Determining Manufacturing Costs

Using T-Accounts and Simple Mathematics

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Abstract

Accounting is a system to provide information to decision-makers about a company. To facilitate decision-making, accounting reports should provide information that has predictive ability, Beaver, Kennelly, and Voss (1968). The Pathways Commission continues in the same vein and argues that accounting should provide information that facilitates good decisions. Managerial accounting tracks three types of costs: direct materials, direct labor, and factory overhead as these costs move through the manufacturing process from raw materials to work-in-process inventory to finished goods inventory and finally to cost of goods sold. T-accounts are a technique that company managers can use to keep track of costs to determine prices and profits. We demonstrate how to use T-Accounts in a simple manufacturing company to track costs and profits.

Keywords: managerial accounting, T-Accounts, expenses, profits

1. Introduction

Accounting is the system by which an economic unit keeps track of both revenues and expenses for reporting purposes within the company and for reporting to outside stakeholders. The reporting process for external stakeholders is financial accounting and the reporting process for internal managers is managerial accounting. Beaver, Kennelly, and Voss (1968, pg. 675) use the term predictive ability. The authors define predictive ability as the "ability to predict events of interest to decision-makers." This criterion has been used since to try to determine if a particular event or piece of information has value. Event study methodology, first used in Ball and Brown (1968) has been used in numerous studies to determine if a particular event or piece of information has been useful in predicting an event or outcome.

The Pathways Commission (2015) proposed a new model of accounting. The Pathways Commission proposes that accounting is a process of describing economic activity so that useful information can be determined that allows decision-makers to make good decisions. The Pathways Commission argues that economic activity is no longer black or white in effect but many shades of gray. That is, accounting judgments using critical thinking convert data about economic activity to useful information to facilitate good decisions. In addition, at each step, feedback to earlier steps in the process improves the decision-making process.

Financial accounting is the part of the process that provides accounting information to external users such as shareholders, creditors, and government agencies. Audited annual reports are submitted to the SEC and shareholders as well as unaudited quarterly reports. Creditors may require more frequent reports to monitor the firm's ability to make required payments. Annual tax filings are required by the IRS for tax purposes.

Our interest in the paper is managerial accounting which is the creation of accounting reports that are useful to decision makers within the firm. Managerial financial reports are created to provide information useful to managers within the company for decision-making. One of the most important aspects of managerial accounting is the control of revenues and expenses. Obviously, revenues must exceed costs for a company to be profitable.

Costs in a manufacturing firm fall into three categories: direct materials, direct labor, and factory overhead. Additional costs of selling and administrative costs are not directly related to product manufacture but must still be covered. One method of tracking costs is the T-Account. A T-account is an account that is used to accumulate costs

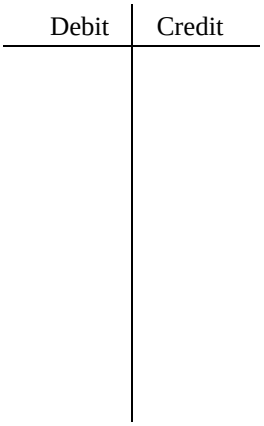
of a particular product unit (job order costing) or department (process cost accounting. As costs are incurred, the costs are added to the T-Account until the unit or process is moved to the next stage and the costs are moved to the new T-Account. Regardless, if a process cost system or a job order cost system is used, there are basic elements and accounts which can be used to determine the costs associated with providing products and services.

2. The Accounting Cycle

During a normal accounting cycle, the first step in the accounting cycle is to record transactions to the general journal as these financial events occur. The next step in the accounting cycle is to post those transactions to the general ledger. The general journal of a business can be thought of as its 'diary.' It details individual events. The general ledger shows the overall impact of each transaction. In its proper form, a general ledger keeps track of every event associated with an account and provides a running total or overall balance for each account.

Assume the company involved in this discussion has its stock listed and traded on a national stock exchange and is subject to Generally Accepted Accounting Principles (GAAP). GAAP dictates that a double-entry accounting system should be used by publicly traded companies.

Another way to represent the events posted to the general ledger is to use T-Accounts.



Every entry in accounting has a corresponding debit and credit. Debit simply means left side and Credit simply means right side. It is the nature of the account (i.e. asset, liability, or equity) that determines whether debits increase or decrease an account or whether credits increase or decrease an account. If an account has a normal debit balance, all entries on the debit side increase the account's balance and all entries on the credit side decrease the account's balance. The resulting balance is the excess of debits over credits.

Managerial accounting is not required to adhere to GAAP, but the reports produced would still follow a double-entry accounting model. The goal of managerial accounting is to determine information for internal use only. It is important for a company to keep track of its costs so that it does not under-charge or over-charge its customers for goods provided. It is equally important for the company to keep track of costs so that revenues exceed expenses. T-Accounts can be used not only to visualize the flow of costs but also to calculate the following costs for a period of time:

Materials Purchased and Used

Labor Expended

Overhead Applied

Under/Over Applied Overhead

Cost of Goods Manufactured

Cost of Goods Sold

Those same T-Accounts can also be used to determine the ending balances for the following accounts:

Materials on Hand

Ending Work in Process

Ending Finished Goods

The example in this paper will use a process costing system (though the same principles would apply to a job order costing system, the only difference is that instead of only one Work in Process and one Ending Inventory account, there would be multiple Work in Process and Ending Inventory Accounts.

To understand manufacturing companies and manufacturing costs better, it is helpful to visualize everything. The first thing one needs to visualize is the overall organization of such a company.

In theory, it could be a single building, but typically manufacturing companies have separate structures for their administrative functions and production functions. Anything associated with administrative functions are period expenses. Administrative functions could include executive salaries, sales commissions, and marketing expenses. These are necessary costs but they cannot and should not be associated with the costs it takes to manufacture products. Therefore, they are expensed in the period incurred.

Anything associated with manufacturing facilities is classified as a product cost. All product costs must be assigned to the goods produced. Unlike period expenses, product costs are not necessarily expensed in the period incurred. Until manufactured goods are sold, all the costs incurred and assigned to such goods remain in inventory accounts. These costs are only treated as an expense once the finished goods are sold.

One use of T-Accounts is to help visualize the flow of costs in a manufacturing environment:

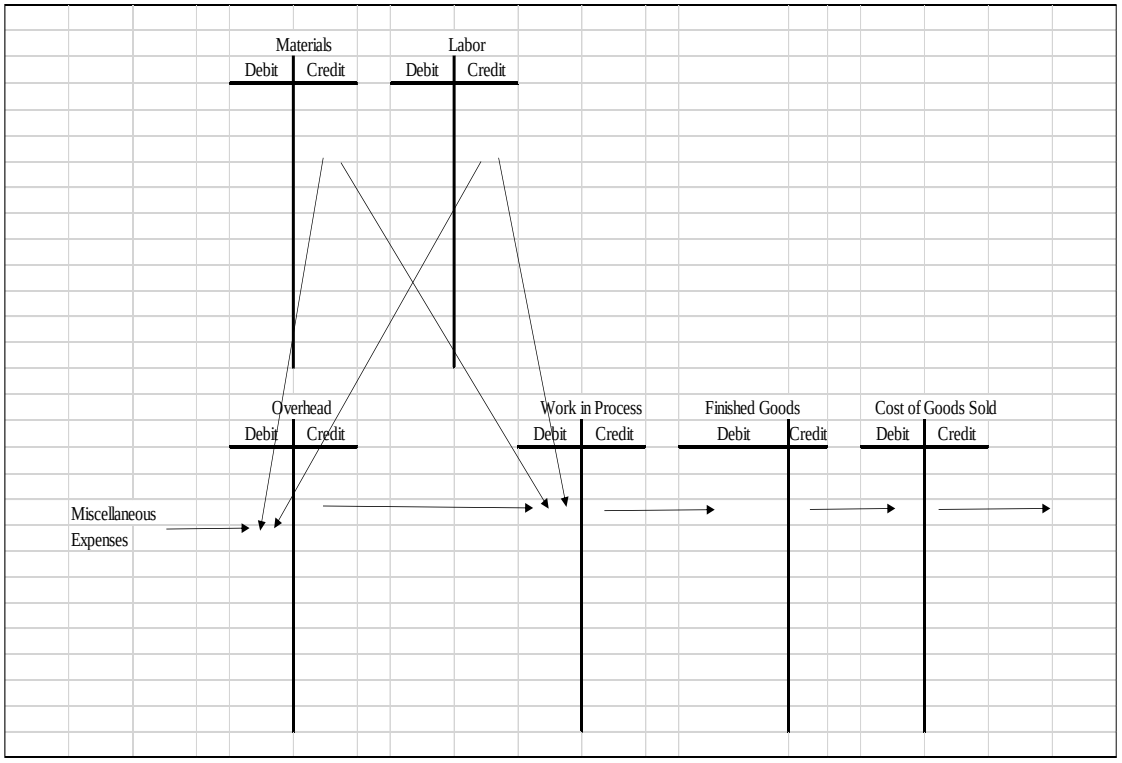


Figure 1.

There are three major categories of costs in a manufacturing facility: Materials, Labor, and Other. Materials and Labor are subdivided into two categories each. Materials can be classified as Direct or Indirect and Labor can be classified as Direct or Indirect. The word ‘Direct’ denotes a cost that can be directly associated with the good being manufactured. There is no subjectivity to it. If you are producing furniture, the wood used to make the furniture would be Direct Materials and the wages of those responsible for actually building the furniture would be Direct Labor. Direct Materials and Direct Labor are collectively referred to as Prime Costs.

All costs that do not fit into the classification of ‘Direct’ are considered overhead. All costs incurred in the operation of a manufacturing facility have to be assigned to the items produced by that facility, even if the relationship between such costs and units of goods manufactured is not always clear. These costs are called ‘Overhead.’

Overhead consists of many things: Indirect Labor is the cost of wages paid to factory personnel not directly involved with the manufacture of a product. This could include custodial staff and manager salaries. Indirect Materials would

include things such as paper, pens, paperclips, and other materials that are needed for administrative purposes but cannot be directly associated with the end product. In addition to that, other miscellaneous expenses such as factory rent, machine repair costs, utilities expenses, and insurance expenses would also be categorized as 'Overhead.' Since no direct relationship exists between units produced and Overhead, it is difficult to properly account for such costs.

It is crucial that management accounting provide accurate and timely calculations. It is important that a manufacturer calculate its production costs as accurately as possible. If a company is selling manufactured goods at a price lower than the cost to manufacture them, it would be essential for the manufacturer to realize that as soon as possible and make the proper adjustments. Unfortunately, the only time that actual overhead costs are known, is at the end of the year. Manufacturers do not have the luxury of waiting that long, so overhead is applied during the year based on a predetermined rate or rates. The difference between overhead incurred and overhead applied will result in over-applied or under-applied overhead. Over-applied factory overhead would lead to a reduction in the COGS and under-applied factory overhead would lead to an increase in COGS.

Direct Labor and Overhead are collectively referred to as Conversion Costs. They are the costs it takes to convert Direct Materials into Finished Goods.

In the picture above, indirect materials, indirect labor, and miscellaneous expenses are assigned to Overhead. This is depicted by the red arrows. Direct Materials, Direct Materials, and Applied Overhead are assigned to Work in Process. This is depicted by the blue arrows. Work in Process represents units that have been started but not finished. It is an asset account. Finished Goods represents units that have been completed and that are ready to be sold. It is also an asset account. The Cost of Goods sold represents units that have been sold. COGS is an expense account. Units being produced start in Work in Process, are transferred to Finished Goods, and finally to Cost of Goods Sold. This is depicted by the green arrows. Using visualizations based on the items above, one can use T-Accounts and simple mathematics to solve a manufacturing cost problem.

3. An Example

Company A began operations in 2015. It produces a single product: widgets. It had the following beginning balances as of January 1, 2016:

Materials $6,000, Beginning Work in Process was zero units and Finished Goods (500 units) was $9,000. During the year, the company purchased $142,000 of raw materials and paid wages totaling $220,000. Factory Rent was $100,000 and Factory Insurance Expense was $65,000. The plant manager was paid a salary of $30,000. The company's executive management earned $200,000. Sales commissions were $65,000 and Marketing Expenses were $54,000. Indirect materials used were $7,500. During the year, 45,000 units were started and completed. Ending Inventory consisted of 2,000 units. In 2016, Direct Materials per unit was $3 and Direct Labor per unit was $4. Estimated Direct Labor hours for 2016 was 3,750 hours. Total Overhead for 2016 was estimated to be $225,000. Overhead was applied on the basis of Direct Labor Hours incurred. During 2016, 3,800 Direct Labor Costs were incurred. The company uses the First In, First Out (FIFO) method to calculate Cost of Goods Sold. Calculate the Following:

Under/Over Applied Overhead

Cost of Goods Manufactured

Ending Materials on Hand

Ending Finished Goods

Cost of Goods Sold

The first step is to identify Period Costs.

Period Expenses:	
Executive Compensation	$ 200,000.00
Sales Commissions	$ 65,000.00
Marketing Expenses	$ 54,000.00
Total	$ 319,000.00

Figure 2.

Period Expenses have no impact on Manufacturing Costs and do not need to be considered.

Answers to each of the above questions can be derived thusly:

Miscellaneous		
Expenses		
Factory Rent		$ 100,000
Factory Insurance Expense		$ 65,000
Plant Manager Salary		$ 30,000
Total		$ 195,000

Figure 3.

Part of solving Manufacturing Problems is separating and categorizing costs.

The debit column for the Manufacturing Overhead Account represents actual overhead. The credit column represents applied overhead. It would be highly unlikely that actual overhead would equal applied overhead.

The amount of Indirect Materials is given. Also, Indirect Labor can be derived by subtracting Direct Labor Costs. Labor doesn't represent a tangible object and no balance can be carried forward.

The Predetermined Overhead Application rate can be estimated and calculated based on Direct Labor Hours incurred.

Predetermined Overhead Rate:
Estimated Overhead/Estimated Direct Labor Hours =
$225,000/3750 = $60 Per Direct Labor Hour Incurred

Figure 4.

	Overhead				
	Debit	Credit			
Misc. Expenses	$ 195,000	$ 228,000	Applied Overhead	$60 x 3,800 Direct Labor Hours	
Indirect Materials	$ 7,500				
Indirect Labor	$ 40,000				
Under Applied Overhead	$ 14,500				

Figure 5.

Over or Under Applied Overhead = Actual Overhead – Applied Overhead =

($195,000 + $7,500 + $40,000) – ($228,000) =

$242,500 - $228,000 = $14,500 Under Applied Overhead

Since Actual Overhead exceeds Applied Overhead by $14,500, Overhead is Under Applied.

	Materials			
	Debit	Credit		
Beg. Bal.	$ 6,000	$ 7,500	Indirect Mat.	
Purch.	$ 142,000	$ 135,000	Direct Mat.	$3 x 45,000 units

Figure 6.

Applied Overhead = $228,000

Direct Materials = $135,000

Direct Labor = $180,000

Total $543,000 Total Manufacturing Costs

	Materials			
	Debit	Credit		
Beg. Bal.	$ 6,000	$ 7,500	Indirect Mat.	
Purch.	$ 142,000	$ 135,000	Direct Mat.	$3 x 45,000 units
	$ 5,500			

Figure 7.

Labor			
Debit	Credit		
$ 220,000	$ 180,000	Direct Labor	$4 x 45,000 units
	$ 40,000	Indirect Labor	
-			

Figure 8.

Ending Materials is calculated by taking the Beginning Balance plus Materials Purchases and subtracting Indirect and Direct Materials used. = $5,500 Ending Materials

Since there is no ending Work in Process, the ending balance in that account is zero.

	Work In Process		
	Debit	Credit	
Beg. Bal.	$ -		
Direct Materials	$ 135,000	$ 543,000	Transferred Out
Direct Labor	$ 180,000		
Applied Overhead	$ 228,000		
	$ -		

Figure 9.

The amount transferred out from Work in Process is added to the Beginning Balance in Finished Goods.

Total Manufacturing Costs/ # of Units Produced = Cost Per Unit	
$543,000 / 45,000 = $12 per Unit	

Figure 10.

Ending Finished Goods = 2,000 Units

	Finished Goods		
	Debit	Credit	
Beg. Bal.	$ 9,000		
Transferred In	$ 543,000	$ 528,000	Transferred Out
Ending Balance	$ 24,000		
2000 Units x $12			

Figure 11.

Since the company uses FIFO, the 2000 units in Ending Inventory will reflect the Cost Per Unit for the current year. So, Ending Finished Goods = $24,000

The Cost of the Units Transferred Out is calculated by taking the Beginning Balance in Finished Goods, adding the cost of Goods Transferred In and Subtracting the Ending Balance:

$9,000 + $543,000 - $24,000 = $528,000 Cost of Goods Transferred Out

The Cost of Goods Sold is calculated by taking the Cost of Goods Transferred Out and adding Under Applied Overhead.

	Cost of Goods Sold	
	Debit	Credit
Transferred In	$ 528,000	
Under Applied Overhead	$ 14,500	
Total Cost of Goods Sold	$ 542,500	

Figure 12.

Under Applied Overhead is only $14,500. That is insignificant compared to the $528,000 Cost of Goods Manufactured, so it is simply added to that cost to arrive at Cost of Goods Sold.

4. Summary and Conclusions

We develop a model that uses T-Accounts to summarize revenues and expenses for a manufacturing company. We demonstrate how to calculate a factory overhead total, a factory overhead rate, and how to apply factory overhead including how to determine over-applied or under-applied factory overhead. We show the use of T-accounts for Materials and labor and how to move those expenses to work in Process. The costs of finished goods is moved to Finished Goods and expenses for units that are sold are transferred to the Cost of Goods Sold.

T-Accounts are useful to help decision-makers to visualize and track expenses. Expense reporting is useful to monitor progress during the accounting period and for pricing. Product costs can be analyzed and evaluated over time and across products. Managers need to find problems before those problems become overly expensive and damage the company and its future.

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