Management Accounting

Information for Decision Making and Strategy Execution

Sixth Edition

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PEARSON

MyAccountingLab
either by reengineering the process or possibly looking to an outsider to undertake one or more of the processes.

**Some Process Costing Wrinkles**

As you might expect process costing systems are usually more complicated than that shown in Exhibit 4-15. To illustrate one of the more important practical considerations in process costing, consider the following example.

**Donald’s Ducks**

Donald’s Ducks has just gone into business to manufacture hand-carved wooden ducks. The manufacturing process begins with a solid block of pine. Each craftsman then uses chisels, small sanders, and polishers to create the final product, which is given a light coat of clear stain.

During the most recent period, 3,500 blocks of wood were entered into production. At the end of the period 2,500 units had been completed and shipped off to customers. Exhibit 4-16 summarizes the costs incurred during the most recent period.

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td>$42,000</td>
</tr>
<tr>
<td>Direct labor</td>
<td>80,000</td>
</tr>
<tr>
<td>Variable factory overhead</td>
<td>8,000</td>
</tr>
<tr>
<td>Fixed factory overhead</td>
<td>$94,000</td>
</tr>
<tr>
<td>Total cost this period</td>
<td>$224,000</td>
</tr>
</tbody>
</table>

Direct materials costs relate almost entirely to the cost of the pine blocks. Direct labor refers to the wages paid to factory employees who carve the ducks. Variable factory overhead refers to the consumables such as chisels, sanding disks, and stains the carvers use. The fixed factory overhead relates to the cost of supervisory and other factory workers and other factory-related costs such as heating, electricity, and depreciation on factory equipment.

If all production had been completed, the process costing would be trivial since the cost of each duck would be computed as $64.00 ($224,000/3,500). The issue that arises in process costing, particularly for financial reporting purposes, is how to account for partially completed work in process. To do this, we use the concept of an equivalent unit of production, which expresses the work equivalent, in finished units of the work, that has been invested in work in process. For example, the equivalent units of 100 units that are 40% complete are 40 (100 x 40%).

Process costing systems use two different cost terms: direct materials costs and conversion costs. **Conversion costs** include all manufacturing costs that are not direct materials costs; that is, conversion costs consist of labor and factory overhead.

In the case of Donald’s Ducks, direct materials costs are $42,000 and conversion costs are $182,000 (80,000 + 8,000 + 94,000). To undertake process costing for this simple example, we begin by identifying the physical flow as shown in Exhibit 4-17.

Next we compute equivalent units. For any units that are completed, the number of equivalent units will equal the number of physical units. So our focus is on the ending work in process. Notice that since all materials are introduced at the start of production, all units in work in process will be 100% complete with regard to materials. Therefore, the equivalent units with respect to materials will equal the physical units and will be 1,000. Now suppose that, on average, the ending work in process is
Chapter 4 Accumulating and Assigning Costs to Products

Exhibit 4-17
Donald’s Ducks: Physical Flows

<table>
<thead>
<tr>
<th>PHYSICAL FLOW</th>
<th>PHYSICAL UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening work in process</td>
<td>0</td>
</tr>
<tr>
<td>Started this period</td>
<td>3,500</td>
</tr>
<tr>
<td>Units to account for</td>
<td>3,500</td>
</tr>
<tr>
<td>Completed and transferred out</td>
<td>2,500</td>
</tr>
<tr>
<td>Ending work in process</td>
<td>1,000</td>
</tr>
<tr>
<td>Units accounted for</td>
<td>3,500</td>
</tr>
</tbody>
</table>

10% complete with regard to the total work that has to be done to turn the original block of wood into the finished product. Therefore, the work done on the 1,000 blocks of wood in ending inventory is equivalent to 100 (1,000 \times 10\%) units of conversion work on completed units. Exhibit 4-18 summarizes our work so far.

Next we introduce the costs we need to account for. Exhibit 4-19 summarizes the costs noted in Exhibit 4-16.

The next step is to compute the cost per equivalent unit of work. To do this, we divide the total materials cost by the equivalent units of materials and the total conversion costs by the equivalent units of conversion. Exhibit 4-20 shows this calculation.

Exhibit 4-20 provides important management information since it pinpoints the cost per unit produced for each of the major production activities. The calculation shows that the materials costs per duck is $12 and the total manufacturing cost to convert the raw block of wood into the finished product is $70.

The final step is to use the equivalent cost calculation to allocate the total manufacturing costs to ending work in process and the finished goods. Exhibit 4-21 summarizes how costs would be distributed to ending work in process and finished goods. Note that, as required, all manufacturing costs have been accounted for.

Final Comments on Process Costing

In practice, process costing is more complicated when production involves multiple departments and defective (spoiled) production. However, the principles and the
Objectives remain the same: compute the cost per equivalent unit for each of the components of manufacturing in order to identify where process improvements (i.e., cost reductions) might be possible. Dealing with these more complex issues is left to a more advanced course in management accounting.
Epilogue to STRICT’S CUSTOM FRAMING

Here is what Enid did to estimate the other costs involved in framing the portraits:
First she identified the three departments used to complete the framing. The first
department, Manufacturing Division, cut the frame pieces from the stock provided
by the supplier and assembled the frames. Enid estimated that the total of all over-
head costs in the Manufacturing Division, including labor, machinery, and other
supplies was about $675,000. Since work in this department was labor intensive
and labor driven, Enid decided that costs in this department were driven by labor
hours. Enid estimated that the labor capacity in the Manufacturing Division was
15,000 hours so she estimated the conversion cost per labor hour as $45 per hour
($675,000 / 15,000). From observing workers prepare the prototype frame, Enid be-
thieved that a reasonable estimate of the time required to produce a frame in this
department was 0.20 hour.
Chapter 4  Accumulating and Assigning Costs to Products

The second department in the framing operation is the Finishing Division. In this division workers complete the framing by adding the portrait, mat, glass, backing, and hardware. Enid estimated that the total of all overhead costs in the Finishing Division, including labor, machinery, heat, and other supplies, is about $625,000. Since work in this division is labor intensive and labor driven, Enid decided that costs in this department are driven by labor hours. Enid estimated that the labor capacity in the Finishing Division is 25,000 hours so she estimated the conversion cost per labor hour as $25 per hour ($625,000/25,000). From observing workers prepare the prototype frame, Enid believed that a reasonable estimate of the time required to finish the frames in this department is 0.30 hour.

The third department in the framing operation is the Packaging Division. In this division the frame is placed on the bed of a small machine that wraps the finished portrait first in bubble wrap, cardboard, and then paper before applying a sealing tape. Enid estimated the total overhead costs in this division, which consists of labor and machine overhead, to be $150,000. Since work in the Packaging Division is machine driven, Enid decided that costs in this department are driven by machine hours. Enid estimated the capacity in the Packaging Division to be 5,000 machine hours and the estimated conversion cost per machine hour to be $30 per hour ($150,000/5,000). The time to package a finished product is about 0.25 minute (while the employee placed the product on the packaging machine bed), 0.30 minute per square foot of portrait wrapped, and 0.50 minute to remove the wrapped portrait from the packaging machine and place it in the shipping bin. The size of these portraits is approximately 2 square feet.

With this information Enid developed the cost summary shown in Exhibit 4-22.

### Exhibit 4-22
Strict's Custom Framing: Cost Summary

| Direct Cost | $350.00 |
| Shipping | 100.00 | $450.00 |

<table>
<thead>
<tr>
<th>Conversion Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Division (0.20 hours @ $45.00)</td>
<td>$9.00</td>
</tr>
<tr>
<td>Finishing Division (0.30 hours @ $25.00)</td>
<td>7.50</td>
</tr>
<tr>
<td>Packaging Division ((0.25 + (0.3 x 2) + 0.50)/60) hours @ $30)</td>
<td>0.68</td>
</tr>
</tbody>
</table>

**Total Manufacturing Cost**: $467.18

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### Summary
This chapter reviewed the basic elements of costing systems. Costing systems focus on computing the cost of a cost object. Common cost objects are products, customers, product lines, departments, or even entire organizational divisions. A cost that is uniquely and unambiguously attributable to a cost object is called a direct cost. Most, but not all, direct costs are the costs of consumables such as raw materials that are used to produce a product. The identifying characteristic of a direct cost is that it depends on how much of a resource is used.

Indirect costs are related to the costs of capacity resources such as machinery and factory supervision. The identifying characteristic of an indirect cost is that it depends on how much of the resource was acquired and not how much is used.
Cost analysts assign direct costs and allocate indirect costs to cost objects. Indirect costs are usually allocated using a predetermined indirect cost rate (also called a predetermined overhead rate or cost driver rate), which is computed by dividing the expected cost of the capacity resource by its practical capacity. The costs of indirect resources are accumulated in cost pools that are often organized around departments or activities.

Most organizations have so-called service departments that do not directly produce goods or services for customers, but instead provide services to the departments or activities that produce goods or services. Service department costs have traditionally been allocated to the production departments, where they are accumulated with the production departments’ own costs and allocated to the cost objects. The appendix to this chapter explains allocation of service department costs to production departments.

Appendix 4-1

Allocating Service Department Costs

For convenience, in this appendix we will call departments that directly produce goods or services production departments. Factory production departments include machining, assembly, and finishing. Most organizations also have so-called service departments that do not directly produce goods or services for customers, but instead provide services to the departments or activities that produce goods or services. For example, factory service departments include machine maintenance and production scheduling. In a hospital, hospital maintenance and the personnel department are examples of service departments.

Service department costs have traditionally been allocated to the production departments, where they are accumulated with the production departments’ own costs and allocated to the cost objects. This appendix explains three methods of allocating service department costs to production departments.

The process of allocating service department costs is best illustrated by an example. Accounting for the costs of service departments begins with accumulating each service department’s costs. Recall in what follows that the objective is then to allocate all service department costs to the production departments.

Wellington Regional Hospital

Wellington Regional Hospital (WRH), which is a rural hospital, has four departments: Medical, Surgical, Maintenance, and Administration. (WRH has contracted out housekeeping and cafeteria services.) The Medical and Surgical Departments are production departments, and the Maintenance and Administration Departments are service departments.

For the upcoming accounting period the expected costs in the Maintenance and Administration Departments are $10,000,000 and $25,000,000 respectively.

Ramona Nasser, the WRH controller, has decided that the cost driver for the Maintenance and Administration Departments should be weighted square meters of floor space occupied and number of employees, respectively. Ramona is proposing a weighted cost driver because although the Surgical Department occupies only one-sixth of the floor space occupied by the Medical Department, the maintenance services provided to the Surgical Department are four times more intense than for the Medical Department.

Since the Medical and Surgical Departments must develop their predetermined overhead rates for the upcoming period, Ramona plans to allocate the planned service department costs using the planned service levels.

Exhibit 4-23 presents the planned results for the upcoming period showing the planned service units provided and the planned costs for each of the service departments.

Ramona also advises that the practical capacity of the Maintenance Department is 60,000 square meters of floor space, and the practical capacity of the Administration Department is 750 employees. Therefore, the planned idle capacity of the two departments is 10% [(60,000 – 54,000)/60,000] and 20% [(700 – 560)/700], respectively. Therefore, Ramona will charge $1,000,000 (10%) of the costs of the Maintenance Department and $5,000,000 (20%) of the costs of the Administration Department to the Cost of Idle Capacity account leaving balances shown in Exhibit 4-24 to be allocated.