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Skylar, Inc.: Traditional Cost System vs. Activity-Based Cost System – A Managerial Accounting Case Study

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Abstract

This case is about a fictitious office workstation manufacturing company "Skylar Inc." and their implementation of the traditional cost system and the activity-based cost system (ABC, hereafter) when allocating product costs. The case focuses on the application of activity-based costing in assigning costs to activity cost pools, calculating activity rates, and assigning activity costs to cost objects. It also highlights the difference between the traditional cost system and ABC in regards to allocating manufacturing and non-manufacturing overhead costs and assigning direct costs to products. This case is designed to provide students with both number crunching exercises and theoretical discussions of the topics.

Keywords: activity-based costing, traditional cost system, overhead allocation, product cost, product margin

1. Introduction

In allocating costs to products, the traditional cost (accounting) system follows a simple framework. Direct product costs, such as material and labor costs, are traced directly to products. Indirect overhead costs are allocated to products based on a firm-wide overhead rate or multiple departmental overhead rates. Selling, general, and administrative costs are classified as period expenses. While the implementation of the traditional cost system is straightforward, the resulting cost allocation is far from precise. For example, some period costs, such as shipping and sales commission, are excluded from product costs despite the fact that they are consumed by products. Furthermore, all manufacturing overhead costs, including facility cleaning crew and security guard salaries, are allocated to products even though they are not traceable to products. At the same time, all non-manufacturing costs—that is, those incurred outside of the manufacturing facilities—are excluded from product costs, even though some are presumably caused by products (Garrison, Noreen, and Brewer 2018).

To address the shortcomings of the traditional cost system, Activity-Based Costing (ABC, hereafter) was introduced in the 1980s through a series of articles by Cooper (1988, 1989) and Cooper & Kaplan (1989). The ABC Hierarchy highlights the relationships between activities and resource consumptions. The activities are classified into four categories: facility-sustaining, product-sustaining, batch-level, and product-level (Cooper and Kaplan, 1991). The application of ABC involves a two-stage process. In the first-stage allocation, both manufacturing and non-manufacturing overhead costs are assigned to activity cost pools. The resource consumptions by activity cost pools are determined through conducting interviews with employees and reviewing time logs. The second-stage allocation starts with the calculation of activity rates by dividing the total cost of each activity pool by the activity output. Activity rates are then used to assign costs to products and other cost objects.

The advantages of ABC over the traditional cost system have been documented in various industries. Lu, Wang, Wu, and Cheng (2017) studied a bicycle parts company and found that the traditional cost system with one single cost driver yields distorted cost allocation. In comparison, the implementation of ABC is able to account for the resource consumption by each bicycle part and, therefore, yields more accurate cost allocations. However, despite the implementation of ABC offering advantages over the traditional cost system, it remains challenging for companies to adopt ABC due to high implementation costs incurred in data collection for the first-stage allocation (Kaplan and Andersen 2007). For example, Akyol, Tuncel, and Bayhan (2007) studied the cost allocation and pricing decision of a sanitary wares company. They found that, while some products were overpriced and others were underpriced when comparing the traditional cost system to ABC, the aggregate effect was about the same between the two systems. Therefore, they concluded that the implementation of ABC was not beneficial due to the high costs of implementation.

A recent improvement to the ABC system was the introduction of the Time-Driven Activity-Based Costing (TDABC) by

Kaplan and Andersen (2007). This new approach provides a solution to the problem of high implementation costs by using time-driven cost drivers that capture the practical capacity of resources. TDABC has been shown to provide more accurate and transparent cost allocations in surgical episodes in the health-care industry (Najjar, Strickland, and Kaplan, 2017).

2. Intended Course, Target Audience and Teaching Objectives

This case covers the topic of product cost allocation with a focus on the activity-based costing method. It is designed to reinforce the application of ABC in allocating overhead costs and assigning direct costs to products. The volume-based traditional cost system is also introduced in order to offer a comparison to ABC. It is designed for undergraduate students in introductory managerial accounting courses. Students in this course are generally accustomed to solving numerical problems but lack conceptual understandings of the theories behind the applications. This case is intended to help students to gain a more comprehensive understanding of the topic. Teaching objectives include the following,

- To demonstrate the departmental approach under the traditional cost system in allocating manufacturing overhead costs.
- To demonstrate ABC allocation of manufacturing and non-manufacturing overhead costs. Specifically, to enhance students' understanding in assigning costs to activity cost pools, calculating activity rates, and assigning activity costs to cost objects.
- To illustrate the difference in allocating overhead costs to products, comparing the traditional cost system with ABC.
- To reinforce the conceptual understanding of the traditional cost system and ABC by presenting a reconciliation of the total overhead costs derived from the two cost systems.
- To illustrate the difference in defining total product cost, comparing the traditional cost system with ABC.
- To illustrate the impact on product margins and pricing decisions based upon the choice between the two cost systems.

This case as well as subsequent discussion questions are designed to be completed within one class session. However, as discussed in the Alternate Teaching Strategies section, additional teaching objectives may be incorporated,

- To enhance students' understandings of the limitations of ABC and implementation challenges.
- To illustrate the application of ABC in assigning costs to other cost objects.
- To enhance student's understanding of the connection between ABC and external reporting under GAAP.
- To assess students' written communication skills.

3. Case Text

In March 2018, Steven was hired as the CFO of Skylar Incorporated, a family owned furniture-manufacturing company that specializes in fabricating a wide variety of office workstations. Skylar is well known for its high-quality, stylish and durable workstations, which has made it one of the top products in the office workstation category.

The company is known for their standard office workstation that goes by the brand name "Classy," and it comes in standard sizes, which are all made out of high-quality wood materials. Additionally, they also manufacture customizable office workstation models, which are usually requested by large corporate clients who have various preferences such as shape, size, material, color, and ergonomics.

Skylar prices their products at a 40% product margin. At this price, their products are one of the cheapest on the market, despite the fact that they boast of a superior product quality than competitors with similar, if not higher, prices. This had led the company owners to consider if the company's pricing is in line with the quality of both their product and service delivery.

In a recent meeting with company owners, Steven was asked to evaluate the cost system of the company. The owners questioned whether the current traditional cost system accurately measured the product costs for both the standard and customized workstations. Understanding activity-based cost system (ABC, hereafter) offers a more accurate measure of product costing, Steven decided to implement ABC for the month of April.

As a new member of the company, Steven has also had to spend time learning about the company's production process, in addition to the costs incurred at each stage of the production process. Manufacturing is divided into two distinct production departments: the cutting department and the assembly department.

The cutting process begins with material acquisition and handling. The purchasing team is responsible for sourcing suppliers, negotiating, as well as finalizing contracts, tracking purchase orders, and arranging deliveries. Once the raw

materials arrive at a delivery point, shipments are examined and transported to various cutting and assembly stations. Raw materials can range from wood sourced from two major suppliers for the standard models, to metals, laminates, composites and even glass sourced from 30 different suppliers for the customized models. Other indirect materials include screws, nuts, bolts, glue, leather and polish.

The cutting department ensures that the individual parts needed to form the workstations are cut to the exact size necessary and measured individually. For the standard models, raw timber is first treated then milled to preferred shape and dimension before provisions are made for fitting the screws and nuts. This is followed by a coat of paint.

For customized models, the cutting process starts with the drawing of a pattern with the exact dimension for each part by a team of engineers. A prototype for each part is cut to ensure a perfect fit before the production run. The cutting process, using different types of wood materials, is identical to the standard models. Metals are cut and welded into the appropriate shapes before being smoothed and sprayed. In the case of glass, a tungsten glass cutter cuts the glass into the required sizes before they are painted. Thus, there are significantly higher direct and indirect material and labor costs for the customized models as opposed to the standard models.

In the cutting department, the individual materials that will finally make up the workstation are made and designed as part of a collective process that ensures that the transportation and installation of the workstations are easier and faster.

The assembly department completes the production process by individually installing the parts with the aid of screws, bolts, adhesives, and welding as needed in order to assemble the workstation. Engineers create a drawn-out plan for each model of the workstation. For customized models, a prototype of the finished product is first sent to the customer for approval.

The assembly process is straightforward, and it could take anywhere from a few minutes to several hours to assemble a standard or customized workstation depending on its size, complexity, and build. Engineers may also be required to spend additional time training assembly workers on how to assemble the customized models.

The production process, including all materials involved, must undergo and pass stringent material quality control inspections. Plant supervisors and engineers inspect product samples (one product for standard models and two for customized models) by putting them through various stress and material testing to ensure that the workstation can withstand both structural and aesthetic limits, which typically vary depending on the type of workstation produced.

Other manufacturing overhead costs include depreciation of equipment and machines, factory lease, utilities, salaries for cleaning crew, security guards, and other miscellaneous. Under the current traditional cost system, manufacturing overhead costs are first allocated to the cutting and assembly departments. Departmental overhead costs are then allocated to each product by machine hours for the cutting department and by direct labor hours for the assembly department.

Based on information gathered from the manufacturing process and a review of the manufacturing and non-manufacturing costs, Steven has identified nine activity cost pools to implement ABC. Employees were given time sheets to keep track of time spent on each activity. Based on the time sheets and interviews with key personnel, Steven's accounting team has compiled a summary of costs and cost allocation for the activities for the month of April as presented in Exhibit 1 to 3.

Steven is preparing to present his findings to company owners and executives in a meeting scheduled for next week. He has asked you to prepare a memo to be distributed in the upcoming meeting. The memo should include a numerical analysis comparing product costs under the traditional cost system and ABC. Furthermore, the memo should include key points that address the differences between the two cost systems, the costs and benefits of implementing ABC, and a recommendation on Skylar's pricing.

Exhibit 1A. Activity-Based Costing – First-Stage Allocation

	Material Acquisition & Handling	Product Design	Production Run	Quality Control	Order Processing	Post-Sale Support	Customer Marketing	Customer Relations	Organization Sustaining	Total
Factory Building Lease			$ 18,000						$ 27,000	$ 45,000
Factory Equipment Depreciation	$ 57,000	$ 14,250	$ 403,750							$ 475,000
Factory Supplies & Indirect Materials	$ 29,700	$ 20,250	$ 85,050							$ 135,000
Factory Utilities & Misc.			$ 92,340						$ 10,260	$ 102,600
Indirect Labor Costs										
Buyer Salaries	$ 12,080									$ 12,080
Engineer Salaries		$ 10,500		$ 4,500						$ 15,000
Mover Salaries	$ 23,000									$ 23,000
Supervisor Salaries	$ 29,160		$ 100,440	$ 24,300				$ 8,100		$ 162,000
Other Indirect Labor Salaries			$ 30,000							$ 30,000
Cleaning Crew Salaries									$ 12,000	$ 12,000
Security Guard Salaries									$ 5,000	$ 5,000
Selling & Administrative										
Administrative Expense					$ 32,480		$ 24,360	$ 50,750	$ 95,410	$ 203,000
Marketing Expense					$ 18,800		$ 75,200			$ 94,000
Office Building Lease									$ 60,000	$ 60,000
Office Equipment Depreciation							$ 9,800	$ 14,840	$ 3,360	$ 28,000
Office Supplies, Utilities & Misc.					$ 20,500	$ 2,460	$ 1,640	$ 4,100	$ 12,300	$ 41,000
Selling Expense					$ 80,500	$ 11,270	$ 35,420	$ 33,810		$ 161,000
Total	$ 150,940	$ 45,000	$ 729,580	$ 28,800	$ 152,280	$ 13,730	$ 146,420	$ 111,600	$ 225,330	$ 1,603,680

Exhibit 1B. Cost Drivers for Activity Cost Pools

Activity Cost Pool	Cost Driver	Standard Models	Customized Models	Total
Material Acquisition & Handling	Number of Purchase Orders	80	210	290
Product Design	Number of Designs	0	22	22
Production Run	Machine Hours	7200	6400	13600
Quality Control	Number of Samples	10	44	54
Customer Orders	Number of Orders	3000	1200	4200
Post-Sale Service	Number of Calls	1700	320	2020

Exhibit 2. Departmental Manufacturing Overhead and Cost Drivers

	Cutting Department	Assembly Department	Total
Factory Building Lease	$ 30,000	$ 15,000	$ 45,000
Factory Equipment Depreciation	$ 325,000	$ 150,000	$ 475,000
Factory Supplies & Indirect Materials	$ 60,000	$ 75,000	$ 135,000
Factory Utilities & Misc.	$ 70,000	$ 32,600	$ 102,600
Indirect Labor Costs			
Buyer Salaries	$ 7,500	$ 4,580	$ 12,080
Engineer Salaries	$ 6,000	$ 9,000	$ 15,000
Mover Salaries	$ 9,000	$ 14,000	$ 23,000
Supervisor Salaries	$ 92,000	$ 70,000	$ 162,000
Other Indirect Labor Salaries	$ 22,000	$ 8,000	$ 30,000
Cleaning Crew Salaries	$ 6,000	$ 6,000	$ 12,000
Security Guard Salaries	$ 2,500	$ 2,500	$ 5,000
Total Departmental Overhead	$ 630,000	$ 386,680	$ 1,016,680

	Machine Hours	Direct Labor Hours
Standard Models	7200 MHs	24500 DLHs
Custom Models	6400 MHs	22500 DLHs
Total	13600 MHs	47000 DLHs

Exhibit 3. Revenue and Other Relevant Costs

	Standard Models	Customized Models
Revenue	$ 1,883,494	$ 1,710,972
Direct Costs		
Direct Materials	$ 325,000	$ 295,000
Direct Labor	$ 270,000	$ 250,000
Relevant Selling & Admin. Expenses		
Shipping	$ 15,000	$ 7,000
Sales Commission	$ 60,000	$ 48,000
Number of Units*	12000	8000

*Assume unit produced equals to units sold

4. Teaching Note

The following discussion questions were used in conjunction with the case implementation. The teaching plan and probable student responses are incorporated in this section.

4.1 Using the Traditional Cost System to Allocate Costs by Department, Calculate the Total Manufacturing Overhead Allocated to the Standard Models and the Customized Models, Respectively

In general, the traditional cost system uses a plant-wide overhead rate or multiple departmental overhead rates to assign manufacturing overhead to products. In the case of Skylar, Inc., a departmental approach, which is more accurate than the plant-wide approach, was used. With multiple overhead rates, the department approach is an improvement when compared to the plant-wide approach because cost allocations are based on the most appropriate cost driver for each department. For example, machine hours are used by the cutting department since all cutting work is done by machines. In comparison, direct labor hours are used by the labor-intensive assembly department to allocate manufacturing overhead costs.

Many students are already familiar with this concept. However, since the traditional cost system is generally taught in an earlier chapter than ABC, it may be helpful for instructors to offer a review on the application. Furthermore, it is critical to emphasize that only manufacturing overhead costs (i.e., all costs incurred at the manufacturing facilities) are allocated to products under the traditional cost system.

The departmental overhead rate is $46.32 ($630,000 divided by 13,600 machine hours) for the cutting department and $8.23 ($386,680 divided by 47,000 direct labor hours) for the assembly department. Using these overhead rates, manufacturing overhead costs are then allocated to the standard models and the customized models as illustrated in Table 1. The total manufacturing overhead is $535,097 for the standard models and $481,583 for the customized models. Students are instructed to perform all mathematical calculations in class. Most students are able to correctly calculate the manufacturing overhead costs for both models.

Table 1. Manufacturing Overhead Costs - Traditional Cost System

	Cutting Department	*Calculation*	Assembly Department	*Calculation*
Departmental Manufacturing Overhead	$ 630,000		$ 386,680	
Cost Driver	13600 MHs		47000 DLHs	
Departmental Overhead Rate	$ 46.32	*(630,000/136,000)*	$ 8.23	*(386,680/47,000)*
	Standard Models	Customized Models		
Machine Hours	7200 MHs	6400 MHs		
Direct Labor Hours	24500 DLH	22500 DLH		
	Standard Models		Customized Models	
Cutting Department Overhead	$ 333,529	(46.32x7,200)	$ 296,471	(46.32x6,400)
Assembly Department Overhead	$ 201,567	(8.23x24,500)	$ 185,113	(8.23x22,500)
Total Manufacturing Overhead	$ 535,097		$ 481,583	

4.2 Describe the Process of First-Stage Allocation in ABC

In the application of ABC, both manufacturing and non-manufacturing overhead costs are first allocated to activity cost pools, in a process described as the first-stage allocation. It is important to emphasize that in the case of Skylar, and as a practical matter, first-stage allocation is generally based on the results of interviews given with employees who are familiar with judging how time and resources are consumed by activities. For the sake of simplicity and to make the case solvable within one class session, results of the first-stage allocation are provided in Exhibit 1. However, it is important for instructors to review Exhibit 1 in detail and lead a discussion on the activity cost pools (in the column heading) as well as the manufacturing and non-manufacturing costs (in the row heading).

In reviewing the activity cost pools, instructors may want to briefly describe the five levels of activity in the ABC hierarchy (i.e., unit-level, batch-level, product-level, customer-level, and organization-level). It may be helpful for instructors to elaborate the definition of each hierarchy level and instruct students to provide examples. Instructor should also ask students to identify the hierarchy level for each activity cost pool, and to group the activity cost pools into the categories of product, customer, and organization. Product-related activities are Material Acquisition and Handling, Product Design, Production Run, Quality Control, Order Processing, and Post-Sale Support. Customer-related activities are Customer Marketing and Customer Relations. The organization related activity is Organization Sustaining.

Even though students are generally able to categorize the activity cost pools into product, customer, and organization categories, the idea that not all activity costs from manufacturing overhead are assigned to products under ABC is not obvious to many students. Thus, it is critical to emphasize that only costs in the product category are assigned to products in ABC. In comparison, the traditional cost system assigns all manufacturing overhead to products, even though some manufacturing overhead costs are in the customer and organization categories.

Furthermore, although it is apparent in Exhibit 1A that some non-manufacturing overhead costs from selling and administrative expenses are included in the first-stage allocation to activities, students do not often see this departure from the traditional cost system. Thus, it is useful for instructors to reconcile the total of $1,603,680 in Exhibit 1A to the total of $1,016,680 in Exhibit 2, and reiterate that the difference is due to the inclusion of $587,000 in non-manufacturing overhead from selling and administrative expenses in ABC.

4.3 Calculate the Total ABC Overhead Cost Allocated to the Standard Models and the Customized Models, Respectively

After identifying the consumption of resources by activities in the first-stage allocation, the next step is to calculate activity rates and assign activity costs to the cost objects. For Skylar, Inc., the cost objects are the standard and the customized workstation models. Most students are familiar with the calculation of activity rates as shown in Table 2. For some students, confusion exists in their attempt to understand why the level of activity is not provided for Customer Marketing, Customer Relations, and Organization Sustaining activity cost pools. If students raise this question, instructors may wish to refer back to Discussion Question 2 and remind students the idea that only costs associated with product level activities are assigned to products. Therefore, it is not necessary to calculate activity rates for Customer Marketing, Customer Relations, and Organization Sustaining.

Furthermore, it would be helpful for instructors to display a classification of activity cost pools in two separate categories, depending on whether activities consume manufacturing or non-manufacturing resources. As illustrated in Table 2, Material acquisition and Handling, Product design, Production Run, and Quality Control consume manufacturing overhead resources. Order Processing and Post-sale Support consume non-manufacturing overhead resources in selling and administrative expenses. This illustration is important for reinforcing the idea that ABC also includes non-manufacturing overhead in cost allocation to products, which is a departure from the traditional cost system.

Students are typically able to correctly match cost drivers in Exhibit 1B to the activity rates calculated in the first section of Table 2 in order to arrive at the total ABC overhead of $553,547 for the standard models and $566,783 for the customized models. As a useful exercise, instructors may ask students to verify their answers by reconciling the total of the two models ($1,120,330) to figures in Exhibit 1A. Students may jump ahead and assume that the total ABC overhead of the two models would match the total activity costs of $1,603,680 in Exhibit 1 and they will be surprised to find otherwise. Instructors may again remind students of the idea that not all activities are allocated to products. Thus, the total ABC overhead of the two models should match the sum of product-related activities only (with a small difference in rounding).

Table 2. Manufacturing and Non-Manufacturing Overhead Costs - Activity-based Cost System

Activity Cost Pool	Total Activity Cost	Total Activity	Activity Rate	*Calculation*
Material Acquisition& Handling	$ 150,940	290 POs	$ 520.48	*(150,940/290)*
Product Design	$ 45,000	22 Designs	$ 2,045.45	*(45,000/22)*
Production Run	$ 729,580	13600 MHs	$ 53.65	*(729,580/13600)*
Quality Control	$ 28,800	54 Samples	$ 533.33	*(28,800/54)*
Order Processing	$ 152,280	4200 Orders	$ 36.26	*(152,280/4200)*
Post-Sale Support	$ 13,730	2020 Calls	$ 6.80	*(13,730/2020)*
Standard Models	Activity Rate	Activity	ABC cost	*Calculation*
Manufacturing Overhead				
Material Acquisition& Handling	$ 520.48	80 POs	$ 41,639	*(520.48x80)*
Product Design	$ 2,045.45	0 Designs	$ 0	*(2,045.45x0)*
Production Run	$ 53.65	7200 MHs	$ 386,248	*(53.65x7200)*
Quality Control	$ 533.33	10 Samples	$ 5,333	*(533.33x10)*
Non-Manufacturing Overhead				
Order Processing	$ 36.26	3000 Orders	$108,771	*(36.26x3000)*
Post-Sale Support	$ 6.80	1700 Calls	$ 11,555	*(6.80x1700)*
Total ABC Overhead			$ 553,547	
Customized Models	Activity Rate	Activity	ABC cost	*Calculation*
Manufacturing Overhead				
Material Acquisition& Handling	$ 520.48	210 POs	$ 109,301	*(520.48x210)*
Product Design	$ 2,045.45	22 Designs	$ 45,000	*(2,045.45x22)*
Production Run	$ 53.65	6400 MHs	$ 343,332	*(53.65x6400)*
Inspection & Quality Control	$ 533.33	44 Samples	$ 23,467	*(533.33x44)*
Non-Manufacturing Overhead				
Order Processing	$ 36.26	1200 Orders	$ 43,509	*(36.26x1200)*
Post-Sale Support	$ 6.80	320 Calls	$ 2,175	*(6.80x320)*
Total ABC Overhead			$ 566,783	

4.4 Prepare a Reconciliation of the Total Manufacturing Overhead Cost under the Traditional Cost System and the Total Overhead Cost under ABC

This discussion question is perhaps the most challenging to students. In the topics of the traditional cost system and ABC, students are accustomed to applying formulas in number-crunching exercises, but have limited understanding of the conceptual differences between the two systems.

First, the traditional cost system allocates all manufacturing overhead costs to products; even those costs that are not caused by the product manufacturing process. For example, the salaries of a facility cleaning crew and security guards are allocated to products only because they are incurred at the manufacturing facilities. In comparison, ABC includes manufacturing overhead costs only if they are caused by product-related activities. Because the cleaning crew and security guards perform activities relating to the general maintenance of the facilities, their salaries are viewed as organization sustaining costs and are thus excluded from product costs under ABC.

Second, the traditional cost system excludes all non-manufacturing costs (i.e. those incurred outside of the manufacturing facilities) from product costs, even though some of these non-manufacturing costs are presumably caused by products. For example, the cost of office supplies and office equipment depreciation are reported as period expense under the traditional cost system. However and in the case of Skylar, a portion of these costs is consumed by product related order processing activities. Thus, ABC includes this type of non-manufacturing cost in product costs. For Skylar, non-manufacturing costs related to Order Processing and Post-Sale Support activities are allocated to the overhead costs of products in ABC.

Instructors may wish to reiterate the two points discussed above before presenting the reconciliation in Table 3A to the class. Table 3A starts with the total manufacturing overhead of $1,016,680 from the traditional cost system and itemizes the adjustments made in order to arrive at the total ABC overhead of $1,120,330. As previously discussed, two types of adjustment are needed. First, manufacturing overhead costs allocated to customer level and organization level activities are deducted from the total manufacturing overhead under the traditional cost system. This category includes a portion of the factory lease, utilities and other miscellaneous costs related to organization sustainment, a portion of factory supervisor salaries based on their time spent on customer relations, and all salaries of the cleaning crew and security guards. Second, product-related non-manufacturing overhead costs are added to the total manufacturing overhead under the traditional cost system. This includes portions of selling and administrative expenses that are caused by product-related Order Processing and Post-sale Support activities.

Table 3A. Reconciliation between the Traditional Cost System and ABC

	Total Manufacturing Overhead - Traditional Cost System	$ 1,016,680
Deduct	Manufacturing overhead allocated to customer and organization level activities	
-	Factory building lease allocated to organization sustaining	$ 27,000
-	Factory utilities & misc. allocated to organization sustaining	$ 10,260
-	Supervisor salaries allocated to customer relations	$ 8,100
-	Cleaning crew salaries	$ 12,000
-	Security guard salaries	$ 5,000
Add	Non-manufacturing overhead allocated to product related activities	
+	Administrative expense allocated to order processing	$ 32,480
+	Marketing expense allocated to order processing	$ 18,800
+	Office supplies, utilities & misc. allocated to order processing	$ 20,500
+	Office supplies, utilities & misc. allocated to post-sale support	$ 2,460
+	Selling expense allocated to order processing	$ 80,500
+	Selling expense allocated to post-sale support	$ 11,270
=	Total Overhead - ABC	$ 1,120,330

In addition to presenting the list of itemized adjustments in Table 3A, instructors may wish to revisit Exhibit 1 and demonstrate the reconciliation by color-highlighting the two types of adjustments. Table 3B presents an example of this approach. Items making up the traditional total manufacturing overhead and the ABC overhead are colored in purple. The areas colored in blue represent the manufacturing overhead costs allocated to customer level and organization level activities. The total of this blue area is to be deducted from the total manufacturing overhead costs under the traditional cost system. The areas colored in green represent product related non-manufacturing overhead costs. The total of this green area is to be added to the total manufacturing overhead costs under the traditional cost system.

Table 3B. Activity-Based Costing – First-Stage Allocation (for Illustration)

	Material Acquisition & Handling	Product Design	Production Run	Quality Control	Order Processing	Post-Sale Support	Customer Marketing	Customer Relations	Organization Sustaining	Total
Factory Building Lease			$ 18,000						$ 27,000	$ 45,000
Factory Equipment Depreciation	$ 57,000	$ 14,250	$ 403,750							$ 475,000
Factory Supplies & Indirect Materials	$ 29,700	$ 20,250	$ 85,050							$ 135,000
Factory Utilities & Misc.			$ 92,340						$ 10,260	$ 102,600
Indirect Labor Costs										
Buyer Salaries	$ 12,080									$ 12,080
Engineer Salaries		$ 10,500		$ 4,500						$ 15,000
Mover Salaries	$ 23,000									$ 23,000
Supervisor Salaries	$ 29,160		$ 100,440	$ 24,300				$ 8,100		$ 162,000
Other Indirect Labor Salaries			$ 30,000							$ 30,000
Cleaning Crew Salaries									$ 12,000	$ 12,000
Security Guard Salaries									$ 5,000	$ 5,000
Selling & Administrative										
Administrative Expense					$ 32,480		$ 24,360	$ 50,750	$ 95,410	$ 203,000
Marketing Expense					$ 18,800		$ 75,200			$ 94,000
Office Building Lease									$ 60,000	$ 60,000
Office Equipment Depreciation							$ 9,800	$ 14,840	$ 3,360	$ 28,000
Office Supplies, Utilities & Misc.					$ 20,500	$ 2,460	$ 1,640	$ 4,100	$ 12,300	$ 41,000
Selling Expense					$ 80,500	$ 11,270	$ 35,420	$ 33,810		$ 161,000
Total	$ 150,940	$ 45,000	$ 729,580	$ 28,800	$ 152,280	$ 13,730	$ 146,420	$ 111,600	$ 225,330	**$ 1,603,680**

4.5 Calculate the Total Product Cost for the Standard Models and the Customized Models, Respectively. Compare the Results between the Traditional Cost System and ABC

This question highlights the difference between the traditional cost system and ABC in assigning direct costs to products. The solution is presented in Table 4A. Most of the students are able to correctly calculate the total product cost under the traditional cost system. That is, the sum of direct materials, direct labor, and total manufacturing overhead. Confusion exists as to whether or not shipping and sales commissions should be included in the total product cost. Under the traditional cost system, shipping and sales commissions are treated as period costs. Because shipping and sales commission costs are caused by products and can be directly traced, they are included in product costs under ABC. Although it is not necessary for instructors to spend much time discussing this question, it is important to

emphasize that the traditional cost system and ABC also differs in the manner in which direct costs are assigned to products.

Table 4A. Total Product Cost and Product Margin

Standard Models	Traditional	ABC
Direct Materials	$ 325,000	$ 325,000
Direct Labor	$ 270,000	$ 270,000
Shipping	N/A	$ 15,000
Sales Commission	N/A	$ 60,000
Manufacturing Overhead	$ 535,097	$ 433,220
Non-Manufacturing Overhead	N/A	$ 120,326
Total Product Cost	$ 1,130,097	$ 1,223,547
Revenue	$ 1,883,494	$ 1,883,494
Product Margin	40%	35%
Customized Models	Traditional	ABC
Direct Materials	$ 295,000	$ 295,000
Direct Labor	$ 250,000	$ 250,000
Shipping	N/A	$ 7,000
Sales Commission	N/A	$ 48,000
Manufacturing Overhead	$ 481,583	$ 521,100
Non-Manufacturing Overhead	N/A	$ 45,684
Total Product Cost	$ 1,026,583	$ 1,166,783
Revenue	$ 1,710,972	$ 1,710,972
Product Margin	40%	32%

4.6 Currently, Skylar Prices Their Products Based on a Desired Product Margin of 40%. Would Skylar Achieved this Product Margin If They Instead Used ABC for the Month of April? Discuss Shortcomings of the Traditional Cost System

The product margin is reduced to 35 percent for the standard models, and 32 percent for the customized models if ABC was implemented to calculate product costs. At this point of the lecture, students should have a reasonable understanding of the three conceptual differences between the traditional cost system and ABC. Instructors may wish to recap these three key points in the context of Skylar, and discuss individually, the directional effect on product costs.

First, manufacturing overhead costs caused by customer and organization level activities are excluded from product costs in ABC, resulting in lower product costs when compared to the traditional cost system. Second, non-manufacturing overhead costs caused by product-related Order Processing and Post-Sale Support activities are added to product cost in ABC, resulting in higher product costs when compared to the traditional cost system. Finally, direct costs such as shipping and sales commissions are also added to product costs in ABC, resulting in higher product costs when compared to the traditional cost system. The aggregate effect of these three differences between the traditional cost system and ABC results in higher product costs (thus, lower product margins) for both the standard and customized models.

However, it is important for instructors to point out that, product costs may not always increase when switching from the traditional cost system to ABC. The directional change varies depending on the magnitude of adjustments made to the traditional cost system.

In addition, some manufacturing overhead costs are misallocated between the two product groups due to the limited choice of cost drivers within the traditional cost system. For Skylar, manufacturing overhead costs are allocated by machine hours and direct labor hours with the departmental approach. As illustrated in Table 4B, 53 percent of the total manufacturing overhead is allocated to standard models and 47 percent is allocated to customized models. In ABC, the percentage of allocation between the two models varies significantly across activity cost pools. Instructors may wish to use Table 4B as a guide to assist students in identifying reasons why manufacturing overhead is misallocated in the traditional cost system. A detailed discussion on cost allocation in each activity cost pool is provided below.

Material Acquisition and Handling consumes costs related to sourcing suppliers, negotiating and finalizing contracts, tracking purchase orders, arranging deliveries, and moving materials from delivery points to cutting and assembly stations. ABC uses the number of purchase orders and thus allocates 28 percent of these costs to standard models and 72 percent to customized models. The customized models were given a much larger portion of the Material Acquisition and Handling costs for two reasons. First, only one type of material (wood) is used on the standard models. In comparison, various types of materials including metals, laminates, composite and glass are used in the customized models. Second, raw materials are sourced only from two suppliers for the standard models, whereas it is 30 suppliers for the customized models. Thus, much more resources and time are spent on acquiring and handling raw materials for the customized

models. This actual consumption of resources is overlooked by the traditional cost system when using machine hours and direct labor hours to allocate manufacturing overhead costs related to Material Acquisition and Handling. As a result, manufacturing overhead costs in this activity cost pool are inappropriately over-allocated to the standard models and under-allocated to the customized models.

This short fall of the traditional cost system becomes more apparent when evaluating costs consumed by Product Design activities. As described in the case, product design includes resources consumed by pattern drawing, prototype making and testing, and training assembly workers. For standard models, none of these tasks are required or have been performed in the month of April. Therefore, using the number of product designs as a cost driver, all of the product design costs are allocated to the customized models. For Production Run, the allocation is the same for the traditional cost system and ABC because the same cost driver (machine hours) have been used. For costs consumed by Quality Control activities, ABC allocates 19 percent of the costs to the standard models and 81 percent to the customized models, based on the number of inspected samples. There are 22 customized models and each requires two sample inspections. In comparison, there are only 10 standard models that each requires only one sample inspection. Again, the traditional cost system inappropriately over-allocated manufacturing overhead costs in Quality Control to the standard models and under-allocated costs to the customized models.

Table 4B. Manufacturing Overhead Allocation to Products

	Standard Models		Customized Models	
	Traditional	ABC	Traditional	ABC
Manufacturing Overhead				
Material Acquisition& Handling	53%	28%	47%	72%
Product Design		0%		100%
Production Run		53%		47%
Inspection & Quality Control		19%		81%

5. Alternative Teaching Strategies

Discussion questions are designed to be completed within one class session. Instructors that wish to spend more class time may also incorporate the following discussion questions.

Instructors may ask students to explore any limitations related to the implementation of ABC for Skylar, Inc. For example, none of the costs related to Product Design were allocated to the standard models in April because product design has already been accomplished in prior periods. Product design activities such as pattern drawing, prototype making and testing, and training assembly workers were performed when each model was first introduced. This presents a problem when deciding whether some of the prior period product design costs should be allocated to the current cost period. In the absence of this cross-period allocation, product costs in the period when product design activities were initially performed would have been higher. Similarly, for customized models, all costs related to product design have been allocated to product costs in April. The same problem of cross-period allocation is presented if clients place additional orders for existing customized models in future periods. This same rationale also applies to material acquisition costs because activities such as sourcing suppliers and negotiating contracts generally require only a one-time effort.

In the case of Skylar, ABC is implemented to allocate costs between two product groups: standard models and customized models. Although this approach is an improvement to the traditional cost system, questions remain as to whether or not costs are accurately allocated to the individual product level (i.e. each model within the two product groups). In other words, can unit cost be accurately calculated by simply dividing total product costs for customized models (or standard models) by the number of units? Take customized models as an example. Product costs can be significantly higher for a model that requires a more complex design, extra cutting and more assembly works. Furthermore, the number of units produced for each individual product can vary. Therefore, another limitation of the current implementation of ABC is that costs are still not precisely allocated to individual product level.

However, an additional challenge is introduced if costs are allocated to the individual product level because that will require significantly more resources to implement such a system and it will be costly to maintain. For example, data collection will require more effort and be more time-consuming because employees will have to keep track of their time spent on each individual product. Resources consumed by each individual product will also have to be separately estimated.

Furthermore, an activity-based cost system can be implemented to assign costs to other cost objects such as customers, suppliers, and distribution channels. Instructors may also explore issues related to customer level activities. The case study can be revised to include data for customers. Instructors may add additional numerical analysis related to the calculation of customer cost and customer margin.

Instructor may also wish to discuss the connection between ABC and external reporting. Under GAAP, only cost of goods sold and inventory valuation on aggregate basis are presented on the financial statements. Individual product costs are not reported. Furthermore, only the traditional cost system conforms to GAAP because reported product costs must include all manufacturing overhead. Non-manufacturing overhead costs are reported as period expenses.

Finally, instructors may use this case to assess students' written communication skills. A formal memo with recommendations to Skylar's owners can be assigned to students to work on outside of class.

6. Classroom Implementation and Evidence of Efficacy

The case was implemented in an 80-minutes undergraduate managerial accounting course. The case and discussion questions were provided to students at the beginning of class. Small groups consisting of three students in each group were formed. Each group was assigned to prepare one written response using only summary points for each discussion question and to be prepared to discuss the answers. The written responses were not graded for a course grade determination purpose. Students were given 50 minutes to prepare their answers. The remaining 30 minutes were spent on instructor-led class discussions about question solutions. After class, students were asked to complete an online case evaluation survey on the website Blackboard. Five extra points on the upcoming exam were given as an incentive to complete the survey. As a result, 46 out of 49 students have participated in the survey. The results of the survey are presented in Table 5. The feedback from the students is generally positive. A majority of students thought the case was easy to read and interesting. Most students found the case to be challenging, but also agree that it provided a valuable learning experience.

Table 5. Case Evaluation Survey Statistics

Questions/Answers	Strongly agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Strongly disagree	Unanswered
1. This case was easy to read.	13.043%	67.391%	13.043%	6.522%	0%	0%
2. This case was interesting.	32.609%	52.174%	8.696%	6.522%	0%	0%
3. This case enhanced my understanding of allocating manufacturing overhead costs using the traditional cost system.	39.130%	43.478%	13.043%	2.174%	0%	2.174%
4. This case enhanced my understanding of allocating manufacturing and non-manufacturing overhead costs using activity-based cost system.	41.304%	43.478%	13.043%	2.174%	0%	0%
5. This case enhanced my understanding of the difference between the traditional cost system and the activity-based costing system in allocating overhead costs.	43.478%	41.304%	6.522%	6.522%	0%	2%
6. This case enhanced my understanding of the difference between the traditional cost system and the activity-based costing system in assigning direct costs to products.	41.304%	43.478%	13.043%	2.174%	0%	0%
7. This case enhanced my understanding of how product cost and product margin is affected by the choice of cost systems.	28.261%	52.174%	17.391%	2.174%	0%	0%
8. This case enhanced my understanding of the benefits of the activity-based costing system.	39.130%	41.304%	17.391%	0%	0%	2%
9. Overall, this case was a valuable learning experience.	54.348%	30.435%	10.870%	4.348%	0%	0%
10. This case was challenging.	54.348%	39.130%	6.522%	0%	0%	0%

7. Conclusion

Managerial accounting textbooks generally cover the traditional cost system and ABC in different chapters. While the comparison between the two cost systems is illustrated in the chapters, assignment problems are usually number crunching exercises on various individual aspects of the two topics. This case is designed to offer one comprehensive example that reviews the applications of the both systems and discusses the conceptual difference between the two.

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