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Activity-Based Costing at Sogel Aviation

Bruce M. Bradford
Fairfield University, bbradford@fairfield.edu

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Activity-Based Costing at Sogel Aviation

Bruce M. Bradford
Fairfield University

Introduction

In 1986, the Bedford Committee (AAA 1986) delivered the opening salvo of what was to become a barrage of criticism of traditional textbook-based lecture/problem solving approach to accounting education. While the traditional approach is recognized as an efficient means to convey the overwhelming volume of technical materials that compose much of accounting education, it has obvious limitations. The Big 8 white paper (*Perspectives on Education*. . . 1989) stated that the traditional approach to accounting education fails to develop critical thinking, communication, and interpersonal skills essential to our profession. Such criticism is not unique to accounting education but reflects a general reform movement in higher education, e.g., Chickering and Gamson (1987).

Campbell and Lewis (1991) and Knechel (1992) suggested case analysis as an effective means to answer the critics of accounting education. The use case analysis varies from case-based courses to courses in which a few cases are used to supplement the traditional approach. Cases vary in length and complexity. Cases developed for lower-level undergraduate courses are often short and unambiguous, e.g., Walters and Pergola (2009) or Brewer, et al. (2008). Cases developed for upper-level undergraduate and graduate courses are large unstructured problems involving several possible solutions, e.g., Bamber and Hughes (2001), Brewer, et al. (2003), Kaciuba and Siegel (2009), Drake et al. (2001), or Bailey, et al. (2009).

Case analysis has been found to be an effective way to increase the depth of student understanding of topics under consideration (Stewart and Dougherty 1993) and increase student interest in those topics (Stout 1996). Cases are ideally suited to improve student's critical thinking skills (Kimmel 1993; Gabriel and Hirsch 1992), communication skills (Gabriel and Hirsch 1992; Hirsch and Gabriel 1995), and interpersonal skills (Scofield 2005). The written case analysis also provides ideal documentation for "assurance of learning" in the AACSB accreditation process.

Activity-Based Costing at Sogel Aviation is designed for Freshmen and Sophomores in an Introduction to Management Accounting course. Baxter Magolda (1992) suggests that these early undergraduate students are intolerant of ambiguity and expect knowledge to be conveyed to them from an authoritative source. To reduce ambiguity, this case provides a concrete framework for the necessary computations to direct them to a satisfactory outcome. Students are asked to build on this initial computational work by evaluating why the situation has developed. They are also asked to reflect on the advantages and disadvantages of alternative cost systems and make a policy decision.

Case Materials

Sean Fitzgerald, President of Sogel Aviation, Inc. is concerned about the profitability of the company. In recent years, the company has become less profitable while sales have increased. Sogel Aviation manufactures two types of aircraft. The Eagle Stunt Flyer is a highly maneuverable biplane used for crop dusting, skywriting, and stunt shows. The Hawk Bushman is a single wing aircraft designed to carry light cargo into difficult terrain. It is designed to operate from a short grassy runways or, alternatively, packed snow.

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Erin O’Conner, Controller, suggested that activity-based costing might provide a better understanding of the company’s cost structure than the traditional job order costing system currently being used. Ms. O’Conner is asked to provide a report comparing job order costs and activity-based costs for the two product lines. This report is to provide the basis for Mr. Fitzgerald’s decision as to which costing system Sogel Aviation would use in the future.

Ms. O’Connor realized that the choice of a cost system would have a major impact on the competitiveness of Sogel Aviation in its niche markets. Accurate knowledge of product costs is critical in setting product sales prices. It is through product pricing that the firm chooses its competitive position in the marketplace. Understanding and managing costs are critical for the continued profitability of the company.

Job order costing

Ms. O’Connor average unit cost data from the company’s accounting records. Direct materials are the costs of raw materials and parts traceable to the finished product. Direct labor is the cost of the labor required to convert the direct materials to finished product. Manufacturing overhead consists of all other manufacturing costs.

Exhibit 1. Cost Summary for One Eagle Stunt Flyer

Direct Materials	\$15,150
Direct Labor	12,000
Manufacturing Overhead	<u>24,000</u>
Total Costs	<u>\$51,150</u>

Exhibit 2. Cost Summary for One Hawk Bushman

Direct Materials	\$22,625
Direct Labor	19,500
Manufacturing Overhead	<u>39,000</u>
Total Costs	<u>\$81,125</u>

Sogel Aviation has chosen to allocate manufacturing overhead to finished products with one plant-wide predetermined overhead rate of 200 percent of direct labor costs. By the end of the year all of the manufacturing costs have been assigned to products. The sale of these products must recover all manufacturing costs, nonmanufacturing costs, and provide profit.

Activity-based costing

Sogel Aviation has budgeted for production of 30 Eagle Stunt Flyers and 50 Hawk Bushman during 2010. Direct material and direct labor traced to each product does not differ between job order costing and activity-based costing. The choice of a cost system effects how much of the \$2,727,000 budgeted manufacturing overhead would be assigned to each product-line. Ms. O’Connor has identified six cost pools and relevant cost drivers for each.

Exhibit 3. Budgeted Costs Associated with Levels of Activity

Activity	Budgeted Costs	Cost Drivers	Activity Level
Assembly support	\$1,700,000	Machine hours	40,000 hours
Inspection	280,000	Number of units	80 units
Materials requisition	30,000	Number of orders	240 orders
Materials handling	123,500	Number of deliveries	260 deliveries
Product design	460,000	Redesign hours	2,300 hours
Facility administration	<u>133,500</u>	Direct labor costs	\$1,335,000
Total	<u>\$2,727,000</u>		

Exhibit 4. Activity Level by Product Line

Cost Driver	Eagle	Hawk	Total
Machine hours	15,000 hours	25,000 hours	40,000 hours
Number of units	30 units	50 units	80 units
Number of orders	110 orders	130 orders	240 order
Number of deliveries	110 deliveries	150 deliveries	260 deliveries
Redesign hours	1,000 hours	1,300 hours	2,300 hours
Direct labor costs	\$360,000	\$975,000	\$1,335,000

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Case Requirements

1. Calculate the pool rates (use Exhibit 5 in Appendix A) and use them to assign manufacturing overhead to each of the two product-lines (use Exhibit 6 in Appendix A) using activity-based costing.
2. Calculate the cost per unit and profit per unit for each of the two products under each cost system (use Exhibits 7 and 8 in Appendix A).
3. If Sogel Aviation's management acted on the job order costing information available to them, how could they become less profitable while selling more airplanes?
4. Describe the advantages and disadvantages of the two costing systems. Should Sogel Aviation change from job order costing to activity based costing? Why or why not?

Teaching Notes

Suggested Teaching Strategy

Although this case can be assigned to individual students, it has been developed as an out-of-class group assignment. About 25 – 30 minutes of class time is used assigning groups and explaining the case to the class. About a week later, an additional 20 – 30 min is needed to debrief the students after the case analysis has been collected.

Heterogeneous groups were formed by asking the students to count-off from 1 to 7 and assigning the four 1s to group one, etc. Groups of three or four students seem to work well. Larger groups have proven to be a problem. One student should be identified as the group leader. The leader is provided with a copy of the case and asked to gather the contact information of all members in the group and email that information to all other members. The leader is also instructed to arrange the first group meeting before the end of class.

If a series of cases are to be assigned, groups may be reused. Alternatively, the instructor may choose to reassign groups to avoid some of the personality problems that may arise during the semester. I often ask students to provide feedback in the form of a peer evaluation. I have them rank participation of each member of the group from zero to ten with ten being the highest score. To provide accountability, these peer evaluations are incorporated into the grading system.

Learning Objectives and Assessment

There are several learning objectives that underlie this case. First, students should be able to correctly calculate the ABC manufacturing overhead costs for each product. Second, they should be able to use ABC to calculate more accurate product profitability. Third, students should be able to perceive that the old job order cost system was providing management with incorrect information. Acting on this information could result in an improper product mix which could lead Sogel Aviation into a situation resulting in declining profitability. Fourth, students should recognize that changing to ABC could provide management with more accurate cost information that could lead to actions that would improve profitability.

In the debriefing for the case, I am careful to point out that the job order costing information was inaccurate because of differences in volume and complexity. ABC in this situation provides this company with more accurate information that allows management to make sound decisions. However, one persistent misconception expressed by students is that both cost systems are equally correct and the choice of one system or the other depends on which one is associated with higher reported profit.

This common misconception can be explained using Baxter Magolda's (1992) model of intellectual development. The Introduction to Management Accounting students appear to be a mix of absolute and transitional learners. Absolute learners would see issues as "black or white." They would be more prone to see both systems as valid in all situations. Transitional learners seemed to do better with "shades of gray" associated with subtleties that create the observed bias in a job order costing system.

In assessing the use of this case, I surveyed the students on how their case experienced affected the way they felt about the course, field of study, and their career choice. The survey instrument was developed based on Stout (1996) (Appendix C). It was completed directly after collecting the case analysis and debriefing the class. The survey, summarized in Table 1, consisted of eleven questions directed at four constructs. The five-point Likert scale responses were coded from 2 (most positive) to -2 (most negative). Questions 7 and 8 were reverse coded for consistency. Summary responses were calculated for each of the four constructs (Spector 1992).

First, students' general interest in accounting as a field of study and their perception of success in accounting and business are examined. Following Stout (1996), student responses are evaluated using a simple

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parametric t-test in Table 1, but these findings are also supported by nonparametric chi-square tests (not reported here). For the first three questions, the mean response of 1.141 is significantly positive at the 0.01 level. However, the individual questions demonstrate varied student response. The perceived future success in accounting and business courses were both significantly positive at the 0.01 level. The attractiveness of accounting as a field of study was not significantly different from zero.

Table 1. Survey of Student Attitudes Associated with Their Case Experience

Question	N	Mean	Std. Error	t-value	p-value
Attractiveness of accounting as a field of study.	64	0.090	0.117	0.800	0.427
Perceived success in future accounting courses.	64	0.360	0.105	3.412	0.001
Perceived success in future business courses.	64	0.690	0.086	8.004	0.000
Section means for perceived impact of course.	64	1.141	0.250	4.565	0.000
Awareness of the importance of financial information in making decisions.	64	0.980	0.093	10.568	0.000
Awareness of the importance of nonfinancial information in making decisions.	64	0.500	0.094	5.292	0.000
Awareness of group dynamic issues in working with a team to achieve a common goal.	64	0.730	0.110	6.697	0.000
Section means for decision making environment.	64	2.219	0.223	9.939	0.000
How interesting is the case analysis portion of this course?	64	0.520	0.102	5.053	0.000
How valuable is the case analysis portion of this course?	64	0.810	0.104	7.800	0.000
How difficult is the case analysis portion of this course?	64	0.440	0.083	5.274	0.000
Section means for interest, value, and difficulty.	64	1.766	0.185	9.562	0.000
How has this course affected your perception of the desirability of a career in accounting?	64	0.020	0.098	0.159	0.874
How has this course affected your perception of the desirability of a management accounting career specialization?	64	0.020	0.103	0.151	0.880
Section means for career choice.	64	0.031	0.184	0.170	0.865

Second, students are asked about the decision-making environment. Did this case experience increase their awareness of group dynamics or the importance of financial and nonfinancial information in decision-making? The mean response of 2.219 ($p < 0.01$) is the strongest response in the survey. This case seemed to be effective at conveying the importance of financial information in decision-making. Students also indicated an increased appreciation of the issues of group dynamics. Anecdotal comments from the students reinforced both points.

Third, students found the case both interesting and a valuable aspect of the course. The mean response of 1.766 is significantly positive at the 0.01 level. In spite of the cases perceived level of difficulty, the students find this case to be a valuable aspect of this course. This suggests that supplementing a traditional approach to the Introduction to Management Accounting with some case analysis can have a positive effect on student feelings about the course.

Fourth, students are asked if this course had any impact on their career choice. Unlike the responses reported by Stout (1996), these responses were resoundingly noncommittal. This course had no significant impact on the students' perception of the desirability of a career in accounting or in management accounting.

This is the second case used in this course; the first case involved job order costing (Bradford 2010). The same survey was administered after debriefing both cases. Mean responses on the second administration of the survey are generally smaller but, following Stout (1996), a paired t-test found no significant differences between mean responses for any question. However, attractiveness of accounting as a field of study is significant at the 0.05 level on the first survey, but becomes insignificant on the second administration of this survey.

Recommended Solution

Requirement 1

Students in Introduction to Management Accounting often are confused by the complexity of activity-based costing. I usually focus on one pool while explaining the mechanics involved in assigning manufacturing overhead from one pool to one product is analogous the use of a single predetermined overhead rate in job order costing. I further simplify ABC by referring to a “quick and dirty” 2-step ABC method: find the pool rates and use them. This requirement asks the students to find the pool rates by finishing Exhibit 5 and then use those pool rates to assign costs in Exhibit 6. The forms provided for requirement 1 are designed to reduce ambiguity and direct the students towards an acceptable conclusion.

I have students calculate total manufacturing overhead assigned from each pool to each product in Exhibit 6. This is done so they can see that the amount of manufacturing overhead assigned represents a portion of the manufacturing overhead in each pool. I stress that the portion of manufacturing overhead assigned is directly related to the cost driver activity of each product. For some students, this step helps them to see how the textbook description of ABC is turned into concrete actions.

Requirement 2

Students draw information from the traditional job order costing system, as presented in Exhibits 1 and 2, to calculate the profit in Exhibit 7. They can use this as a basis for completing Exhibit 8 by recognizing the direct material and direct labor are unchanged in the ABC system. The ABC manufacturing overhead should be drawn from Exhibit 6 to complete the calculation or profit per unit.

Requirement 3

The first essay asked the students how is it possible for Sogel Aviation to sell more airplanes and make less profit. Ideally, they should see that the information provided to management from the old job order costing system is biased. Differences in volume and complexity has led to undercosting of the Eagle Stunt Flyer and overcosting the Hawk Bushman. If management believed their cost system and put more effort into selling the Hawk Bushman, they would be surprised that costs were higher than anticipated and they actually made less money than they thought they would. Bad information leads to bad strategy. Kaplan and Cooper (1998) describe similar situations where real companies discovered by adopting ABC costing that they were actually selling products at breakeven or at a loss.

Requirement 4

The second essay asks the students to review the advantages and disadvantages of job order and activity-based costing systems. This provides the students an opportunity to reflect on what is involved in the decision they will be asked to make. I generally focus on the major differences. Job order costing is relatively simple and low cost but often inaccurate. Activity-based costing is complex and more expensive to administer, but it provides a greater degree of accuracy.

In this case, Sogel Aviation would benefit from improved product cost information. They should adopt ABC. The increased costs could be somewhat mitigated by the use of technology. If Sogel Aviation has access to an ERP system, atomized cost information could be assembled according to GAAP for financial reporting purposes and according to ABC for decision-making purposes. Implementation costs would still be high but the administration costs might not be too onerous.

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APPENDIX A. Forms for Completion of Requirements 1 and 2.

Exhibit 5. Cost Driver Pool Rates

Activity	Budgeted Cost	Activity Level	Pool Rate
Assembly support	\$1,700,000	40,000 hours	
Inspection	280,000	80 units	
Materials requisition	30,000	240 orders	
Materials handling	123,500	260 deliveries	
Product design	460,000	2,300 hours	
Facility administration	133,500	\$1,335,000	
Total manufacturing overhead	2,727,000		

Exhibit 6. Manufacturing Overhead Per Unit by Product Line

Activity	Eagle	Hawk	Total
Assembly support			
Inspection			
Materials requisition			
Materials handling			
Product design			
Facility administration			
Total manufacturing overhead			
Number of units produced			
Manufacturing overhead cost per unit			

Exhibit 7. Job Order Unit Cost and Profit

	Eagle Stunt Flyer	Hawk Bushman
Direct materials per unit		
Direct labor per unit		
Manufacturing overhead per unit		
Manufacturing cost per unit		
Sales price	\$80,000	\$100,000
Profit per unit		

Exhibit 8. ABC Unit Cost and Profit

	Eagle Stunt Flyer	Hawk Bushman
Direct materials per unit		
Direct labor per unit		
Manufacturing overhead per unit		
Manufacturing costs per unit		
Sales price	\$80,000	\$100,000
Profit per unit		

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APPENDIX B. Suggested Solution for Activity-Based Costing at Sogel Aviation

1. Calculate the pool rates (Exhibit 5 in Appendix A) and use them to assign manufacturing overhead to each of the two product-lines (Exhibit 6 in Appendix A) using activity-based costing.

Suggested Solution for Exhibit 5 Cost Driver Pool Rates

Activity	Budgeted Cost	Activity Level	Pool Rate
Assembly support	\$1,700,000	40,000 hours	\$42.50 machine hour
Inspection	280,000	80 units	\$3,500 per unit
Materials requisition	30,000	240 orders	\$125 per order
Materials handling	123,500	260 deliveries	\$475 per delivery
Product design	460,000	2,300 hours	\$200 per redesign hour
Facility administration	133,500	\$1,335,000	\$0.10 per DL\$ or 10%
Total manufacturing overhead	2,730,000		

Suggested Solution for Exhibit 6 Manufacturing Overhead Per Unit by Product Line

Activity	Eagle	Hawk	Total
Assembly support	\$637,500	\$1,062,500	\$1,700,000
Inspection	105,000	175,000	280,000
Materials requisition	13,750	16,250	30,000
Materials handling	52,250	71,250	123,500
Product design	200,000	260,000	460,000
Facility administration	36,000	97,500	133,500
Total manufacturing overhead	\$1,044,500	\$1,682,500	\$2,727,000
Number of units produced	30 units	50 units	
Manufacturing overhead cost per unit	\$34,816.67	\$33,650	

2. Calculate the cost per unit and profit per unit for each of the two products under each cost system (Exhibits 7 and 8 in Appendix A).

Suggested Solution for Exhibit 7 Traditional Unit Cost and Profit

	Eagle Stunt Flyer	Hawk Bushman
Direct materials per unit	\$15,150	\$22,625
Direct labor per unit	12,000	19,500
Manufacturing overhead per unit	24,000	39,000
Manufacturing costs per unit	51,150	81,125
Sales price	80,000	100,000
Profit per unit	\$28,850	\$18,875

Suggested Solution for Exhibit 8 ABC Unit Cost and Profit

	Eagle Stunt Flyer	Hawk Bushman
Direct materials per unit	\$15,150	\$22,625
Direct labor per unit	12,000	19,500
Manufacturing overhead per unit	34,817	33,650
Manufacturing cost per unit	61,967	75,775
Sales price	80,000	100,000
Profit per unit	\$18,033	\$24,225

Suggested solution for requirement 3. If Sogel Aviation's management acted on the job order costing information available to them, how could they become less profitable while selling more airplanes?

Sogel Aviation has a situation. They find they are selling more airplanes, but making less profit. Under the old job order costing system, management was informed by the cost management system that the Eagle Stunt Flyer is the more profitable product. If we assume that ABC costs are more accurate, the Hawk Bushman is really the more profitable product.

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If management aggressively marketed the Eagle Stunt Flyer, they would have been manufacturing and selling a product that makes less profit. This would result in higher costs and less profit than expected. The company could easily see their profits decline. This effect would have been aggravated by a change in product mix favoring the Eagle Stunt Flyer.

Suggested solution for requirement 4. Describe the advantages and disadvantages of the two costing systems. Should Sogel Aviation change from job order costing to activity based costing? Why or why not?

The job order costing is simple and easy to use. However, it is less accurate than ABC. When products differ in output volume or complexity, job order costing can assign too much manufacturing overhead to the high volume product and too little to the low volume product. This bias, known as overcosting (or undercosting), can misinform management about the profitability of various product-lines. In this case job order costing indicated that the Eagle Stunt Flyer was more profitable than the Hawk Bushman, which is not true.

In this case, ABC assigned manufacturing overhead using six pools. Assigning these costs according to direct labor costs would treat all manufacturing costs as variable costs. Job order costing overcosted the Hawk Bushman making it appear less profitable than the Eagle Stunt Flyer. ABC indicated that the Hawk Bushman is actually the more profitable product. Since ABC provides management with clear insight into product profitability, it becomes an enabler of strategy and critical to the continued success of the firm. Sogel Aviation should choose ABC.

APPENDIX C
Evaluation of Activity-Based Costing at Sogel Aviation

Circle the letter that corresponds to the response which best fits each question or statement.

1. Attractiveness of accounting as a field of study.
 - a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact

2. Perceived success in future accounting courses.
 - a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact

3. Perceived success in future business courses.
 - a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact

4. Awareness of the importance of financial information in making decisions.
 - a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact

5. Awareness of the importance of nonfinancial information in making decisions.
 - a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.

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- d. Positive impact.
 - e. Significant positive impact
6. Awareness of group dynamic issues in working with a team to achieve a common goal.
- a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact
7. How interesting is the case analysis portion of this course?
- a. Very interesting.
 - b. Interesting.
 - c. Not interesting.
 - d. Boring.
 - e. Very boring.
8. How valuable is the case analysis portion of this course?
- a. Very valuable.
 - b. Valuable.
 - c. No value.
 - d. Wasteful of my time.
 - e. Very wasteful of my time.
9. How difficult is the case analysis portion of this course?
- a. Very easy.
 - b. Easy.
 - c. Not difficult.
 - d. Difficult.
 - e. Very difficult
10. How has this course affected your perception of the desirability of a career in accounting?
- a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact
11. How has this course affected your perception of the desirability of a management accounting career specialization?
- a. Significant negative impact.
 - b. Negative impact.
 - c. No impact.
 - d. Positive impact.
 - e. Significant positive impact