate goals.

## Discussion questions and problems

1. Why develop separate value stream metrics? Why not simply use corporate/organizational level measures?
2. List the six measures in the value stream starter set. Describe how each measure is computed, and list the purpose of each measure.
3. Acme Monaco's Medical Products Value Stream produces precision wire and spring apparatus and instruments for use in medical and orthodontic procedures. Eight machinists, one manager/supervisor, one production engineer, one salesperson, and two maintenance people are assigned to the value stream. All value streams at Acme Monaco share the efforts of company executives, design engineering, IT support, and accounting personnel. Acme Monaco's sales of medical products were \$186,000 in May, representing thirty percent of Acme Monaco's sales for the month. What are the sales per person for May in the Medical Products Value Stream at Acme Monaco? Should Acme Monaco allocate the cost of employees shared by all value streams to each value stream?
4. What is the difference between on-time shipment and on-time delivery? Should on-time shipment/delivery be measured based units of product, dollars of sales, line items of orders, or total orders with 100% of items shipped/delivered on time? Does it matter? Is there any potential for adverse behavior depending on how on-time shipment/delivery is measured?
5. Horst Engineering makes precision metal parts. Their Large Diameter Value Stream had enough bar stock in their raw materials inventory to produce 12,000 parts worth. They had 2,600 parts in work-in-process, and 1,000 in finished goods inventory. The Large Diameter Value Stream sells an average of 400 parts per day. Compute the dock-to-dock time for the Large Diameter Value Stream.
6. What is a representative part for a value stream? Why is using a representative part preferable to using the total value of inventory from the accounting records in calculating dock-to-dock days?
7. Johnsbury Manufacturing's Thermal-Shield Value Stream has four cells with the following first-time through rates in the month of September: Stamping 99%, Machining 95%, Assembly 90%, Finishing 88%. Compute the first time through that would be reported for the Thermal Shield Value Stream in September.
8. Gopher Lawn Equipment's Hand-held Value Stream has a balance in Accounts Receivable of \$639,437 as of November 30. They had sales of \$430,117 during November, a month with 20 working days. Compute the day's receivables outstanding for Gopher Lawn Equipment's Hand-held Value Stream.
9. Most financial analysis sites measure accounts receivable days based on a thirty-day month. The measure could also be calculated using working days, four five-day weeks per month for many companies. Does it matter whether calendar days or working days are used in the calculation?
10. Name three supporting measures frequently reported at the value stream level. Describe the purpose of each of the measures.



11. Describe four ways companies help ensure that the operational measures they report at the value stream level will motivate continuous improvement.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 9: Value Stream Costing

1. An advantage of value stream costing over standard costing in a lean organization is that value stream costing ...
  - A) uses more detailed and accurate overhead cost allocations than standard costing
  - B) reports the actual cost of each production job or product rather than the standard cost.
  - C) eliminates most of the transactions associated with cost accounting.
  - D) provides more detailed financial reporting than is possible with standard costing.
2. Standard costing creates problems in a lean organization because it ...
  - A) promotes the use of visual management rather than transaction control.
  - B) encourages over production, building inventory, and large batch quantities.
  - C) discourages local optimization and absorption of overhead.
  - D) reveals waste.
3. In value stream costing total costs assigned to the value stream ...
  - A) include only direct (with respect to products) labor and materials.
  - B) include only direct (with respect to products) labor and materials and allocated overhead.
  - C) include all costs directly associated with the value stream including direct materials and direct and indirect (with respect to products) labor, but few if any allocations of shared costs.
  - D) include all production costs, including direct materials, direct and indirect (with respect to products) labor, and allocations of any shared production costs, but no marketing or administrative costs.
4. Value stream costing is used to ...
  - A) create a value stream P & L (income) statement, and provide financial results for the value stream box score.
  - B) provide actual costs for variance analyses comparing actual and budgeted costs.
  - C) compute individual job and product costs to report profit by job or product.
  - D) encourage value stream managers to increase the ratio of direct to indirect (with respect to products) labor within the value stream.
5. Value stream costing simplifies accounting by ...
  - A) automating the collection of detailed costs of direct material and direct labor by product.
  - B) allocating all overhead using actual direct labor hours of machine hours rather than relying on more complex calculations.
  - C) centralizing and consolidating the purchasing function.
  - D) reducing the number of cost centers to a few mostly self contained value streams.
6. Which of the following is **not** a condition that must be satisfied before value stream costing can be effectively implemented?
  - A) Reporting needs to be by departments or individual products.
  - B) There should be few (or no) shared service departments or “monuments.”
  - C) There must be thorough tracking of “out of control” situations and exceptions, like scrap and rework.
  - D) Inventory must be reasonably under control relatively low, and consistent.

7. In value stream costing, the cost of performing activities outside the value streams (such as financial accounting) should be ...
- A) treated as a sustaining cost of the business and not assigned to any value stream.
  - B) divided evenly across all the value streams
  - C) allocated to the value streams based on sales
  - D) allocated to the value streams based on a measure of the activity performed (like number of transactions for financial accounting).
8. When using value stream costing, managers evaluate make or buy decisions by ...
- A) comparing the cost of purchasing (buying) a product to the production cost per unit computed under value stream costing.
  - B) comparing the cost of purchasing (buying) a product to the average production cost per unit for all products in the value stream.
  - C) comparing the effect on the overall value stream results of buying a product to making it in the value stream.
  - D) disregarding the financial impact and comparing the effect on the overall value stream operating measures reported in the value stream box score of buying a product to making it in the value stream.
9. If a reasonably accurate value for the total cost of inventory can be calculated, individual product costs are not necessary for inventory valuation. Which of the following is **not** a condition that must be met before simplified inventory valuation methods can be used?
- A) Overall inventory levels are low (for example, inventory turns above 12).
  - B) A computerized perpetual inventory system is in place.
  - C) Inventory flows through stable processes that are under control.
  - D) Kanban and other visual management systems are in place to control inventory.
10. How do value stream profit and loss statements usually report the effect of changes in the overall inventory levels on operating income?
- A) The material and conversion costs reported for each value stream are adjusted to reflect the inventory changes. Value stream profits therefore include the effect of inventory changes.
  - B) The change in inventory levels is reported as an adjustment before computing the profit reported for each value stream. Each reported value stream profit reflects the change in inventory.
  - C) The change in overall inventory across all value streams is reported as a single adjustment to the combined value stream profits to arrive at an adjusted division profit. The effect of inventory change is not included in the reported value stream profits so those measures will send the proper signal about inventory reduction.
  - D) Value stream profit and loss statements do not report the effect of inventory changes.
11. Able Manufacturing had material costs of \$250,000 and conversion costs of \$380,000 in their most recent month containing twenty working days. At the end of the month Able Manufacturing had raw material on hand equal to eight days worth of production, work-in-process equal to four days worth of production, and finished goods equal to six days worth of production. The value for ending inventory using the "days of stock" method is ...
- A) \$ 377,000
  - B) \$ 415,000
  - C) \$ 440,000
  - D) \$ 567,000

12. Wiremold tracks the direct materials in inventory. At the end of their most recent month, the direct material cost of their inventory (raw materials, work-in-process and finished goods) was \$603,210. During the most recent month, their value streams had material costs of \$920,000 and conversion costs of \$552,000 in twenty working days. At the end of the month, Wiremold had raw material on hand equal to seven days worth of production, work-in-process equal to two days worth of production, and finished goods equal to eight days worth of production. The value for ending inventory using the "material cost plus days of conversion cost" method is ...
- A) \$ 846,400
  - B) \$ 851,610
  - C) \$ 874,000
  - D) \$ 879,210
13. Baker Production had \$260,000 in material costs and \$418,000 in conversion costs during their most recent month. They manufactured 24,000 units during the month, in twenty working days. They had 16,000 parts in finished goods inventory at the end of the month. Using either the "quantity of finished goods" method or the "average cost" method, the cost of ending finished goods inventory for Baker Production is ...
- A) \$ 542,000
  - B) \$ 452,000
  - C) \$ 312,667
  - D) \$ 271,200
14. Charlie Company's had a total material cost in inventory 1,953,000 on December 31<sup>st</sup>. During January, Charlie Company Precision purchased material costing \$468,000. They scrapped \$22,000 worth of material in production January. The material content of Charlie Company's December shipments was \$457,000. The raw material cost in Charlie Company's January 31<sup>st</sup> inventory was ...
- A) \$ 1,986,000
  - B) \$ 1,964,000
  - C) \$ 1,942,000
  - D) \$ 1,920,000
15. Issues to take into account when selecting an inventory valuation method include all of the following except ...
- A) the amount of inventory.
  - B) the extent of visual control of inventory.
  - C) the difference or similarity of the mix of inventory and the mix of sales.
  - D) the presence or absence of an inventory tracking module in the company's ERP system.

#### Discussion questions and problems

1. How does value stream costing simplify the accounting system?
2. Why is standard costing inappropriate for lean organizations?
3. Why is the information reported using value stream costing better for a lean organization than the information reported by a standard cost system?

4. What is the advantage of using material purchases as the measure of material cost for the value stream? How does this differ from traditional costing? What conditions have to be in place for the purchase amount to be a valid measure for material cost?
5. Identify the conditions that must be in place before an organization can implement value stream costing and briefly explain why the condition is important for value stream costing to be successful.
6. Should costs associated with sustaining the entire organization be allocated to the value streams? Explain why or why not.
7. Identify three reasons why managers may want to know the costs of individual jobs or products. Explain how the needs can be addressed using value stream costing.
8. Universal Valve Company – Value Stream Profit & Loss Statements.

Universal Valve Company has organized into four value streams based on type of product: Plastic Valves, Alloy Valves, Brass Valves, and Large Valves & Manifolds. The table below shows the sales and costs by value stream for the month of August. The costs in the “Other” column represent resources shared by all the value streams or used by people outside the value streams.

Universal Valve	Plastic	Alloy	Brass	Large & Manifolds	Other	Total
Revenue	458,300	675,000	1,408,300	525,000	-	3,066,600
Material purchases	205,800	562,500	765,000	362,500	44,500	1,940,300
Energy costs	6,400	25,000	45,000	20,500	5,200	102,100
Supplies expense	5,000	6,500	16,200	7,100	4,300	39,100
Travel costs	1,000	1,200	2,200	800	8,600	13,800

The following table contains information on machinery, space occupied, and employees assigned to each value stream:

Universal Valve	Plastic	Alloy	Brass	Large & Manifolds	Other	Total
Production cells	4	3	11	4	-	22
Machines	13	11	40	12	-	76
Space (sq. feet)	18,800	17,400	57,900	15,900	40,000	150,000
Employees						
Operators	19	17	57	16	1	110
Production control	1	1	2	-	-	4
Purchasing agents	1	1	1	-	-	3
Engineers	1	1	2	1	-	5

The space in the “other” column is shared space, space used outside the value streams and space currently unused and available. The operator in the “other” column is a material handler that handles materials and supplies purchased outside the value streams. The Large & Manifolds value stream shared a small portion of the services of a Brass Production Controller and an Alloy purchasing agent.

Machine depreciation is \$500 per month per machine. Universal Valve pays \$.20 per square foot per month (\$2.40 per year) for its space.

In addition to the employees listed in the table above, Universal had the following employees that supported all value streams: a plant manager, an engineering manager, a customer service representative, three accountants, three Information technicians, and seven sales people. The monthly cost of salary and benefits for each type of employee is given in the list below:

<u>Type of employee</u>	<u>Monthly salary and benefits</u>
Operators and material handlers .....	\$ 4,700
Production controllers, purchasing agents, accountants, & information technicians .....	\$ 5,200
Engineers.....	\$ 7,700
Plant manager.....	\$ 11,300
Engineering manager.....	\$ 9,400
Customer service representative.....	\$ 3,800

Sales people are paid a straight commission equal to 2% of sales.

Universal Valve's inventory was valued at \$1,772,500 at the beginning of August and \$1,723,400 at the end of August.

Required:

- A. Based on the above information, prepare a division profit and loss report for Universal Valves. Use the report in figure 9.7 as a model for formatting your report.
  - B. Should support costs be allocated to the value streams? Explain your answer.
9. Bristol Brass has a single value stream. In September, there were twenty working days and the value stream had material costs of \$850,000 and conversion costs of \$880,000. At the end of September, Bristol Brass had raw material on hand equal to ten days worth of production, work-in-process equal to three days worth of production, and finished goods equal to four days worth of production. Calculate a value for ending inventory using the "days of stock" method.
  10. Acme Medical Supplies is required to track direct materials in inventory so they can identify the shipment lot should there be a problem with any of their products. At the end of October, the direct material cost of their inventory (raw materials, work-in-process and finished goods) was \$237,000. During October, there were twenty working days and their value streams had material costs of \$424,700 and conversion costs of \$526,000. At the end of October, Acme Medical Supplies had raw material on hand equal to five days worth of production, work-in-process equal to three days worth of production, and finished goods equal to six days worth of production. Calculate a value for ending inventory using the "material cost plus days of conversion cost" method.

11. Pegasus Manufacturing manufactured 17,000 parts during November. They had \$350,000 in material costs and \$258,000 in conversion costs during the month of November. At the end of November, they had 12,500 parts in finished goods inventory at the end of November. Calculate the cost of ending finished goods inventory for Pegasus using either the “quantity of finished goods” method or the “average cost” method.
12. The total material cost in Precision Steel’s inventory on November 30 was \$3,687,000. During December, Precision purchased material costing \$624,000. Precision scrapped \$12,000 worth of material during December and the material content of December’s shipments was \$637,000. Calculate the raw material cost in Precision’s Steel’s inventory on December 31<sup>st</sup>. How could precision Steel calculate the total cost of inventory on December 31<sup>st</sup>?
13. Identify two issues that should be considered when selecting an inventory valuation method and briefly describe the significance of each issue to the choice of inventory valuation method.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 10: Using the Box Score

1. Which of the following is **not** an example of a use of the value stream box score?
  - A) Employees in the production cells using the box score to manage daily performance.
  - B) Value stream managers using the box score to plan and evaluate lean improvements.
  - C) Value stream continuous improvement teams using the box score to design high-impact kaizen events and improvement plans.
  - D) Plant and division managers using the box score to evaluate value stream performance.
2. Which of the following is a purpose of the value stream box score?
  - A) Achieving operational control in production cells.
  - B) Showing the planned effects of lean improvements in the value stream.
  - C) Showing the links between value stream measures and the strategic objectives of the organization.
  - D) Showing the profitability of the division or company.
3. The box score measures three dimensions of performance in the value stream. The dimensions include all of the following except ...
  - A) capacity.
  - B) financial.
  - C) operational.
  - D) strategic.
4. A good way to use the box score to report on actual value stream performance is to ...
  - A) display actual box score results for all the weeks in a quarter to show the trend in performance.
  - B) display current state performance and a future state based on planned improvements.
  - C) display current state performance and future states based on the expected results of pursuing different strategy alternatives.
  - D) display current performance for the most current week or month, without reference to expected future states or performance trends.
5. A good way to use the box score to support strategic decision making is to ...
  - A) display actual box score results for all the weeks in a quarter to show the trend in performance.
  - B) display current state performance and a future state based on planned improvements.
  - C) display current state performance and future states based on the expected results of pursuing different strategy alternatives.
  - D) display current performance for the most current week or month, without reference to expected future states or performance trends.

#### Discussion questions and problems

1. How is the box score used within a lean organization? Who uses it and how do they use it?



2. Briefly explain how the box score can be used to: (a) report on value stream performance; (b) show the planned effects of lean improvements; (c) support tactical decision making, such as make or buy decisions, (d) plan strategic changes such as future capital investments or product rationalization.
3. Alloy Value Stream Special order – Scenario 1.

Universal Valves has organized their production operations into four order-delivery value streams. They have adopted value stream costing for internal reporting but currently they are still using standard costs for external financial reporting. The Alloy Valves Value Stream currently employs 21 people and produces and sells 52,657 valves per month. They have just received a special order for 1,000 valves from Bristol Pumps. The valves have a standard direct material cost of \$9.50 per valve, standard labor cost of \$1.50 per valve, and a standard overhead cost of \$4.00 per valve. Bristol Pumps is willing to pay only \$14.00 per valve. The current state box score for the Alloy Valve Value Stream is shown below.

Alloy Valves Value Stream		Current State	Future State
Operational	Productivity	\$32,143	
	On-time shipment	88%	
	Inventory days	22	
	First time through	86%	
	Average cost/unit	\$11.51	
Capacity	Productive	47%	
	Non-productive	30%	
	Unused available	23%	
Financial	Revenue	\$675,000	
	Material Costs	479,167	
	Labor Costs	87,417	
	Machine costs	35,417	
	Other costs	4,083	
	VS profit	68,916	
	VS return on sales	10.2%	

The Alloy Value Stream team estimates that producing the special order will not require hiring any additional labor or adding machines. They estimate productive capacity utilization will rise to 51%, and non-productive capacity utilization will rise to 31%. On time shipment, first time through and inventory days should be unaffected.

Required:

- A. Complete a future state box score column for the Alloy Valves Value Stream assuming they will accept the order.
- B. Should the Alloy Valves Value Stream accept the special order from Bristol Pumps? Why or why not?

#### 4. Alloy Value Stream Special order – Scenario 2.

Universal Valves has organized their production operations into four order-delivery value streams. They have adopted value stream costing for internal reporting but currently they are still using standard costs for external financial reporting. The Alloy Valves Value Stream currently employs 21 people and produces and sells 52,657 valves per month. They have just received a special order for 1,000 valves from Bristol Pumps. The valves have a standard direct material cost of \$9.50 per valve, standard labor cost of \$1.50 per valve, and a standard overhead cost of \$4.00 per valve. Bristol Pumps is willing to pay only \$14.00 per valve. The current state box score for the Alloy Valve Value Stream is shown below.

Alloy Valves Value Stream		Current State	Future State Make	Future State Outsource
Operational	Productivity	\$32,143		
	On-time shipment	88%		
	Inventory days	22		
	First time through	86%		
	Average cost/unit	\$11.51		
Capacity	Productive	64%		
	Non-productive	34%		
	Unused available	2%		
Financial	Revenue	\$675,000		
	Material Costs	479,167		
	Labor Costs	87,417		
	Machine costs	35,417		
	Other costs	4,083		
	VS profit	68,916		
	VS return on sales	10.2%		

The capacity shown is for the bottleneck process, Deburring. The Alloy Value Stream team estimates that producing the special order using overtime will degrade on-time performance and quality, as well as overburdening the operators. Hiring another operator at a cost of \$4,204 per month and accepting the order will change productive capacity utilization at the bottleneck process to 54% and non-productive capacity utilization will drop to 30%. On time shipment, first time through and inventory days should be unaffected.

The Alloy Value Stream has found a local producer that needs work and is willing to produce the valves for Universal Valve for \$12.75 per valve. On-time shipment and first time through would essentially remain unchanged, but the Alloy Valves inventory days would drop to 20 because they would not need to carry inventory for the special order. If the Alloy Valve value stream decides to accept the order and outsource production, it would not need to hire an additional operator, and capacity in the bottleneck process would remain unchanged from the current state.

Required:

- Complete a future state box score column for the Alloy Valves Value Stream assuming they will accept the order and hire an additional operator to produce it in house.

- B. Complete a future state box score column for the Alloy Valves Value Stream assuming they will accept the order and outsource production to the local producer.
- C. What should the Alloy Valves Value Stream do, accept the special order, and make it, accept the order and outsource production, or decline the order? Explain the reasoning behind your choice.

5. Brass Value Stream – Insourcing – Scenario 1.

Universal Valves has organized their production operations into four order-delivery value streams. They have adopted value stream costing for internal reporting but currently they are still using standard costs for external financial reporting. The Brass Valves Value Stream currently employs 63 people and produces and sells 73,000 valves per month. They have made improvements in their processes that have freed capacity, and improved on-time shipment and first time through. However, they have been unable to generate additional sales in a depressed market. The current state box score below shows the results of the lean improvements compared to the prior state.

Brass Valves Value Stream		Prior State	Current State	Future State
Operational	Productivity	\$22,354	\$22,354	
	On-time shipment	82%	87%	
	Inventory days	14	14	
	First time through	88%	92%	
	Average cost/unit	\$15.97	\$15.97	
Capacity	Productive	62%	53%	
	Non-productive	32%	19%	
	Unused available	6%	28%	
Financial	Revenue	\$1,408,333	\$1,408,333	
	Material Costs	765,000	765,000	
	Outsourced costs	62,400	62,400	
	Labor Costs	267,083	267,083	
	Machine costs	59,433	59,433	
	Other costs	11,833	11,833	
	VS profit	242,584	242,584	
	VS return on sales	17.2%	17.2%	

The Brass Value Stream currently buys housings from a supplier for \$62,400. According to the accounting system, the standard cost of making the housings in house would be \$36,000 for material, \$9,000 for direct labor, and \$24,000 for standard manufacturing overhead. The Brass Value Stream team believes the standard cost of materials accurately reflects the direct material cost of producing the housings in the value stream. To make the housings, they have to lease two additional machines at \$1,530 per month each, hire two more operators at \$4,200 per month each, and hire another supervisor at \$4,500 per month. They have free space for the machines and their other costs would remain unchanged. They believe producing the housings in the value stream rather than buying them would improve production flow and result in better quality housings, increasing on-time shipment to 91%, improving first time through to 95%, and reducing inventory days to 12. Adding the machines and people and producing the housings

rather than buying them would result in average productive capacity utilization of 60% and non-productive capacity utilization of 22%.

Required:

- A. Complete a future state box score column for the Brass Valves Value Stream assuming they will insource the production of housings.
- B. Should the Brass Valves Value Stream insource housing production? Why or why not?

#### 6. Brass Value Stream – Insourcing, Capital Equipment, and New Orders – Scenario 2.

Universal Valves has organized their production operations into four order-delivery value streams. They have adopted value stream costing for internal reporting but currently they are still using standard costs for external financial reporting. The Brass Valves Value Stream currently employs 63 people and produces and sells 73,000 valves per month. They have made improvements in their processes that have freed capacity, and improved on-time shipment and first time through. The current state box score below shows the results of the lean improvements compared to the prior state.

Brass Valves Value Stream		Prior State	Current State	Future State
Operational	Productivity	\$22,354	\$22,354	
	On-time shipment	82%	87%	
	Inventory days	14	14	
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	Material Costs	765,000	765,000	
	Outsourced costs	62,400	62,400	
	Labor Costs	267,083	267,083	
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The Brass Value Stream currently buys housings from a supplier for \$62,400. According to the accounting system, the standard cost of making the housings in house would be \$36,000 for material, \$9,000 for direct labor, and \$24,000 for standard manufacturing overhead. The Brass Value Stream team believes the standard cost of materials accurately reflects the direct material cost of producing the housings in the value stream. To make the housings, they have to lease two additional machines at \$1,530 per month each, hire two more operators at \$4,200 per month each, and hire another supervisor at \$4,500 per month. They have free space for the machines and their other costs would remain unchanged. They believe producing the housings in the value stream rather than buying them would improve production flow and result in better quality housings, increasing on-time shipment to 91%, improving first time through to 95%, and reducing inventory days to 12. Adding the machines and people and producing the housings

rather than buying them would result in average productive capacity utilization of 60% and non-productive capacity utilization of 22%.

The Brass Valves Value Stream also received an order for 2,500 additional valves per month. The customer is willing to pay \$18.00 per valve for this type of valve. This model does not use the housings, so accepting or declining this order will not affect the monthly demand for the housings. According to the accounting system, the standard direct material cost of the valve is \$14.00, the standard direct labor cost per valve is \$1.50, and the standard overhead per valve is \$4.00. The Brass Value Stream team believes the standard cost of materials accurately reflects the direct material cost of producing the housings in the value stream. If they decide to produce the valves but not insource the housings, they would not need to add any new machinery or people to the value stream. On time shipment, inventory days and first time through would be unchanged from the current state. Productive use of capacity would rise to 57% and non-productive use of capacity would rise to 21%.

If the Brass Valve Value Stream accepts the order and insources production of the housing, their productive capacity utilization would be 64% and their nonproductive capacity utilization would be 24% after adding the machinery and people needed to support the insourcing. The team believes their inventory days would be 13, their on-time shipments would be 90%, their first time through would be 92%, and they're concerned the lack of available capacity would limit their flexibility.

The Brass Valve Value Stream Team is also considering leasing a new machine to automate a manual production task. The machine costs \$4,000 per month and would free up two assembly operators. If they lease the machine they would not need to hire two additional operators to insource the housing, but they would still need the other machines and the supervisor.

If they insource the housing, accept the order and lease the machine rather than hiring two operators, productive use of capacity would be 60%, and nonproductive use of capacity would be 20%. If they insource the housing and lease the machine but turn down the new order, their productive capacity utilization would be 55% and their non-productive capacity utilization would be 18%. In either case, they expect on-time shipment would be 91%, first time through 95%, and inventory days 12.

If they decide not to insource the housing, will wait to lease the \$4,000 machine until the operators it can free up can be profitably redeployed in the Brass valve Value Stream or in another value stream at Universal Valve.

Required:

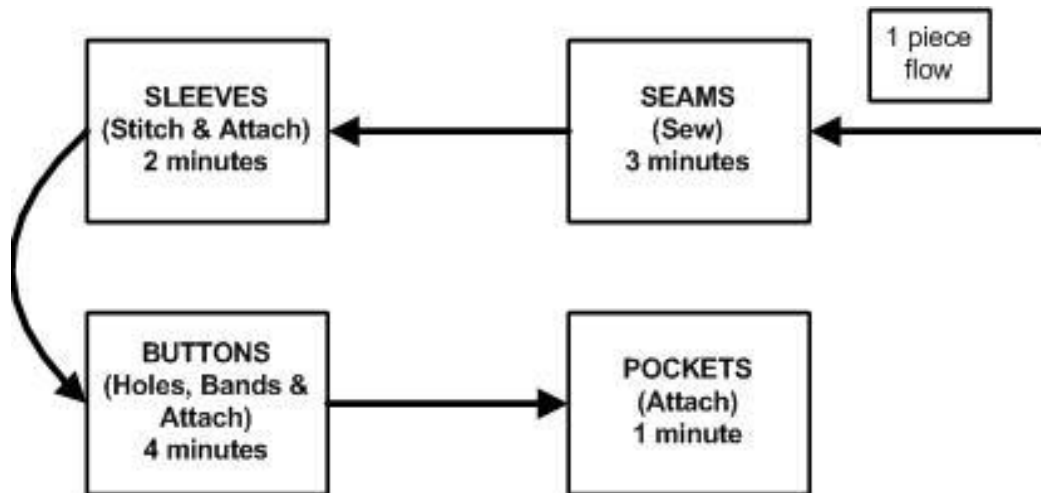
- A. Complete future state box score columns for the Brass Valves Value Stream assuming:
  - I. They will insource the production of housings (done in requirement A, problem 5).
  - II. They will accept the new order, but not insource production of housings.
  - III. They will insource the production of housings and lease the additional machine freeing two operators but turn down the new order.
  - IV. They will insource production of housings, accept the new order, and lease the additional machine freeing two operators to work on the housing.
- B. What course of action would you recommend to the Brass Valves Value Stream team? Explain your answer.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 11: Calculating Product Costs – Features and Characteristics

1. Although individual product costs are generally not necessary when managing by value stream there are a few instances where individual product costs may be useful, including ...
  - A) calculating the market price of products.
  - B) calculating a price for transferring products from one division to another.
  - C) valuing inventory.
  - D) measuring production efficiency.
2. The primary driver of conversion cost for a product in the value stream is ...
  - A) the total direct labor cost per unit of the product.
  - B) the total direct labor time per unit of product.
  - C) the total machine time per unit of the product.
  - D) the rate of flow per unit of product in the value stream.
3. The bottleneck process or cell in a value stream ...
  - A) is the first process or cell in the value stream.
  - B) is the last process or cell in the value stream.
  - C) determines the maximum possible rate of flow through the value stream.
  - D) affects the rate and quality of production but not product cost.
4. The average product cost per unit for a value stream is computed as ...
  - A) total value stream costs divided by the number of units shipped to customers.
  - B) total value stream costs divided by the number of units produced.
  - C) direct material, direct labor and allocated overhead divided by the number of units produced.
  - D) the sum of the standard material cost per unit and the standard conversion cost per unit.
5. The average cost per unit reported using value stream costing discourages overproduction and encourages inventory reduction because average cost per unit is calculated ...
  - A) using standard costs rather than actual costs.
  - B) with all conversion costs for the period in the numerator and the number of units produced rather than the number of units sold is used in the denominator.
  - C) with all conversion costs for the period in the numerator and the number of units sold rather than the number of units produced in the denominator.
  - D) with all conversion costs assigned to units of product and only included in the numerator when the product is sold, and with the number of units sold in the denominator.
6. Analyzing the capacity utilization of processes in a value stream, the bottleneck process in the value stream is usually ...
  - A) the process with the highest productive use of capacity but very low nonproductive capacity and some available capacity.
  - B) the process with the lowest productive use of capacity but very high nonproductive capacity and some available capacity.
  - C) the process with the lowest unused available capacity (or highest negative unused available capacity, where demand exceeds capacity for some processes).
  - D) the process with the lowest productive use of capacity regardless of the level of nonproductive capacity and available capacity.

Use the following diagram and information for questions 7, 8 and 9.



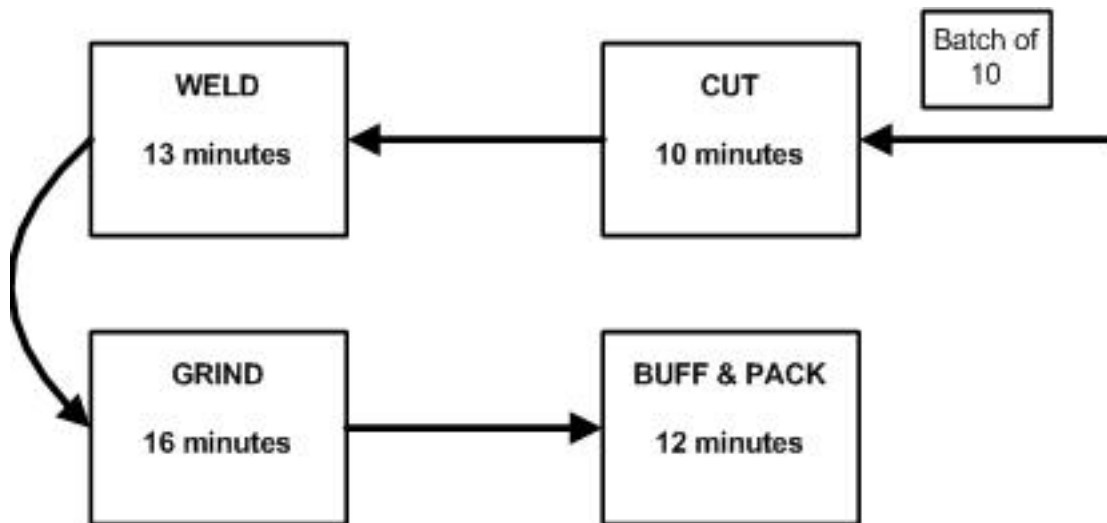
The Shirts value stream for Jacmel Apparel consists of a single production cell, depicted in the diagram above. Excluding the cost of direct materials it costs \$800 per week to run the Shirt value stream, and it currently produces and sells 540 shirts per week.

Jacmel Apparel's managers have identified a feature affecting processing time in the Shirt bottleneck process and have classified their shirt styles into one of three categories on the feature: low, medium, or high. Using the same productive time it currently takes to produce their current output, the Shirt value stream would be able to produce 360 shirts if it produced only "high" intensity styles during a week. If total available time were 100% productive (non productive and unused available capacity were zero) The Shirt value stream could produce 400 high intensity style shirts per week.

7. The bottleneck process is ...
  - A) Seams
  - B) Sleeves
  - C) Buttons
  - D) Pockets
8. Given the process depicted in the diagram above, which of the following features of shirts produced in the Shirts value stream would be used to adjust the amount of conversion cost assigned to a particular style shirt?
  - A) The cut of the shirt (fitted or regular), affecting the time spent sewing seams.
  - B) The number of buttons and button holes in the shirt design, affecting time in the Button cell.
  - C) The number of pockets, affecting time in the Pockets cell.
  - D) All of the above.
9. The conversion cost per shirt (rounded to the nearest penny) for a "high intensity" style shirt should be ...
  - A) \$ 2.22
  - B) \$ 2.00
  - C) \$ 1.48
  - D) \$ 1.33

## Discussion questions and problems

1. Why are individual product costs generally not needed when managing by value stream? What information do value stream managers usually use to replace in place of individual product costs and gross profit margins?
2. Even if individual product costs are not needed to support tactical decisions why might it still be helpful to know what product features create costs and how much cost particular features add to products? How could this information be useful to managers?
3. How does the rate of flow drive cost in a lean value stream? How is this assumption different from assumptions made in standard costing?
4. What determines the rate of flow through the value stream?
5. How is the average cost per unit calculated in value stream costing? What costs are included in the numerator and what measure of units is used in the denominator? How does this measure drive lean approach to inventory?
6. How can the bottleneck process in a value stream be identified? What characteristics does it have?
7. Acme Metals has a Connectors value stream that produces metal connectors for mining and oil drilling industries. Excluding the cost of direct materials, the Connectors value stream costs \$20,000 per week to run and it produces and sells 1400 connectors per week. The processes are depicted in the diagram below.



The processing times shown in the process boxes are the average machine process times to produce a batch of 10 connectors. It takes one minute to set up for each batch in cutting and grinding and two minutes to set up for each batch in welding. Buffing and packing does not require any setup time. Setups take the same amount of time regardless of the type of connector being produced. Acme Metals runs one weekly shift of five eight-hour days.



The Connectors Value Stream Team identified the following connector features that may potentially affect the conversion cost for a connector in the value stream:

- **Connecting Rod Diameter** – affects the cutting time. Small diameter rods require 8 minutes per batch, average rods require 10 minutes per batch, large diameter rods require 12 minutes per batch.
- **Number of Welds** – affects the welding time. A small number of welds require 10 minutes per batch, a medium number of welds require 12 minutes per batch and a large number of welds require 15 minutes per batch.
- **Hardness of the Metal** – affects the grinding time. Soft metal requires 7 minutes per batch, average metal requires 15 minutes per batch, and hard metal requires 20 minutes per batch.
- **Connecting Rod Length** – affects the buffing and packing time. Short connectors require 6 minutes per batch, medium connectors require 12 minutes per batch, and long connectors require 14 minutes per batch.

Required:

- A. Identify the bottleneck process in the Connectors value stream.
- B. Identify the feature or features of the connecting rods affecting the bottleneck process.
- C. Create a cost table showing the conversion cost per connector for each level (or combination) of features that affect the bottleneck process. In computing the costs, assume that the total time available per week to set up and produce batches of connectors, is the time currently being used to set up 140 batches and produce 1,400 connectors in the bottleneck process. All remaining available time (if any) in the bottleneck process is taken up by nonproductive activity other than setups.
- D. Based on your answer to requirement C, do you believe the difference in conversion cost is great enough to warrant using features and characteristics costing, or can the Connectors value stream simply use the average conversion cost for all connectors in the value stream?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 12: Eliminating More Wasteful Transactions

1. Once lean manufacturing is widespread in an organization all of the following attributes are usually in place except ...
  - A) Cellular manufacturing is widespread across the plant.
  - B) Initial supplier certification and some kanban pull from some suppliers.
  - C) Lean thinking is applied throughout the entire organization.
  - D) Extensive use of visual systems.
2. In traditional manufacturing \_\_\_\_\_ are used to schedule production, follow jobs through the production process, accumulate actual costs on jobs and track inventory.
  - A) invoices
  - B) kanban pull systems
  - C) visual systems
  - D) work orders
3. Once lean manufacturing is widespread in the lean enterprise, kanbans can be used to ...
  - A) signal production based on customer orders.
  - B) track labor costs.
  - C) track and compute actual product costs.
  - D) follow jobs through the production process.
4. Companies where lean manufacturing is widespread can eliminate tracking actual labor to work orders or job cost sheets because ...
  - A) direct labor is mostly eliminated by automation.
  - B) cell performance measures are used to control production and labor costs are tracked at the value stream level.
  - C) the ERP system will automatically allocate labor costs based on actual production.
  - D) Labor costs will be traced to each kanban.
5. Most support functions are carried out within each value stream rather than by employees in specialized support departments when lean manufacturing is widespread. The procurement function can usually be moved within the value stream because ...
  - A) each value stream purchases from a small number of certified suppliers, rather than a large number of suppliers competing on invoice price.
  - B) blanket purchase orders are negotiated with suppliers with deliveries controlled by kanban pull systems rather than separately negotiated purchase orders.
  - C) procurement now is focused on facilitating the relationship between suppliers and the value stream rather than determining purchase quantities negotiating orders, and scheduling shipments.
  - D) all of the above.

6. Most support functions are carried out within each value stream rather than by employees in specialized support departments when lean manufacturing is widespread. Manufacturing engineering can usually be moved within the value stream because ...
- A) manufacturing engineering will be focused on process improvements and continuous improvement teams are focused on improvement of entire value streams, not isolated processes.
  - B) lean management requires that every value stream have at least one manufacturing engineer.
  - C) Kanban pull systems require constant maintenance and updating that can be best supplied by manufacturing engineers specializing in each value stream.
  - D) all of the above.
7. All of the following are steps that should be in place before the use of work orders for tracking materials can be completely eliminated except ...
- A) The number of suppliers for each commodity is reduced.
  - B) Key suppliers of materials are certified.
  - C) The procurement function is automated.
  - D) Blanket purchase orders are used for most material purchases.
8. Companies where lean manufacturing is widespread ...
- A) have very accurate perpetual inventory systems.
  - B) rely on cycle counting to track inventory.
  - C) expense materials on receipt and use a month-end adjustment to value inventory for reporting purposes.
  - D) use RFID tags to track and value inventory.
9. When lean manufacturing is widespread, cycle counting of inventory ...
- A) is used to count every item of inventory over the span of a year without having to shut down production to count everything at once.
  - B) can be eliminated because inventories are low in value and controlled through visual means.
  - C) is used to ensure the accuracy of the production and purchase scheduling.
  - D) Is used to calculate inventory value without having to count every item of inventory.
10. Which of the following is an example of lack of process control that conventional management addresses by adding transaction controls to minimize the likelihood of material misstatements of financial statements?
- A) Short product lead times.
  - B) Stable inventory and process times.
  - C) Poor factory organization.
  - D) Little or no expediting of customer orders to meet delivery requirements.
11. Which of the following is not an example of a process control that minimizes the chance of errors that would lead to material misstatements of financial statements?
- A) Visual kanban signals that limit inventory levels and prevent overproduction
  - B) Day-by-the-hour charts to immediately identify and correct production problems
  - C) Short lead times that enable low levels of inventory.
  - D) Frequent expediting to satisfy customer delivery demands.

## Discussion questions and problems

1. What characteristics in place when lean manufacturing is widespread allow companies to eliminate the use of work orders to schedule production and follow jobs through the production process? What replaces the use of the work orders?
2. Identify three reasons companies require detailed labor reporting by job, and describe how companies where lean manufacturing is widespread satisfy these needs without detailed labor reporting by job.
3. At conventionally managed companies, personnel in specialized departments perform many support functions. Briefly explain how companies where lean manufacturing is widespread satisfy their needs for the following support: production control, inventory movement and management, procurement, and manufacturing engineering.
4. Identify three reasons companies require detailed material cost and quantity reporting by job, and describe how companies where lean manufacturing is widespread satisfy these needs without detailed reporting on material costs and quantities by job.
5. Why do companies maintain perpetual inventory systems? How do companies where lean manufacturing is widespread eliminate the need for perpetual inventory systems without losing needed information?
6. How can process controls substitute for transaction controls? Is this substitution a second-best solution motivated by the desire to eliminate waste and save money?
7. Identify three process controls that are characteristic of companies where lean manufacturing is widespread, and identify a transaction control that can be reduced or eliminated due to the presence of the process control.
8. Why might managers resist the elimination of transaction controls?
9. Apex Manufacturing.

Apex Manufacturing makes precision parts for OEMs (original equipment manufacturers) of home appliances. The accounting department is very proud of their control system. A description follows.

Customer orders are automatically entered into the ERP system by the sales force. Most orders are automatically approved. Unusually large orders, orders for new customers, or orders with terms outside specified parameters must be approved by the credit manager, and/or the division manager, and this is always completed in one day.

The ERP system revises the production schedule based on the updated order information, along with the information reported from the shop floor. It also updates material forecasts for the buyers. Based on the forecasts for various materials, the buyers solicit bids from at least three suppliers whenever possible to ensure competition will yield the lowest possible purchase price.

When production is scheduled to begin, the manager of the department housing the initial production process submits a material requisition to the material warehouse. The warehouse

issues the materials and the perpetual inventory system is automatically adjusted to reflect the issuance. A copy of the work order accompanies the materials onto the shop floor.

All workers in each department record their time twice daily, allocating their time using over thirty different job codes representing various types of direct labor operations and indirect labor activities. There are often errors in the entries, and discrepancies between the sums of the time entered by the workers and their time clock hours used for payroll. The accounting department spends a lot of time reconciling the labor reports from the workers with the time clock data. They also review labor time reports weekly, and they believe between their review and the reviews of the labor variance analyses by the departments, most of the data entry errors are discovered and corrected.

At the end of each shift, good units, scrapped materials, and any defective units discovered during production are recorded for each job in the department. There is a weekly meeting in each department on each shift to discuss the weekly labor, materials and overhead variances.

When an operation is completed for all the units in an order or a batch (very large orders may be split into more than one batch) the order moves to the department housing the next process. If there is too long a queue of jobs waiting in the next department, the order may be returned to the warehouse until it is scheduled to run in the next department. In either case, the status of the order is updated in the ERP system. At any time, Apex personnel can look up the current status and location of any job. The system will also have the current cost of the job at standard, based on its stage of completion. The workers at each process enter the labor, and any additional materials and parts that may be required in the same manner as at the initial process.

Once the job passes final inspection (including re-inspection of any units sent back to production for rework), it is returned to the warehouse to be shipped to the customer. The transfer from final inspection to the warehouse is recorded and it automatically moves the units in the job from work-in-process to finished goods. Once the job is shipped, another entry moves the units from finished goods to cost of goods sold at standard cost.

The workers complained about the amount of time they spent entering labor data and production results in the computer, and the variance report review meetings were sometimes acrimonious, especially if there were significant unfavorable variances. Accounting spent a lot of time reconciling the time data, and they did cycle counts of inventory, making sure that all parts and products were physically counted at least once per year. However, accounting felt all the work was worthwhile. Keeping on top of labor and inventory meant that they could be confident of the job status in the ERP system to respond to customer inquiries. They rarely had significant year-end adjustments to make, and the annual audit usually went smoothly. They were able to finish monthly financial statements within five business days of month end, and they had good, if not final, annual numbers within three weeks of the year end.

Apex is planning a lean transformation. The entire factory will be reorganized into production cells arranged by value stream. Workers will be cross-trained and assigned to each value stream. Orders from most of their OEM customers will be covered by blanket purchase agreements. Purchases of all key materials and parts will also be covered by blanket purchase orders with one or two (at most) certified suppliers for each material or part. Lead times and inventory levels will be greatly reduced. Standard work practices are documented and displayed in each production cell. Kanbans will control production starts and material flow.

Apex's accountants are told that there will need to be big changes in accounting and a lot of the work they are currently doing will be greatly reduced or eliminated. They want to know:

- How under the new system are we going to control material costs and encourage lower costs?
- How are we going to control labor costs and ensure workers are working hard?
- How are we going to schedule production?
- How are we going to track the progress of jobs to respond to customer inquiries?
- How are we going to get values for inventory and cost of goods sold?
- Are we still going to have jobs?

Required:

- A. Which of the accounting and recording activities in Apex's current system add value and which are waste?
- B. Assume that lean manufacturing becomes widespread at Apex. Describe the accounting and record-keeping processes that would be in place. What current activities would be eliminated and what would replace them?
- C. Respond to the bulleted list of questions raised by the accountants.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 13: Sales, Operational, and Financial Planning (SOFP)

1. The purpose of lean sales, operations, and financial planning is ...
  - A) to meet or exceed the quarterly earnings per share or profit targets.
  - B) to eliminate unfavorable variances by the end of quarterly and annual reporting periods.
  - C) to anticipate future customer needs and to provide exactly the capacity needed to meet those needs.
  - D) to anticipate future customer needs, establish the capacity to meet those needs and provide flexibility to cope with the unexpected.
2. Traditional budgeting processes do not help lean organizations because ...
  - A) they usually employ rolling budgets rather than annual budgets.
  - B) they rely on a bottom-up planning process without sufficient input from higher management levels.
  - C) they focus on financial outcomes, not operational inputs and customer demand.
  - D) they are completed too quickly, not allowing time to double-check for errors and test assumptions.
3. The monthly SOFP planning process begins with ...
  - A) the executive SOFP meeting.
  - B) value stream demand planning.
  - C) value stream operations planning.
  - D) value stream financial planning.
4. The SOFP team for each value stream should be ...
  - A) composed of managers from outside the value stream for greater objectivity.
  - B) a cross-functional group mostly from within the value stream.
  - C) accounting personnel expert in budgeting.
  - D) separate from the people who will be responsible for executing the plan.
5. Separate demand forecasts should be prepared for ...
  - A) each individual product or item for each month or period of the planning horizon.
  - B) each product family for each month or period of the planning horizon.
  - C) each value stream in total for each month or period of the planning horizon.
  - D) each production facility for each month or period of the planning horizon.
6. A good way to determine the length of the planning horizon is by ...
  - A) the lead time required for a major capital investment.
  - B) the fiscal year of the company.
  - C) the evaluation period for the CEO's long-term bonus.
  - D) None of the above, the planning horizon should always be the next twelve months.
7. The outcome of the \_\_\_\_\_ is a new set of monthly sales forecasts covering the planning horizon.
  - A) value stream demand planning.
  - B) value stream operations planning.
  - C) SOFP planning meeting.
  - D) executive SOFP meeting.

8. If the sales force is not part of the value stream ...
- A) demand planning is omitted from the SOFP process.
  - B) the sales people provide product family demand forecasts for the value streams.
  - C) sales must be reorganized before lean SOFP planning can be implemented.
  - D) forecasting is done by each value stream manager.
9. Inaccurate demand forecasts can be addressed by ...
- A) penalizing sales people when actual sales do not meet forecasts.
  - B) adjusting forecasts down so actual sales almost always exceed the forecast.
  - C) working to understand the causes of variability in forecast error and continually improving the forecasting process.
  - D) rewarding sales people for meeting sales forecasts.
10. Value stream operations planning relies on all of the following to estimate future value stream capacity except ...
- A) anticipated effect of planned improvements.
  - B) benchmarking analyses of best-in-class companies.
  - C) current capacity utilization from the value stream cost analysis.
  - D) demonstrated capacity as revealed in day-by-the-hour reports.
11. A capacity shortfall in the near future could be met by ...
- A) purchase of capital equipment.
  - B) scheduling overtime or getting help from another value stream.
  - C) developing new marketing strategies.
  - D) establishing long-term continuous improvement plans.
12. Which of the following is an example of a short-term action resulting from the SOFP operations planning?
- A) creating level scheduling plans.
  - B) purchasing or redeploying capital equipment.
  - C) establishing new product development programs.
  - D) developing new market strategies.
13. Ideally, the cycle time of the production process ....
- A) should be greater than the takt time.
  - B) should be equal to or slightly greater than the takt time.
  - C) should be less than the takt time.
  - D) should be uncorrelated with the takt time.
14. Capital acquisitions should be evaluated based on ...
- A) discounted cash flow based on anticipated use over the life of the acquisition.
  - B) the smallest possible addition to capacity that will cover upcoming needs.
  - C) flexibility and ease of use without regard to cost.
  - D) flexibility, ease of use, the match of added capacity with upcoming needs, and cost.
15. Which of the following is **not** an output of value stream operations planning for materials and components?
- A) Adjustments to kanban quantities for materials and components.
  - B) Adjustments to the number of kanbans for materials and components.
  - C) Calculating new economic order quantities for materials and components.
  - D) Forecasts of material and components quantities for suppliers.



16. A source of financial information for the SOFP financial reports is ...
- A) the sales and production information from SOFP spreadsheet.
  - B) the accounting general ledger.
  - C) the planning bills.
  - D) the MRP system.
17. Which of the following is not a purpose of the SOFP planning meeting?
- A) Make decisions on how each value stream will work to match customer demand and production capacity.
  - B) Resolve conflicts and resource issues with the value streams.
  - C) Discuss budget variances and make plans to eliminate unfavorable variances.
  - D) Identify issues requiring decisions from the executive team.
18. Which of the following is not an outcome of the SOFP planning meeting?
- A) A target cost analysis of key products.
  - B) Recommendations for short-term actions for each value stream.
  - C) Financial reports and a rolling budget for each value stream and for the company.
  - D) Issues and recommendations requiring decisions of the executive team.
19. The purpose of the Executive SOFP meeting is to review the plans and budgets, ...
- A) analyze variances, award bonuses, and authorize execution of the plan.
  - B) make decisions outside the scope of the value stream teams, and authorize execution of the plan.
  - C) set budget targets, and authorize execution of the plan.
  - D) establish target costs analyze variances, award bonuses, and authorize execution of the plan.
20. All of the following are keys to successfully implementing a lean SOFP process except ...
- A) Senior management should not be involved in the process. It should be delegated to value stream employees.
  - B) Planning must be done by value stream.
  - C) Meetings must focus on decision-making.
  - D) Employees should adhere to a formal process.

#### Discussion questions and problems

1. What is the principal purpose of the lean SOFP process?
2. Is the lean SOFP process waste? Why can't lean companies simply react to actual customer demand?
3. List three reasons why conventional budgeting processes may not be useful to lean organizations. How does the lean SOFP process overcome the problems with conventional budgeting?
4. Should the SOFP team for each value stream be people who will also be responsible for executing the plan? Why or why not?

5. For each of the following planning processes, list the major issue or issues addressed (looking at it another way, what question or questions does the process try to answer?):
  - a. Value stream demand planning.
  - b. Value stream operations planning.
  - c. Value stream financial planning.
6. How should a company determine the length of their planning horizon?
7. Are sales forecasts the same as sales targets? Should the demand forecast used in SOFP planning be pessimistic, realistic, or optimistic? Explain your reasoning.
8. Identify two short-term actions arising out of SOFP operations planning and explain their purpose in meeting customer demand through lean production.
9. Identify two long-term actions arising out of SOFP operations planning and explain their purpose in meeting customer demand through lean production.
10. How can sales policies and incentives create unevenness and variation? Suggest a sales policy change or incentive that would reduce rather than increase unevenness and variation.
11. Precision Manufacturing's demand forecasts and capacity analysis show that by the end of the next fiscal year, they will exceed the capacity of their current equipment on a lathe operation. Precision's Managers in the Stainless Steel Value Stream are evaluating a new state-of-the-art CNC Lathe. The lathe has the fastest cycle time of any lathe on the market. It would have the capacity to serve Precision's future demands as well as replacing two existing lathes. What questions should Precision's Managers be asking and answering before they decide whether purchasing the new lathe is the best solution to their capacity problem?
12. How are SOFP financial reports typically presented? Can SOFP financial reports reduce the importance of the monthly reports of actual results? Briefly explain your answer.
13. What are the reasons for having an SOFP planning meeting? Who participates? Is the meeting restricted to short-term issues?
14. What are the reasons for having an executive SOFP meeting? Who participates? Is the meeting restricted to short-term issues?
15. What are the keys to successful implementation of SOFP?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 14: Lean Financial Accounting II

1. Companies can ensure that appropriate payments are made to certified suppliers when lean manufacturing is widespread by ...
  - A) matching purchase orders and receiving reports with invoices.
  - B) automatically paying the invoiced amount.
  - C) automatically paying for materials upon receipt, or upon use.
  - D) paying a fixed amount each month as negotiated in a blanket purchase order.
2. If companies where lean manufacturing is widespread are certified suppliers for their customers they can ...
  - A) request payment on receipt of material rather than issuing invoices.
  - B) stop offering discounts for early payment.
  - C) minimize invoicing by delivering only once per month.
  - D) eliminate accounts receivable.
3. One way lean companies reduce the number of accounts they track in their general ledger is by ...
  - A) eliminating all inventories.
  - B) organizing by value stream and assigning costs to value streams rather than departments
  - C) organizing by production cell and assigning costs to cells rather than departments.
  - D) centralizing inventory, accounts receivable and accounts payable.
4. Conversion costs reported for each value stream would include ...
  - A) direct labor plus allocated overhead.
  - B) direct value stream costs other than material cost plus allocated production support costs.
  - C) all costs that are directly incurred by the value stream except material purchases.
  - D) all direct product costs for products produced in the value stream.
5. The recommended approach for accounting for expenses when lean manufacturing is widespread is to ...
  - A) charge all expenses, including material purchases, to the period when they were incurred.
  - B) charge production costs, including purchases, to the products or jobs, but charge all other expenses to the period incurred.
  - C) charge direct material and direct labor costs to the products or jobs, but charge overhead and all other expenses to the period incurred.
  - D) pay cash immediately for everything to simplify accounting.

6. Which of the following best describes the preferred lean approach to inventory accounting?
- A) Record all production costs at standard and use an end-of-period adjustment to account for the difference between standard cost and actual.
  - B) Record all production costs as period expenses and use a simple end-of-period adjustment to account for the overall change in inventory.
  - C) Record all production costs as period expenses, write-off inventory values and abandon GAAP reporting.
  - D) Record inventory at standard material cost, record conversion costs as period expenses, value inventory at standard direct material cost and abandon GAAP reporting.
7. Lean companies close their books to prepare financial statements ...
- A) Weekly.
  - B) Monthly.
  - C) Annually, or quarterly if SEC reports are filed quarterly.
  - D) Lean companies should never close their books.
8. The difference between the conventional approach to control and the lean approach to control is ...
- A) the conventional approach emphasizes statistical analysis and prevention, while the lean approach emphasizes inspection and correction.
  - B) the conventional approach emphasizes inspection and correction, while the lean approach emphasizes mistake-proofing and prevention.
  - C) the conventional approach emphasizes process controls, while the lean approach emphasizes financial controls.
  - D) the conventional approach employs variance analysis, while the lean approach employs benchmarking analysis.
9. Which of the following is a problem of the conventional control approach relying on monthly comparisons of actual financial results to budget targets?
- A) Monthly reports do not provide information over a long enough time period.
  - B) The budget reports provide system wide information when departmental information is needed for problem solving.
  - C) Financial measures are effects. They provide little information about causes.
  - D) The monthly reporting does not provides sufficient time for an effective problem solving process.
10. In terms of control, what is the role of the accountant in a lean company?
- A) Accountants focus on financial reporting and they rely on the operating personnel to control processes.
  - B) Accountants become involved in operations and continually assess the effectiveness of cell and value stream measures and the SOFP process.
  - C) Accountants prepare financial data in the SOFP process but otherwise rely on the operating personnel to control processes.
  - D) Accountants summarize control reports from the value streams to prepare divisional and corporate level reports.

## Discussion questions and problems

1. What is the purpose of the three-way match in the accounts payable process? How is this purpose satisfied without the three-way match when lean manufacturing is widespread?
2. How can companies where lean manufacturing is widespread speed collections of amounts owed them while eliminating the need to issue invoices?
3. Why do conventional companies have such extensive charts of accounts? If lean companies will greatly reduce the number of general ledger accounts, what will be lost? How will lean companies replace the function that detailed ledger accounts perform for conventional companies?
4. Does having a more detailed chart of accounts provide more control or less control?
5. Describe what does it mean to use the “cash basis” of accounting for expenses. Can a company where lean manufacturing is widespread use a cash basis of accounting for expenses when generally accepted accounting principals require an accrual basis?
6. Can a lean company treat production expenses as period costs and still report income in conformance with generally accepted accounting principles? Explain your answer.
7. What does “closing the books” mean? Why do companies close their books? How often should lean companies close their books?
8. How can a company have valid month-end information before the end of the month?
9. Which is the more cost effective way to improve quality, inspecting quality in or prevention through process improvement (e.g., 5S, mistake-proofing, root-cause analysis, and continuous improvement of standard work)? Does your answer apply to accounting processes and services as well as production of products and other services?
10. What are the problems with conventional budget-based control?
11. What role should accountants play in achieving control once lean process controls are in place?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 15: The Lean Enterprise

1. Which of the following is not a characteristic of a lean enterprise?
  - A) Lean methods are widespread throughout the organization.
  - B) A command and control culture is adopted to enforce lean principles and methods.
  - C) Co-operative “win-win” relationships based on lean principles are established with customers and suppliers.
  - D) None of the above. A, B, and C are all characteristics of a lean enterprise.
2. Lean methods are tools, methods and procedures that ...
  - A) apply equally well with any management philosophy or corporate culture.
  - B) yield best results when an organization adopts a command and control culture.
  - C) yield best results when an organization adopts a cooperative, continuous improvement culture.
  - D) apply only to manufacturing operations.
3. Which of the following is an example of a lean method?
  - A) Budget-based variance analysis.
  - B) Three-way matching of invoices.
  - C) MRP (manufacturing resource planning) production scheduling.
  - D) TPM (total productive maintenance).
4. Which of the following is an example of evidence suggesting lean culture is being established?
  - A) Managers staying with lean methods in the face of pressure to meet conventionally measured profit targets.
  - B) Managers stay in their offices, keeping out of the production areas.
  - C) Earnings are the driver of change and improvement.
  - D) Failed improvement efforts are not tolerated.
5. The main motivation for lean enterprises to establish partnerships is to ...
  - A) squeeze suppliers for cost cuts on parts and materials and more frequent deliveries.
  - B) lock in customers and reduce competition.
  - C) add value to end-use customers and reduce waste throughout the wider value stream.
  - D) push distributors to sell more of their products and services.
6. Communications and transactions between customers and suppliers ...
  - A) are outside the scope of transaction elimination efforts.
  - B) are often the source of a duplication of efforts by the customer and supplier.
  - C) are rarely the source of a duplication of efforts by the customer and supplier.
  - D) have no effect on the financial or operational integrity of systems of either the customer or supplier.

7. Macromapping is a tool used ...
  - A) to visually depict all of the value streams in a facility in a single document.
  - B) to visually depict all of the value streams in an organization.
  - C) to show the geographic location of all the customers for products of a given value stream.
  - D) to show the flow of the wider value stream across two or more organizations (for example, supplier and customer).
8. \_\_\_\_\_ is a method used by lean enterprises to understand customer value and ensure that products or services delivering that value can be produced and delivered at a reasonable cost.
  - A) target costing.
  - B) value-based pricing.
  - C) macromapping.
  - D) activity-based costing.

#### Discussion questions and problems

1. What does it mean to be a lean enterprise? What are the most important ways a lean enterprise differs from a conventionally managed enterprise and a company embarking on a lean transformation?
2. Identify three characteristics of a lean culture and describe how they differ from the culture at conventionally managed companies.
3. Give three examples of lean methods. Can an enterprise that does not have a lean culture implement lean methods?
4. Briefly describe the characteristics of a partnership a lean enterprise would have with its suppliers. Explain why a lean enterprise would partner with its suppliers. Isn't it better to encourage competition among suppliers?
5. Why would suppliers agree to a partnership with a lean enterprise? What's in it for them?
6. Are boundary-spanning transactions (transactions and interactions between organizations rather than within organizations) fertile ground for eliminating waste? If so, which organization will reap the benefit?
7. If the lean enterprise is organized and managed by value streams, don't these value streams exist entirely within the organization?
8. What are macromaps? Can macromaps be used to (a) eliminate waste, to (b) add value? Provide brief explanations or examples to support your answers.
9. Briefly describe target costing.

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 16: Target Costing

1. The purpose of target costing is ...
  - A) to calculate the standard cost of products and services.
  - B) to set production cost budgets.
  - C) to make value created for the customer the driving force of the business.
  - D) to calculate selling prices for products and services that will yield an acceptable profit.
2. In target costing, the selling price is based on ...
  - A) the value of the product or service to the customer.
  - B) the target production cost plus a mark-up to cover other costs and profit.
  - C) the target total cost, plus a markup to cover profit.
  - D) the target total cost plus ten percent.
3. In target costing, allowable cost is calculated by ...
  - A) adding and deducting five percent to target cost to establish an allowable cost range.
  - B) deducting required profit (as determined by the company's business plan) from the selling price.
  - C) multiplying the selling price by ninety percent.
  - D) taking the most recent actual cost for this or the most similar product or service and deducting ten percent.
4. In target costing the cost gap is ...
  - A) the difference between standard cost per unit and actual cost per unit.
  - B) the difference between selling price per unit and target cost per unit.
  - C) the difference between the standard cost per unit and the allowable cost per unit.
  - D) the difference between the allowable cost per unit and the average value stream cost.
5. Target costing is used ...
  - A) for new products and existing products only when new value streams are created.
  - B) when introducing new products either in new or existing value streams, but not with existing products.
  - C) with currently existing products, but not with new products.
  - D) with currently existing products and with new products.
6. The first phase (the first three steps) in the target costing process is designed to ...
  - A) specify how the features of the product or service provide value to customers and where the value is created.
  - B) understand the needs of the customers and match the needs to product features and characteristics.
  - C) calculate overall target cost and target costs for major components.
  - D) develop value versus cost strategy and identify improvement targets to drive to customer value.



7. What is the customer value weight measuring?
  - A) The relative importance of a particular need to a customer.
  - B) The importance of a feature in satisfying overall customer needs.
  - C) The association (low, medium or high) between a product or service feature and a particular customer need, regardless of its importance to the customer.
  - D) The number of different customer needs a particular product or service feature influences.
  
8. NeverPaint, a manufacturer of vinyl siding, identified seven customer needs. The needs were rated for their importance to the customer on a five-point scale (1 = low, 5 = high). The sum on the ratings for the seven customer needs was 25. One of the most important customer needs, durability, was rated 5 in importance. Features were given ratings of 1, 3, or 5 based on their importance (low moderate, or high) to satisfying a customer need. The "thickness" feature was rated highly important in providing durability, but it did not contribute to satisfying any of the other customer needs. The customer value weight for "thickness" would be ...
  - A) 0.2
  - B) 1.0
  - C) 5.0
  - D) 25.0
  
9. The feature of a product that creates the most value for customers is ...
  - A) the feature that has the highest customer value weight ...
  - B) the feature that contributes to satisfying the greatest number of customer needs.
  - C) the feature that has the highest association with the highest rated customer need.
  - D) the feature that costs the most to produce.
  
10. NeverPaint, a manufacturer of vinyl siding, rated customer needs on a five-point scale (1 = low, 5 = high) for their importance to the customer. Using the same scale, they also rated customer satisfaction with NeverPaint's current product, customer satisfaction with the best available product from competitors, and the perception among NeverPaint's managers of the importance of each customer need. Customers ranked resistance to fading a 4 in importance, a 2 in satisfaction with NeverPaint's siding and a 3 in satisfaction with the best product from competitors. NeverPaint's manager's rated resistance to fading a 3 in importance. Which of the following is a valid conclusion to draw from the ratings?
  - A) NeverPaint's managers have been overestimating the importance customers place on resistance to fading.
  - B) Customers are not very satisfied with the resistance to fading of NeverPaint's nor its competitors' siding, and NeverPaint trails its competitors in satisfying this need.
  - C) NeverPaint's current product does satisfy customers on resistance to fading, but this need is not very important to customers.
  - D) Customers think resistance to fading is more important than it really is.
  
11. The second phase of the target costing process (steps 4 through 6) involves ...
  - A) developing a value-to-cost strategy and product and process improvement targets.
  - B) calculating target costs for the product (or service) and for major components.
  - C) specifying customer needs and determining the customer value of the product or service.
  - D) understanding customer needs and matching the needs to product or service features.

12. A company should determine the value of an improved product or service by ...
- A) Starting with the current price, and adding an estimated value for each improvement.
  - B) Starting with the current price and adding the cost of providing each improvement.
  - C) Finding the best alternative currently available in the market and adding (deducting) estimated value where the improved product will (will fail to) better satisfy customer needs.
  - D) Finding the best alternative currently available in the market and adding the cost of providing improvements that better satisfy customer needs.
13. The Customer Value for Business Processes Matrix (figure 16.9) shows ...
- A) the significance of value stream business processes to the product features that produce customer value.
  - B) the significance of value stream business processes to satisfying each customer need.
  - C) the significance of value stream business processes to creating competitive advantage compared to the best available alternative from a competitor.
  - D) the significance of value stream business processes to the target cost of the product.
14. NeverPaint, a manufacturer of vinyl siding created a Customer Value for Business Processes Matrix (like the one in Figure 16.9). One process, Curing, was judged to have a high contribution (value weighting 5) to color quality but no impact on any other value creating product feature. The customer value rating (weight) for color was 16%. If the customer value apportioned to all NeverPaint's processes summed to 12, what is the equivalent percentage for the Curing process?
- A) 5.00%
  - B) 6.67%
  - C) 16.00%
  - D) 80.00%
15. The purpose of the third phase (steps 7 through 9) of the target costing process is to ...
- A) develop a value-to-cost strategy and product and process improvement targets.
  - B) calculate target costs for the product (or service) and for major components.
  - C) specifying customer needs and determining the customer value of the product or service.
  - D) understand customer needs and matching the needs to product or service features.
16. Andover Overhead Doors calculated an average customer value of \$2,200 for their security door line after they implement planned improvements. However, after consultation with their sales people and key customers, they've decided the selling price will need to be \$2,000. The current average cost in the Security Door Value Stream is 1,200 per door. If the required profit margin for the Security Door Value Stream is 48%, what is the target cost per security door?
- A) \$ 1,200
  - B) \$ 1,144
  - C) \$ 1,040
  - D) \$ 960

17. Required profit margins and target costs for the product or service should be based on ...
- A) a corporate standard uniformly applied to all products or services.
  - B) the overall revenue and cost impact of the product on the value stream.
  - C) sales price and direct product costs (materials and direct labor) for the individual product.
  - D) sales price and projected standard cost (direct materials, direct labor, and overhead for the individual product).
18. Andover Overhead Doors calculated an average customer value of \$2,200 for their security door line after they implement planned improvements. However, after consultation with their sales people and key customers, they've decided the selling price will need to be \$2,000. The current average cost in the Security Door Value Stream is 1,200 per door. If the required profit margin for the Security Door Value Stream is 48%, what is the average cost gap per security door?
- A) \$ 56
  - B) \$ 144
  - C) \$ 160
  - D) \$ 240
19. The purpose of the fourth phase (steps 10 through 12) of the target costing process is to ...
- A) develop a value-to-cost strategy and product and process improvement targets.
  - B) calculate target costs for the product (or service) and for major components.
  - C) specify customer needs and determining the customer value of the product or service.
  - D) understand customer needs and matching the needs to product or service features.
20. Andover Overhead Doors examined their process costs along with their Customer Value for Process Cost Matrix and identified high cost processes that were adding very little customer value. If Andover applies the generic cost-value strategies, they would ...
- A) emphasize the features produced by these processes to make them more valuable.
  - B) eliminate the features and the related process steps that make the process costly.
  - C) try to eliminate waste in the process while retaining all the features.
  - D) Ignore these processes to focus on processes adding higher value.
21. Olde English Kitchenware has a Pots and Kettles Value Stream. The Pots and Kettles Value Stream is trying to reduce the cost gap for a tea kettle. An improvement in a ceramic coating process is expected to reduce the overall process cost in the value stream by \$80,000. Apportioning the cost savings among all the products in the value stream, \$10,000 of the ceramic process savings would apply to the tea kettle. How much of the cost savings should be counted toward closing the cost gap and meeting the target cost for the tea kettle?
- A) \$0, process improvements do not count toward reducing product cost gaps.
  - B) \$10,000, the portion of the savings that can reasonably be attributed to tea kettle production.
  - C) Approximately \$10,000 but the actual amount will be based on actual production volumes.
  - D) \$80,000, the overall value stream savings helps meet the target return for the value stream.

## Discussion Questions and Problems

1. What is the purpose of target costing? How does target costing relate to lean management?
2. Could a conventionally managed company use target costing?
3. Explain why the initial design stage for a product or service is the ideal starting point for target costing.
4. How can target costing be the principal driver of value stream improvement? Think about what you have learned about lean management. How else might value stream improvement be driven? What usually drives improvement at conventionally managed companies?
5. Many internet-based companies offer information or services to users free of charge. How do they make money? Who are their customers?
6. Therma-Clear, makes windows for residential construction. Their Custom Value Stream focuses on providing windows for custom home construction and major renovations. Therma-Clear windows may be recommended by architects designing the houses, or by the general contractor. The homeowner has the final decision, but often the homeowner relies on the recommendation of the architect or contractor. The general contractor installs the windows or hires a subcontractor to do the installation. Who should Therma Clear's Custom Value Stream regard as their customer?
7. Describe basic features, performance features, and excitement features, and explain how they relate to customer needs and customer value.
8. What is the purpose of a Customer Needs – Product Features matrix such as the one presented in Figure 16.4? What does customer value weight measure?
9. Based on the Customer Needs – Product Features matrix in Figure 16.4, which of the following two features is feature is more important in creating value for the customer, the “rechargeable battery and power supply” feature or the “component density” feature? Briefly explain your answer.
10. Refer to the customer satisfaction diagram (figure 16.5). On which need(s) did ECI most underestimate the importance to the customer? On which need(s) did ECI most overestimate the importance to the customer? Where does ECI's failure to understand customer needs appear to have the greatest impact? Briefly explain your answer.
11. Refer to the customer satisfaction diagram (figure 16.5). On which need(s) does ECI currently have the greatest competitive advantage? On which need(s) does ECI have the greatest competitive disadvantage? On what customer need is improvement most critical for ECI? Overall, who is currently providing greater customer satisfaction, ECI or the competition? Briefly explain your answer.
12. What is the distinction between understanding customer needs, the first phase of target costing, and specifying customer needs, occurring in step 4?
13. Therma-Clear is doing a target cost analysis for a picture window it has been selling for \$550. Its toughest competitor offers a similar window for \$500. Therma-Clear plans improvement to its window that will match the competitor's ability to satisfy customer needs in every respect. In addition, the Therma-Clear window will have a higher R-Value than the

competitor's window. Therma-Clear estimates the net present value of the energy savings to the customer over the life of their window (25 years) is \$150. What is the customer value of the new window? Do you think Therma-Clear's selling price for the new window will be equal to the customer value you calculated? Briefly explain your answer.

14. Refer to the Customer Value for Business Processes matrix (figure 16.9). What does the equivalent percentage represent? Which value stream process contributes most and which contributes least to creating customer value?
15. Therma-Clear has decided that the selling price for its new high R-Value picture windows should be \$600. The value stream's required profit margin is 54%. They expect to sell 120 windows per month at the \$600 selling price. The value stream will have \$21,600 per month in material costs and \$18,800 in conversion costs. Compute the target cost per window, the monthly cost gap, and the current average cost gap per window.
16. Therma-Clear examined their process costs along with their Customer Value for Process Cost Matrix and identified high cost processes that were adding very little customer value. Can they simply eliminate the low value high cost features produced by these processes?
17. When a product is produced in a value stream along with several other products, how should target costs and cost gaps be computed?
18. Target Costing at XYZ Industries

XYZ Industries is using target costing to improve a family of hydraulic connectors it produces in the HC-OEM Value Stream. As the name implies, the HC-OEM Value Stream produces connectors for original equipment manufacturers – mostly manufacturers of pumps and filtration systems. The HC-OEM Value Stream team talked to their sales force and they also interviewed buyers, design engineers, production supervisors, sales people and customer service representatives at several key customers. The customers identified five needs, and each need was assessed for importance on a scale from 1 (low) to 5 (high). The customers also assessed the performance of XYZ and two key competitors on a scale of 1 (poor) to 5 (excellent) on each of the needs. The results are summarized in Table 1.

While the value stream improvement team was gathering and summarizing the assessments for table 1, they asked the value stream personnel to rate the importance of each of the needs identified by the customers. They also identified the product and process features that contributed to satisfying each customer need. The results are summarized in Table 2.

Table 1  
Customer Needs Importance and Performance Ratings

Customer Needs	Importance to Customer	Performance rating by customer		
		XYZ Industries	Competitor A	Competitor B
Precise machining	4	4	3	5
Perfect quality	4	4	3	3
Low price	5	3	5	4
Short lead times & flexibility	3	2	1	2
Reliable delivery	3	4	2	3

Table 2  
Importance of Needs as Perceived at XYZ, and  
Product & Process Features' Contributions to Satisfying Customer Needs

Customer Needs	Importance to customer as perceived by XYZ	Product & Process Features					
		Machining	Threading	SPC	Inspection	Pull system	Delivery schedule
Precise machining	5	●	●	▲	■	□	□
Perfect quality	5	▲	●	●	▲	□	□
Low price	3	□	□	■	□	●	□
Short lead times & flexibility	2	□	□	▲	□	●	●
Reliable delivery	4	□	□	■	□	●	●

Legend: High correlation = ●  
Medium correlation = ▲  
Low correlation = ■

Table 3  
Specification of Customer Needs

Customer Needs	Measurement	Target Value
Precise machining	Customer defined standard	Meet or exceed BA1292 & BA 9622 standards
Perfect quality	Rejects per million	Three sigma
Low price	Unit price to the customer	Less than \$60
Short lead times & flexibility	Lead time from order placement to shipment	5 working days
Reliable delivery	On time shipment based on customer requirement date	97.50%

Through their discussions with representatives at the OEMs, the HC-OEM Value Stream team specified customer needs and established target values for required performance, as shown in Table 3 above. Based on the specified customer needs, the HC-OEM value stream team planned improvements. They estimated the value to the OEMs of their enhanced hydraulic connectors. Their work is summarized in table 4 below.

The HC-OEM value stream team determined that their enhanced hydraulic connectors would be worth an average of \$63.20 to their OEM customers due to the added the quality and operational cost savings the enhanced connectors would provide. However, as noted in table 4 below, they plan to reduce the price from the current \$61.60 to \$59.00 to meet the price point demanded by the OEMs. They believe the reduced price and increased quality should allow them to increase unit sales volume by ten percent.

Table 4  
Calculation of Customer Value

<b>Customer Needs</b>	<b>Operational Impact</b>	<b>Revenue Impact</b>	<b>Financial Impact</b>	<b>Per unit value to customer</b>
Nearest competitive product				\$58.00
Precise machining: Engineering kaizens to improve design and tooling, match precision of customer B	Increased precision reduces assembly time for customer	None	Saving in operations or cost premium for competitor B	\$1.00
Perfect quality: Kaizens to improve SPC, increase quality	None	Should enhance perceived quality and sales LT	LT sales increase, warranty cost reduction	\$1.00
Low price: Reduce price from \$61.60 to \$59.00 to meet customers target cost needs. Kaizens to eliminate waste.	None	None	Savings of \$2.60 per unit	\$2.60
Short lead times & flexibility: SPC kaizens improve flow, waste elimination reduces lead time, increases flexibility.	Enables customers to meet demand with reduced inventory.	None	Inventory carrying cost and space savings.	\$0.60
Reliable delivery: SPC & waste elimination kaizens maintain delivery reliability advantage with shorter lead times.	None	None	Included in short lead times & flexibility above.	\$-
Total relative value to OEMs				\$63.20

The team then estimated the association of each of their production cells and processes with the value creating processes and features. Processes and cells were assessed as having either a high, medium, low, or no association with each value creating process and feature. The results of the value stream assessment are summarized in table 5 below.

Finally, the HC-OEM Value Stream team performed a cost analysis by capacity category for the current state of the value stream as shown in table 6 below. The HC-OEM value stream was currently producing and selling 22,500 hydraulic connectors per month with an average selling price of \$61.60 per connector. In addition to the employee and machine costs shown in table 6, the HC-OEM value stream had the following costs:

Material costs (in Machining)	\$ 496,350	(\$ 22.06 per connector)
Material costs (in Inspect & Pack	\$ 26,325	(\$ 1.17 per connector).
Tooling (in Maintenance)	\$ 15,583	
Facilities costs	\$ 4,172	

Table 5  
Business Process and Production Cell Association with Value Creating Processes and Features

Product and Process Features	Machining	Threading	SPC	Inspect & pack	Shipping	Customer service	Maintenance	Engineering	Management
Machining	●	□	□	□	□	□	□	■	□
Threading	□	●	□	□	□	□	□	▲	□
SPC	□	□	●	□	□	□	■	▲	□
Inspection	□	□	□	●	□	□	□	□	□
Pull system	□	□	□	□	□	●	□	●	□
Delivery schedule	□	□	□	□	■	●	●	▲	□

Legend: High association = ●  
Medium association = ▲  
Low association = ■

Table 6  
Current Value Stream Cost Analysis

	Total	Machining	Threading	SPC	Inspect & Pack	Shipping	Customer Service	Maintenance	Engineering	Management
<b>Employees</b>										
Cost	182,520	21,060	21,060	14,040	7,020	10,530	28,080	52,650	17,550	10,530
Productive	10%	31%	19%	0%	11%	39%	9%	0%	0%	0%
Non-Productive	58%	63%	63%	13%	51%	23%	57%	77%	67%	67%
Unused available capacity	32%	6%	18%	87%	38%	38%	34%	23%	33%	33%
<b>Machines</b>										
Cost	261,791	149,299	111,974	-	-	518	-	-	-	-
Productive	67%	81%	50%	0%	0%	28%	0%	0%	0%	0%
Non-Productive	20%	16%	23%	0%	0%	65%	0%	0%	0%	0%
Unused available capacity	13%	3%	27%	0%	0%	7%	0%	0%	0%	0%



XYZ Industries has a target return on sales of 35% for the HC-OEM value stream.

Required:

- A. Who are the customers of the HC-OEM Value Stream of XYZ Industries? Is the value stream task force talking to the right people?
- B. Following Figure 16-4, create a table matching the HC-OEM Value Stream's customer needs to product and process features and compute a customer value weight for each product and process feature. Which product or process feature creates the most value for customers?
- C. Create a customer satisfaction diagram for the HC-OEM Value Stream similar to the one shown in Figure 16-5. How did the perception of the importance of customer needs held by members of the HC-OEM Value Stream team differ from those expressed by OEM representatives? What are the HC-OEM Value Stream's greatest strengths and weaknesses in providing customer satisfaction? What are the HC-OEM Value Stream's greatest competitive advantages and disadvantages?
- D. Consider the calculation of customer value summarized in Table 4. If the HC-OEM Value Stream task force has calculated the value of their hydraulic connectors to be \$63.20 after planned improvements, why aren't they planning to charge \$63.20? Does this mean the calculation is wrong? What is the most significant change the HC-OEM Value Stream is planning to make from a value perspective? What implication does your answer have for the improvements the HC-OEM Values Stream will need to make to meet its target cost?
- E. Using a value weighting of 5 for high association, 3 for medium association, and 1 for low association in Table 5, determine the customer value apportioned to each process and express the value as a percentage of overall value, following Figure 16.9. Which process contributes most to creating value? Leaving management aside, which process contributes least to creating value?
- F. Complete the financial section of the HC-OEM box score for the current state (22,500 connectors at \$61.60) using the cost information provided in Table 6 and the above narrative. Compute the cost gap in total and on a per unit basis if HC-OEM reduces the price to \$59.00 and the sales volume remains at 22,500 per month.
- G. Use the information from table 6 and the table you created in requirement E to perform a cost value analysis on the processes. Which processes are high value, low cost, and which are low value high cost? Use your analysis to suggest general improvement strategies for two processes
- H. Complete the financial section of the HC-OEM box score for the future state assuming the following results from the planned kaizens:
  - a. Unit sales have increased 10 percent due to the lower price and improved quality.
  - b. Material costs in machining have been reduced from \$22.06 per connector to \$21.56 by reducing waste.

- c. Material costs in Inspect & Pack have been reduced from \$1.17 to \$.75 per connector.
- d. Sufficient excess capacity was created in Machining, Threading, Inspect & Pack, and Shipping to handle the increased volume without added resources. Labor costs were reduced by \$3,510 each in Threading, Inspect & Pack, and Shipping by redeploying people to other value streams.
- e. Overall machine costs were reduced by \$4,480 in Machining and \$2,240 in Threading despite the increase in volume.

If the 35% return on sales target is not satisfied, compute the future state cost gap in total and on a per unit basis. Where would you look for additional improvements to close the cost gap?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 17: Expanding Value Streams Outside Our Four Walls

1. Which of the following is not a principle of lean thinking?
  - A) Value, from the perspective of the end-use customer must be identified and created.
  - B) Value stream – a “stream” of connected, interdependent activities creates value for customers.
  - C) Waste – non value-adding work should be eliminated immediately.
  - D) Empowerment – continuous improvement is the responsibility of everyone, so people need access to good information and the authority to make changes.
2. Which of the following is the best definition of the term value stream?
  - A) The activities that occur within a single production cell.
  - B) The set of production activities a company uses to produce a product for a customer.
  - C) The set of all activities a company uses to create and deliver a product or service to a customer.
  - D) The set of all activities required to design, produce, and deliver a finished product or service to an end use customer.
3. For companies that sell to other companies (business-to-business) the prime point of contact is usually ...
  - A) the sales department in contact with the customers’ purchasing department.
  - B) the sales department in contact with customers’ manufacturing departments or cells.
  - C) the sales department with the customers’ warehouse personnel.
  - D) the design engineers with the customers’ purchasing department.
4. How should a lean company manage information flow between its suppliers and customers?
  - A) To avoid duplication, all information from customers should flow through sales and all information from suppliers should flow through purchases.
  - B) They should integrate information systems with their customers and suppliers or create networks of relationships throughout their organization.
  - C) They should minimize contact with suppliers to encourage competition, and all information from customers should flow through sales and product design.
  - D) To improve flow, all information from customers and suppliers should flow through production.
5. Which of the following is an advantage that can be obtained through collaboration with suppliers and customers?
  - A) Duplication of efforts such as order and payment processing by customer and supplier can be reduced or eliminated.
  - B) Information flow can be restricted to improve security.
  - C) Key functions or activities can be shared regardless of competence or expertise of the parties involved.
  - D) Key functions or activities can be outsourced to save money.

6. Eight percent of the overall value of Therma-Clear's high R Value windows is attributed to the assembly process, ranking it fifth highest of 12 business processes at Therma-Clear. Assembly uses ten percent of the overall conversion costs, the fourth highest percentage of 12 business processes at Therma-Clear. What is the value-cost ratio for the Assembly process?
  - A) 80%
  - B) 125%
  - C) 114.3%
  - D) 87.5%
7. Eight percent of the overall value of Therma-Clear's high R Value windows is attributed to the assembly process, ranking it fifth highest of 12 business processes at Therma-Clear. Assembly uses ten percent of the overall conversion costs, the fourth highest percentage of 12 business processes at Therma-Clear. How would Therma-Clear's assembly be classified?
  - A) Low cost, high value.
  - B) High cost, low value.
  - C) High cost, high value.
  - D) Low, cost, low value.
8. \_\_\_\_\_ processes can be considered a core competence if the proportion of value created exceeds the cost, but otherwise the process could be considered for outsourcing.
  - A) Low cost, high value
  - B) High cost, low value
  - C) High cost, high value
  - D) Low, cost, low value
9. \_\_\_\_\_ processes should be eliminated if possible, or considered for outsourcing.
  - A) Low cost, high value
  - B) High cost, low value
  - C) High cost, high value
  - D) Low, cost, low value
10. Beneficial collaborations between a supplier and a customer ...
  - A) cannot be identified using macro value stream maps.
  - B) must be initiated by the supplier, not the customer.
  - C) must be initiated by the customer, not the supplier.
  - D) can be initiated by either the customer or the supplier.

#### Discussion questions and problems

1. You are at a busy airport walking to the gate for your connecting flight. You know meals will not be served on your next flight. You see a McDonalds with only a couple of customers in line at the register and decide to stop and get a large order of French Fries to tide you over. Taking a broad perspective, describe the French Fries value stream.
2. Enormous Motors Corporation (EMC) has embarked on a lean transformation in hopes of competing more effectively with Toyota and other automobile companies. They used to carry 60 days inventory of most parts and they received weekly or monthly shipments from suppliers. Now they demand daily shipments from suppliers like Flint Fuel Systems. EMC's inventory turns have improved dramatically, and their dock-to-dock times have improved. Flint Fuel Systems, like most EMC suppliers, is a conventionally managed company. To

satisfy EMC, their biggest customer by far, they try to keep 90 days inventory of all the components they produce for EMC avoid stock-outs. Has EMC's lean transformation eliminated waste in the value stream?

3. Hinckley Hinges makes decorative hardware that it sells to hardware and home improvement stores. Hinckley's customers wanted the products to be easy to unpack and display on store shelves. Listening to their customers, Hinckley ships their hardware in blister packs that protect the hardware and can be easily slid onto display hangers. This has reduced stocking time, and inventory damage experienced by its customers. Homeowners buying Hinckley hardware have great difficulty opening the blister packs. They sometimes scratch or mar the hardware or cut the installation instruction sheet opening the blister pack. The blister pack material is a plastic that is not accepted for recycling by most communities. Has Hinckley's packaging added value?
4. Has Hinckley's packaging eliminated waste in the value stream?
5. Which is the more effective way to efficiently deliver value to the end-use customer, collaborative relationships with customers and suppliers or arms length relationships governed by market forces?
6. Consider the Customer Service process in Table 17.1 and Figure 17.5. What would you recommend ECI do: (1) continue to provide customer service, but improve it, (2) have a customer or supplier perform most or all of the customer service activity, (3) outsource customer service (to a company other than their customers and suppliers)? Does your answer change if it costs more to outsource than it currently costs ECI to perform customer service in house?
7. Why do you think Superior Meter Company was able to successfully collaborate with Automobile Interiors Company? What factor or factors were key to the success?
8. The following table lists the percentage of conversion costs and the percentage of total value associated with each process in a future state for the HC-OEM Value Stream of XYZ Industries (see the Chapter 16 problem 17 for more details). The HC-OEM Value Stream produces hydraulic connectors for original equipment manufacturers of pump and filtration systems.

Business Process	Percentage of Conversion Cost	Percentage of Total Value
Machining	39%	8%
Threading	30%	10%
SPC	3%	12%
Inspect & Pack	1%	4%
Shipping	2%	2%
Customer Service	7%	21%
Maintenance	12%	10%
Engineering	4%	33%

Map the processes on a cost value matrix as in figure 17.5. Which processes represent strengths to build on? Which processes should be explored for customer supplier collaboration?

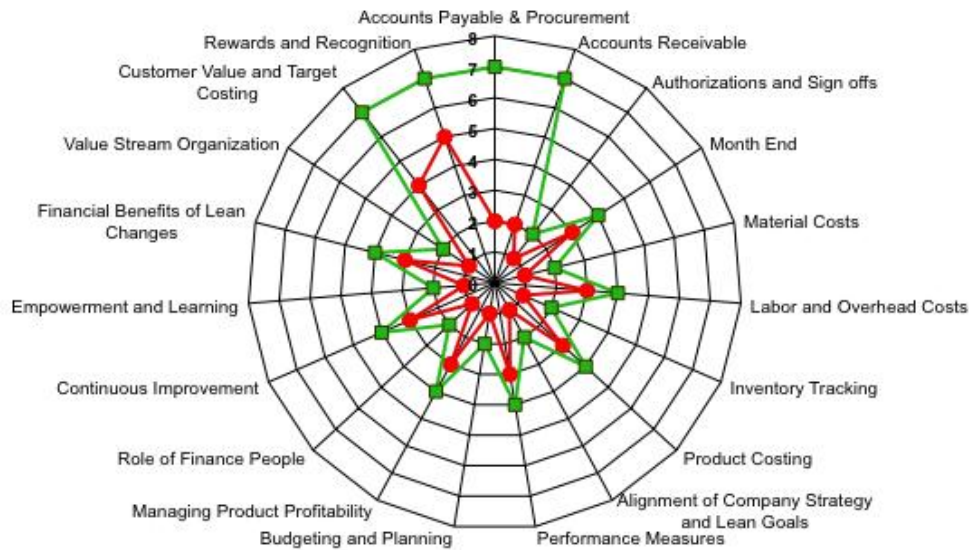
## **PRACTICAL LEAN ACCOUNTING**

### Chapter 18: The Lean Accounting Diagnostic

1. Which of the following is **not** an accounting change that can be implemented during the Piloting Lean Cells stage.
  - A) Create new cell level performance measurements.
  - B) Calculate the financial benefits of lean improvements.
  - C) Link value stream cost analysis to sales and operations planning.
  - D) Eliminate waste from financial accounting processes.
2. Which of the following is **not** an accounting change that is typically implemented during the Managing by Value Stream stage.
  - A) Extend value stream analysis outside the company to suppliers, customers, and partners.
  - B) Replace standard costing with direct costing with features and characteristics
  - C) Performance measures at the value stream level are integrated with strategic or corporate measures.
  - D) Link value stream analysis to sales and operations planning.
3. The use of target costing is associated with the \_\_\_\_\_ phase.
  - A) Traditional
  - B) Piloting Lean Cells
  - C) Managing by Value Stream
  - D) Lean Enterprise
4. The lean accounting diagnostic tool is used to ...
  - A) Assess the current state of lean accounting at a company but does not address future plans.
  - B) Assess the current state of lean accounting at a company, and provide a basis for developing an action plan to reach the desired future state.
  - C) Assess the current state of lean accounting at a company and compare it to the ideal lean accounting implementation.
  - D) Assess the current state of lean accounting at a company and compare it to a benchmark company.
5. The lean accounting diagnostic has nineteen assessments grouped in five diagnostic areas. A move from multiple entries for labor and materials for tracking and costing work-in-process to visual controls would show progress in the \_\_\_\_\_ diagnostic area.
  - A) financial accounting
  - B) operational accounting
  - C) management accounting
  - D) lean business management

Use the following chart to respond to questions 6 and 7

### Lean Accounting Diagnostic



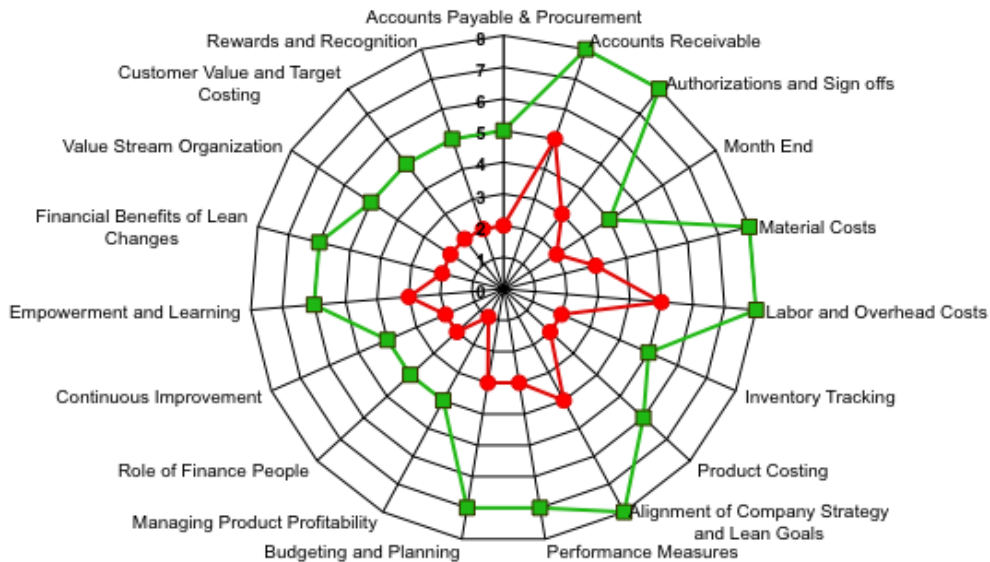
6. The interior area on the chart outlined by the points marked by circles represents ...
  - A) the current state of lean accounting at the company
  - B) the desired future state of lean accounting at the company.
  - C) the state of lean accounting at a benchmark company.
  - D) either the current state at the company or a benchmark company, a legend is needed to identify which is which.
  
7. The scores on some assessments (for example, customer value and target costing, and rewards and recognition are much higher than on others. For the current state, the higher scores mean that ...
  - A) the company has changed too fast in these areas and needs to move back to a level of maturity more consistent with the other dimensions.
  - B) the company currently has a higher level of lean accounting maturity in these areas.
  - C) the company should work on these areas until they can earn a score of 8 before moving on to other areas.
  - D) the company should not work to further advance in maturity in these areas, until they have caught up in other areas.

#### Discussion questions and problems

1. What is the purpose of the lean accounting diagnostic?
2. How does the lean accounting maturity path relate to the lean accounting diagnostic?

3. Name the five lean accounting diagnostic areas and describe in general terms the shift from traditional accounting to mature lean accounting in each diagnostic area.

### Lean Accounting Diagnostic



4. The above diagnostic was completed by a division of a Fortune 1000 corporation. Required:
  - A. On which area or areas and on which specific assessments does the division currently have the highest level of maturity?
  - B. On which area or areas and on which specific assessments does the division currently have the lowest level of maturity?
  - C. On which area or areas and on which specific assessments does the division want to make the greatest progress in the immediate future?



## **PRACTICAL LEAN ACCOUNTING**

### Chapter 19: Performance Measurement Linkage Chart

1. Critical success factors are ...
  - A) economic conditions necessary for a given plan to succeed.
  - B) measures of goals specified in a company strategy.
  - C) drivers, factors that will enable strategic goals to be achieved.
  - D) summary financial measures required by the SEC.
2. Performance measures are needed for ...
  - A) strategic goals for the overall company, the value streams, and production cells but not the critical success factors.
  - B) critical success factors and strategic goals for the overall company, the value streams, and production cells.
  - C) critical success factors. If the CSFs are achieved the goals will be achieved.
  - D) only the critical success factors and goals that can be expressed in financial terms.
3. What determines the frequency with which measures should be gathered and reported?
  - A) External reporting requirements. Measures are usually reported quarterly or monthly.
  - B) The payroll reporting period. Measures are usually reported weekly or bi-weekly.
  - C) The type of measure (operational or financial). Operational measures are usually reported each shift, or daily, financial measures are usually reported weekly.
  - D) The speed of change, how rapid the response must be, and the time required for change to appear in performance for the system or activity being measured. Measurement frequency can vary from almost instantly to weekly or even monthly.
4. What determines the type of control that should be used on the processes being measured?
  - A) The nature of the process (manual or automated).
  - B) The sophistication of the information system.
  - C) The speed of change, how rapid the response must be, and the time required for change to appear in performance for the system or activity being measured.
  - D) The nature of the process (manual or automated), the speed of change, how rapid the response must be, and the time required for change to appear in performance for the system or activity being measured.
5. To be effective, lean performance measures should be focused on ...
  - A) looking at the past and understanding causes to assign credit or blame.
  - B) understanding root causes and performance improvement to meet future goals.
  - C) looking at the past and recording results.
  - D) recording past results and comparing them to future goals.
6. The process of developing performance measures should begin with ...
  - A) a standard set of company level measures that apply to all lean companies.
  - B) the company's strategy.
  - C) each value stream creating measures.
  - D) establishing measures for each of the production cells.

#### Discussion questions and problems

1. What are critical success factors?

2. What should lean organizations measure, results, processes or both?
3. What determines how often measurements must be made and reported?
4. What is the focus of lean performance measurement and how does that focus differ from traditional financial reporting?
5. What is the purpose of the performance measurement linkage chart? Briefly describe how the chart is used to achieve its purpose.
6. AAA Access Control Inc. Performance Measurement

AAA Access Control Inc. produces and sells a wide variety of security and access control devices. The corporate goals are: (1) to be the industry leader in product and process innovation, (2) to be recognized for having products able to completely satisfy customer needs, (3) to be highly profitable while offering great value to customers through cost efficiency. They also have sales growth and profitability goals, and they want to reduce inventory to increase cash flow.

The Card Division designs and produces cards containing magnetic strips, chips or RFID devices for swipe or proximity access control. The division plans to contribute to AAA Access Control's goals by (1) offering rapid customization to customers (2) providing perfect quality and on-time delivery with short lead times, and (3) continually improving cost performance and eliminating waste through lean management.

The Card Division's goals for the coming year are:

- 20% sales growth.
- Inventory turns greater than 15.
- Five day lead-time from approved design to shipment.
- Two day lead-time from customer request to design approval for custom cards.
- 99.9% external quality, 99% internal quality.
- 95% on-time delivery.
- Profitability – target ROS.
- One implemented improvement per employee per month.

The Custom Card Value stream receives orders from customers and designs a card to meet their specifications. Once the design is approved, the cards go into production. One of the production cells in the Custom Card Value Stream is a Lamination Cell, where the layers are laminated to a sheet of basic card stock to make the completed card.

Required:

- A. Identify critical success factors for the Custom Card Value Stream. What must it do to be successful in contributing to the Card Division's goals?
- B. Create a performance measurement linkage chart For the Card Division, the Custom Card Value Stream and the Lamination Cell. Use the Card Division's goals and the starter set of value stream and cell measures.
- C. Are all Card Division goals supported by Value Stream measures? If not, suggest one or more additions to the starter set that would support the Card Division's goals.

## ***PRACTICAL LEAN ACCOUNTING***

### Chapter 20: Transaction Elimination Maturity Path Table

1. When can transactions be eliminated?
  - A) Immediately following the decision to begin a lean transformation. Recording transactions is wasteful and should be eliminated.
  - B) When processes are stable and under control, and recording transactions is no longer necessary to ensure reasonably accurate information.
  - C) Immediately for transactions used for internal reporting purposes, but never for transactions supporting external financial reports.
  - D) Only after the organization is a fully mature lean enterprise.
2. What is a transaction elimination maturity path table?
  - A) A standard chart of transactions that can be eliminated at each stage of lean accounting maturity.
  - B) A table that categorizes a company's lean accounting maturity based on the transactions they have eliminated.
  - C) A table showing which transactions are required to be eliminated based on the stage of lean manufacturing maturity.
  - D) A table used to assess the current and planned future states of lean production and lean accounting maturity and to plan the orderly elimination or replacement of transaction driven processes.
3. Which of the following best describes how the transaction elimination maturity path table should be used?
  - A) Managers assess the current state and planned future state of lean production, and prepare a table planning for the orderly elimination of transactions no longer needed at each stage of maturity.
  - B) Managers decide which transactions they would like to eliminate and look up on the table the level of lean production they need to have in order to do so.
  - C) Managers look up the level of lean accounting maturity on the table and based on the table they switch off the transaction modules in their ERP system that are no longer required.
  - D) Managers eliminate transactions and look up on the table the level of lean accounting maturity they have achieved.
4. What is the relationship between the transaction elimination maturity path table and a detailed action plan to eliminate transactions?
  - A) They are the same. Transaction elimination maturity path table is another term used to describe a detailed action plan.
  - B) The transaction elimination maturity path table provides guidance for development of a detailed action plan by a lean accounting team.
  - C) The transaction elimination maturity path table will be used to evaluate the results of the detailed action plan.
  - D) The detailed action plan leads to the development of the transaction elimination maturity path table.

5. How can process maps facilitate transaction elimination?
- A) Process maps can make waste visible, showing how many transactions are required and where they are required to complete a process.
  - B) Process maps can help in understanding the current state process.
  - C) Process maps can be used to show how and where in the process transactions will be eliminated.
  - D) A, B, and C are all ways that process maps can facilitate transaction elimination.

#### Discussion questions and problems

1. If transactions are wasteful, why are they so prevalent in control systems?
2. If transactions are necessary for control, how can they be eliminated as lean production and lean accounting matures? Give one example of transaction elimination that does not lead to a loss of control.
3. What is the transaction elimination maturity path table, and how is it used?
4. What is the relationship between the lean accounting maturity path, the lean accounting diagnostic, and the transaction elimination maturity path table?

## **PRACTICAL LEAN ACCOUNTING**

### Chapter 21: Value Stream Cost Analysis

1. Value stream cost analysis ...
  - A) is concerned only about bottleneck processes within the value stream.
  - B) shows how resources in the value stream are being used.
  - C) shows the total cost of resources in the value stream but does not show how those resources are used.
  - D) shows the cost of resources in the value stream but not the capacity utilization.
2. Which of the following is **not** a typical use of value stream cost analysis?
  - A) To show the trend in summary capacity usage over time.
  - B) To show the change in capacity usage associated with planned improvements.
  - C) To compute standard costs for financial reporting.
  - D) To match production output to customers needs.
3. \_\_\_\_\_ are a source for much of the basic value stream data gathered during the “define the value stream” step of value stream cost analysis.
  - A) Current and future state value stream maps.
  - B) Benchmarking studies.
  - C) Payroll reports.
  - D) Machine depreciation records.
4. For the purposes of capacity analysis, **total** available time for workers in the value stream for a month is ...
  - A) total productive time – total non-productive time.
  - B) total productive time + total non-productive time.
  - C) (hours per shift – time per shift for breaks) × shifts per day × working days per month.
  - D) 24 hours × working days per month.
5. Total time used in productive activity for a machine in the value stream for a month is ...
  - A) total good units produced × machine process time per unit.
  - B) (total good units produced × machine process time per unit) + rework time.
  - C) the same as the productive time for the workers in the process.
  - D) (total good units produced × machine process time per unit) + preventive maintenance time.
6. Total time used in non-productive activity for workers in the value stream for a month includes ...
  - A) time performing preventive maintenance on machines.
  - B) time moving materials.
  - C) time spent on kaizen blitz process improvement activity.
  - D) all of the above.

Use the following information for questions 7, 8 and 9

Continental Flange operates a single eight-hour shift five days per week. Workers have a 30-minute paid lunch period and two 15-minute breaks each day. During the most recent week, 1,520 flanges were ground, with 60 requiring rework and 20 being scrapped, 1,500 flanges were

moved from grinding to the next process. Each flange requires 30 seconds of labor time. Reworking flanges takes on average the same amount of time as the initial process. The single worker in the grinding process set up the grinder for different model flanges eight times, averaging 75 minutes per setup. The worker also spent two hours in meetings and administrative activities during the week, two and a half hours on preventive maintenance, and 90 minutes cleaning the work area.

7. Total time used in productive activity for the worker for the week was ...
  - A) 720 minutes.
  - B) 750 minutes.
  - C) 780 minutes.
  - D) 790 minutes.
8. Total time used in non-productive activity for the worker for the week was ...
  - A) 850 minutes.
  - B) 960 minutes.
  - C) 990 minutes.
  - D) 1,000 minutes.
9. Available but unused time for the worker for the week was ...
  - A) 350 minutes.
  - B) 500 minutes.
  - C) 680 minutes.
  - D) 0 minutes.

Use the following information for questions 10, 11 and 12

Continental Flange operates a single eight-hour shift five days per week. During the most recent week, 1,520 flanges were ground, with 60 requiring rework and 20 being scrapped, 1,500 flanges were moved from grinding to the next process. Each flange requires an average of 45 seconds of time on the grinding machine. Reworking flanges takes on average the same amount of time as the initial process. The grinding machine was set up for different model flanges eight times, averaging 75 minutes per setup. The grinding machine was down twice for repairs, once for 3 hours and once for one hour. The grinding machine was also idle for 100 minutes while cleaning and regularly scheduled maintenance took place.

10. Total time used in productive activity for the grinding machine for the week was ...
  - A) 1,125 minutes.
  - B) 1,140 minutes.
  - C) 1,185 minutes.
  - D) 1,285 minutes.
11. Total time used in non-productive activity for the grinding machine for the week was ...
  - A) 60 minutes.
  - B) 300 minutes.
  - C) 900 minutes.
  - D) 1,000 minutes.

12. Total available but unused time for the grinding machine for the week was ...
- A) -25 minutes.
  - B) 0 minutes.
  - C) 100 minutes.
  - D) 275 minutes.

Discussion questions and problems

1. A critical part of VSCA, value stream cost analysis, is value stream capacity analysis. What is the link between capacity and cost, and why is it so important to analyze value stream capacity?
2. Describe four ways value stream cost analysis can be used to support planning, decision-making and performance evaluation.
3. The Hand Load / Wave Post process had 27% available capacity in the current state. Why do you think it had eleven workers, when the capacity analysis suggests it could get by with fewer workers?
4. In the future state even more unused available capacity is created in the Hand Load / Wave Post operation. How could ECI take advantage of this added capacity?
5. BWP Bats is a boutique baseball bat maker located in Pennsylvania. They currently make over 200 models of baseball bats to the specifications of major league baseball players and minor league teams. A key part of the bat making process is the lathe operation, where a 37-inch long, 2¾ inch diameter cylinder of ash or maple called a billet is placed in a computerized lathe and shaped to the model specifications. BWP runs a shift from 7:00 AM – 3:30 PM (8.5 hours) Monday through Friday. There were four 5-day weeks during February. There were 2,930 billets processed by the lathe during February, producing 2,880 good bats and 50 that had to be scrapped. It takes 108 seconds to shape a bat on the lathe. The lathe was set up for 140 different models during February. It takes four minutes to program and set up the lathe for each model. The lathe is down for cleaning and maintenance 30 minutes per day, and it was stopped twice during the month for unscheduled cutting tool replacement, with each stoppage taking 75 minutes.

There was only one worker in the lathe operation during February. Workers get a ten minute break every morning and afternoon, and a 30 minute unpaid lunch break. The breaks and lunch time are not included in total available time. There are 120 seconds of manual labor per bat associated with the lathe process. Some of the manual labor on one bat can take place while another bat is being turned on the lathe. The lathe worker performs the setups, but was not involved with the unscheduled cutting tool replacements, which were performed by the repair staff. The lathe worker spent half an hour per day cleaning and maintaining the lathe and another 24 minutes per day on average in meetings and performing administrative tasks.

- a. Based on the information above, report productive, non-productive, and unused available capacity for the machine (the lathe) in BWP Bat's lathe process for February.
- b. Based on the information above, report productive, non-productive, and unused available capacity for the employee in BWP Bat's lathe process for February.

6. Analyze the capacity for the current state for Caspian Corporation – Motors Value Stream (Requirement B of problem 11 in chapter 4, found on page 20 of this question file).
7. Analyze the capacity for the future state for Caspian Corporation – Motors Value Stream (Requirement B of problem 12 in chapter 4, found on page 23 of this question file).
8. Analyze the capacity for the current state for the Accounts Payable Process at Brand X Corporation (Part b of requirement A for problem 11 in chapter 6, found on page 30 of this question file).
9. Analyze the capacity for the current state for the Accounts Payable Process at Brand X Corporation (Part b of requirement A for problem 12 in chapter 6, found on page 33 of this question file).



## **PRACTICAL LEAN ACCOUNTING**

### Chapter 22: Value Stream Mapping

1. What is a value stream map?
  - A) A diagram showing all the companies involved in supplying materials or components for a family of products in a value stream.
  - B) A map showing delivery routes to customers of a family of products in a value stream.
  - C) A factory floor map showing the routings for a family of products in a value stream.
  - D) A diagram showing the material and information flows in a value stream.
2. Which of the following statements describes a way the lean accounting uses value stream maps?
  - A) The current and future state value stream maps form the basis for calculating the financial benefits of lean improvements.
  - B) The value stream box score prepared in lean accounting is a part of the value stream map.
  - C) Daily and weekly cell measures are reported on the value stream map
  - D) The value stream map replaces the general journal for the value stream.
3. Accounting and Information processes such as billing and collection and accounts payable ...
  - A) are support processes that occur outside the value stream and should not be included in value stream maps.
  - B) are part of the value stream but they should not be included on value stream maps.
  - C) are part of the value stream and can be added to the production processes shown on value stream maps.
  - D) are irrelevant to value stream mapping and accounting for the value stream.
4. The data boxes on the value stream maps ...
  - A) contain a standard information set that is the same for all companies using value stream maps.
  - B) are the principal source of information for value stream cost and capacity analysis.
  - C) are only completed for production processes, not support processes.
  - D) are the same for production and non-production (support processes).
5. All of the following are items that might appear in a data box for a production process on a value stream map except ...
  - A) production cycle time.
  - B) number of employees.
  - C) standard cost per unit for the process.
  - D) production demand quantity.

#### Discussion questions and problems

1. What is a value stream map? Why do managers and employees create value stream maps?
2. How are value stream maps used in lean accounting?

3. Should support processes and the accompanying data boxes be included on the value stream map? Provide one argument supporting their inclusion and one supporting their exclusion.
4. Consider the SMT production cell for ECI shown in figures 22.1 and 22.2. Recommend additional information that could be included in the data box to support value stream cost and capacity analysis.