Lecture 2: Self-study exercises

(Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

11.11 ABC, product cost cross-subsidisation

McCarthy Potatoes processes potatoes into chips at its highly automated Longford plant. For many years, it processed potatoes for only the retail consumer market where it had a superb reputation for quality. Recently, it started selling chips to the institutional market that include hospitals, cafeterias and university halls of residence. Its penetration into the institutional market has been slower than predicted. McCarthy's existing costing system has a single direct-cost category (direct materials, which are the raw potatoes) and a single indirect-cost pool (production support). Support costs are allocated on the basis of kilograms of chips processed. Support costs include packaging material. This year's total actual costs for producing 1 000 000 kg of chips (900 000 for the retail market and 100 000 for the institutional market) are:

Direct materials used	€150 000
Production support	€983 000

The existing costing system does not distinguish between chips produced for the retail or the institutional markets.

At the end of the year, McCarthy unsuccessfully bid for a large institutional contract. Its bid was reported to be 30% above the winning bid. This came as a shock as McCarthy included only a minimum profit margin on its bid. Moreover, the Longford plant was widely acknowledged as the most efficient in the industry.

As part of its lost contract bid review process, McCarthy decided to explore several ways of refining its costing system. First, it identified that €188 000 of the €983 000 pertains to packaging materials that could be traced to individual jobs (€180 000 for retail and €8000 for institutional). These will now be classified as a direct material. The €150 000 of direct materials used were classified as €135 000 for retail and €15 000 for institutional. Second, it used activity-based costing (ABC) to examine how the two products (retail chips and institutional chips) used the support area differently. The finding was that three activity areas could be distinguished and that different usage occurred in two of these three areas. The indirect cost per kilogram of finished product at each activity area is as follows:

Activity area	Retail chips	Institutional chips
Cleaning	€0.120	€0.120
Cutting	0.240	0.150
Packaging	0.480	0.120

There was no opening or closing amount of any stock (materials, work in progress or finished goods).

Required:

1. Using the current costing system, what is the cost per kilogram of chips produced by McCarthy?
2. Using the refined costing system, what is the cost per kilogram of (a) retail market chips, and (b) institutional market chips?
3. Comment on the cost differences shown between the two costing systems in requirements 1 and 2. How might McCarthy use the information in requirement 2 to make better decisions?

Suggested Solution

1.

Direct costs		
Direct materials	€150 000	€150 000
Indirect costs		
Product support	983 000	983 000
Total costs		€1 133 000
	Cost per kilogram of chips = € 1.133	

2.

	Retail chips	**Institutional chips**
Direct costs		
Direct materials	€135 000	€15 000
Packaging	180 000	8 000
Indirect costs	315 000	23 000
Cleaning		
€0.120 x 900 000	108 000	
€0.120 x 100 000		12 000
Cutting		
€0.24 x 900 000	216 000	
€0.15 x 100 000		15 000
Packaging		
€0.48 x 900 000	432 000	
€0.12 x 100 000		12 000
	756 000	39 000
Total costs	€1 071 000	€62 000
Units produced	900 000	100 000
Cost per unit	€1.19	€0.62

Note: The total costs of €1 133 000 (€1 071 000 + €62 000) are the same as those in requirement 1.

3.

There is much evidence of product-cost cross-subsidisation.

	Retail	**Institutional**
Current system	€1.133	€1.133
ABC system	€1.190	€0.620

Assuming the ABC numbers are more accurate, retail is undercosted by approximately 5% (€1.133 ÷ €1.19 = 0.95) while institutional is overcosted by 83% (€1.133 ÷ €0.620 = 1.83).
The current system assumes that each product uses all the activity areas in a homogeneous way. This is not the case. Institutional sales use far fewer resources in the cutting area and the packaging area. The percentage of total costs for each cost category is:

	Retail	**Institutional**	**Total**
Direct costs			
Direct materials	90.0%	10.0%	100.0%
Packaging	95.7	4.3	100.0
Indirect costs			
Cleaning	90.0	10.0	100.0
Cutting	93.5	6.5	100.0
Packaging	97.3	2.7	100.0
Units produced	90.0%	10.0%	100.0%

McCarthy Potatoes can use the revised cost information for a variety of purposes:

- *Pricing/product emphasis decisions*. The sizable drop in the reported cost of institutional potatoes makes it possible that McCarthy Potatoes was overpricing potato products in this market. It lost the bid for a large institutional contract with a bid 30% above the winning bid. With its revised product cost dropping from €1.133 to €0.620, McCarthy Potatoes could have bid much lower and still made a profit. An increased emphasis on the institutional market appears warranted.
- *Product design decisions*. ABC provides a roadmap as to how to reduce the costs of individual products. The relative components of costs are:

	Retail	**Institutional**
Direct costs		
Direct materials	12.6%	24.2%
Packaging	16.8	12.9
Indirect costs		
Cleaning	10.1	19.3
Cutting	20.2	24.2
Packaging	40.3	19.3
Total costs	100.0%	100.0%

Packaging-related costs constitute 57.1% (16.8% + 40.3%) of total costs of the retail product line. Design efforts that reduce packaging costs can have a big impact on reducing total unit costs for retail.

- *Process improvements*. Each activity area is now highlighted as a separate cost. The three indirect cost areas are over 60% of total costs for each product, indicating the upside from improvements in the efficiency of processes in these activity areas.

11.12 ABC, activity area cost driver rates (continuation of Exercise 11.11)

Exercise 11.11 reports ABC data for the three activity areas (cleaning, cutting and packaging) on a per output unit basis (per kilogram of chips). This format emphasizes product costing. An alternative approach that emphasizes the costs of individual processes (activities) is to identify (a) the costs at each activity area, and (b) the rate per unit of the cost driver at each activity area. The following information pertains to (a) and (b):

1 Cleaning activity area: McCarthy used 1.2 million kilograms of raw potatoes to yield 1 million kilograms of chips. No distinction is made as to the end-product when cleaning potatoes. The cost driver is kilograms of raw potatoes cleaned.
2 Cutting activity area: McCarthy processes raw potatoes for the retail market independently of those processed for the institutional market. The production line produces (a) 250 kg of retail chips per cutting-hour, and (b) 400 kg of institutional chips per cutting-hour. The cost driver is cutting-hours on the production line.
3 Packaging activity area: McCarthy packages chips for the retail market independently of those packaged for the institutional market. The packaging line packages (a) 25 kg of retail chips per packaging-hour, and (b) 100 kg of institutional chips per packaging-hour. The cost driver is packaging-hours on the production line.

Required:

1 What are the total activity costs in the (a) cleaning, (b) cutting and (c) packaging activity areas?
2 What is the cost rate per unit of the cost driver in the (a) cleaning, (b) cutting and (c) packaging activity areas?
3 How might McCarthy Potatoes use information about the cost driver rates calculated in requirement 2 to better manage the Longford plant?

Suggested Solution

1.

Cleaning activity area	
1 000 000 Kg x €0.120	€120 000
Cutting	
900 000 x €0.24	€216 000
100 000 x €0.15	15 000
	€231 000
Packaging	
900 000 x €0.480	€432 000
100 000 x €0.120	12 000
	€ 444 000

2.

Cost pool	Costs in pool	Number of driver units	Costs per driver unit
Cleaning	€120 000	1 200 000 raw Kilograms	€0.10
Cutting	€231 000	3 850 hours*	€60.00
Packaging	€444 000	37 000 hours†	€12.00
* (900 000 ÷250) + (100 000 ÷400) = 3600 + 250 = 3850. † (900 000 ÷ 25) + (100 000 ÷ 100) = 36 000 + 1000 = 37 000.			

3.

McCarthy Potatoes can use information about cost driver rates in several ways:

1 Target the high cost rate areas for process improvement. For example, cutting has a € 60 per hour rate. McCarthy Potatoes could seek ways to reduce this by either redesigning processes or employing lower-cost equipment.

2 Benchmarking to signal areas capable of improvement. If McCarthy Potatoes has other potato processing plants around the globe, it could compare cost driver rates for the same activity at different plants. It could then seek to transfer knowledge from the most efficient plants to the less efficient plants.

3 Use cost driver rates as performance targets when evaluating operating managers. For example, the manager in charge of potato cleaning could be given a target rate of €0.09 per raw kilogram of potatoes cleaned.

4 Developing a flexible budget for McCarthy Potatoes. The effect of different product mixes and different output levels can be estimated using the cost driver rates.

11.18 Activity-based job costing, unit-cost comparisons.

Aircomposystèmes SA has a machining facility specializing in work for the aircraft components market. The prior job-costing system had two direct-cost categories (direct materials and direct manufacturing labour) and a single indirect-cost pool (manufacturing overhead allocated using direct labour-hours). The indirect cost-allocation rate of the prior system for the year would have been. SFr 115 per direct manufacturing labour-hour. Recently, a team with members from product design, manufacturing and accounting used an activity-based approach to refine its job-costing system. The two direct-cost categories were retained. The team decided to replace the single indirect-cost pool with five indirect-cost pools. These five cost pools represent five activity areas at the facility, each with its own supervisor and budget responsibility. Pertinent data are as follows:

Activity area	Cost driver used as allocation ase	Cost-allocation rate
Materials handling	Parts	SFr 0.40
Lathe work	Turns	0.20
Milling	Machine-hours	20.00
Grinding	Parts	0.80
Testing	Units tested	15.00

Information-gathering technology has advanced to the point where all the data necessary for budgeting in these five activity areas are automatically collected. Two representative jobs processed under the new system at the facility in the most recent period had the following characteristics:

	Job 410	**Job 411**
Direct materials cost per job	SFr 9 700	SFr 59 900
Direct manufacturing labour cost per job	750	11 250
Direct manufacturing labour-hours per job	25	375
Parts per job	500	2 000
Turns per job	20 000	60 000
Machine-hours per job	150	1 050
Units per job	10	200

Required:

1 Calculate the per unit manufacturing costs of each job under the prior job-costing system.
2 Calculate the per unit manufacturing costs of each job under the activity-based job-costing system.
3 Company the per unit cost figures for Jobs 410 and 411 calculated in requirements 1 and 2. Why do the prior and the activity-based costing systems differ in their job cost estimates for each job? Why might these differences be important to Aircomposystèmes?

Suggested Solution

1.

	Job order 410		**Job order 411**	
Direct manufacturing costs				
Direct materials	Sfr 9 700		SFr 59 900	
Direct manufacturing labour,				
SFr 30 x 25; 375	750	SFr 10 450	11 250	SFr 71 150
Indirect manufacturing costs,				
SFr 115 x 25; 375		2 875		43 125
Total manufacturing costs		SFr 13 325		SFr 114 275
Number of units		÷10		÷ 200
Unit manufacturing cost per job		SFr 1 322.50		SFr 571.375

2.

	Job order 410		**Job order 411**	
Direct manufacturing costs:				
Direct materials	Sfr 9 700		SFr 59 900	
Direct manufacturing labour,				
SFr 30 x 25; 375	750	SFr 10 450	11 250	SFr 71 150
Indirect manufacturing costs:				
Materials handling,				
SFr 0.40 x 500; 2000	200		800	
Lathe work,				
SFr 0.20 x 20 000; 60 000	4 000		12 000	
Milling,				
SFr 20.00 x 150; 1050	3000		21 000	
Grinding,				
SFr 0.80 x 500; 2000	400		1 600	
Testing,				
SFr 15.00 x 10; 200	150	7 750	3 000	38 400
Total manufacturing costs		SFr 18 200		SFr 109 550
Number of units per job		÷10		÷ 200
Unit manufacturing cost per job		SFr 1 820		SFr 547.75

3.

	Job order 410	Job order 411
Number of units in job	10	200
Unit cost per job with prior costing system	SFr 1332.50	SFr 571.375
Unit cost per job with activity-based costing	SFr 1820.00	SFr 545.75

Job order 410 has an increase in reported cost of 36.6% [(SFr 1820 – SFr 1332.50) ÷ SFr 1332.50] while job order 411 has a decrease in reported cost of 4.1% [(SFr 547.75 – SFr 571.375) ÷ SFr 571.375].

A common finding when activity-based costing is implemented is that low-volume products have increases in their reported costs while high-volume products have decreases in their reported cost. This result is also found in requirements 1 and 2 of this problem.

The product cost figures calculated in requirements 1 and 2 differ because:

- the job orders differ in the way they use each of the five activity areas; and
- the activity areas differ in their indirect cost allocation bases (specifically, each area does not use the direct labour-hours indirect cost allocation base).

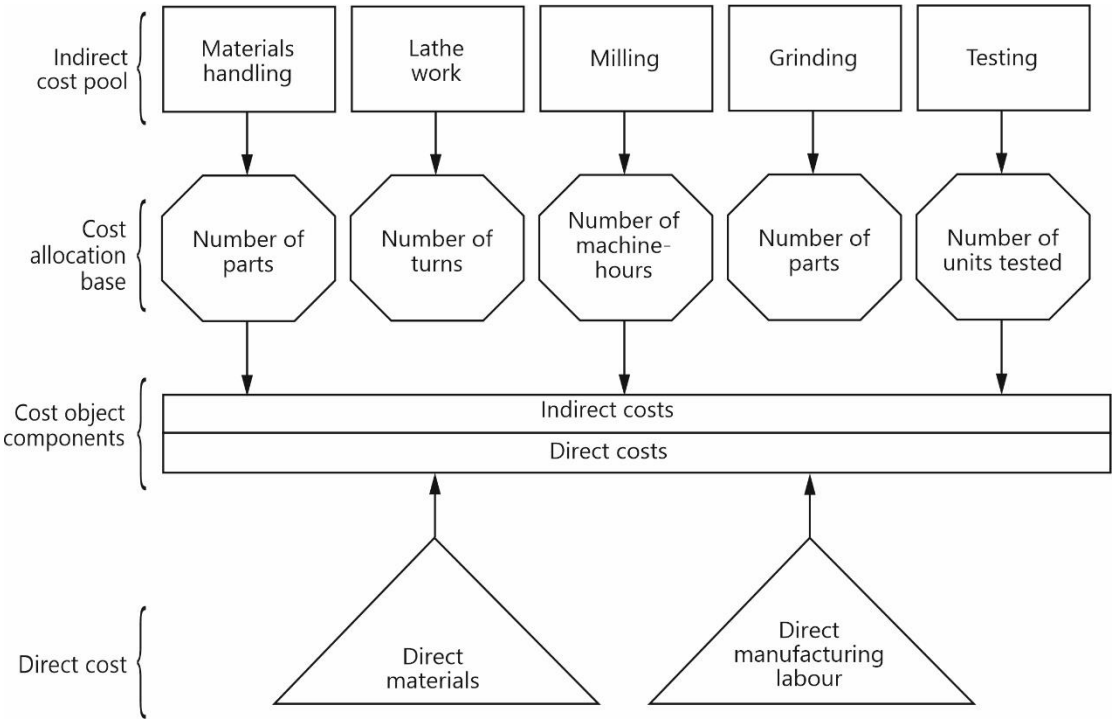
The following table documents how the two job orders differ in the way they use each of the five activity areas included in indirect manufacturing costs.

	Usage based on analysis of activity area cost drivers		Usage assumed with direct labour-hours as application base	
Activity area	**Job order 410**	**Job order 411**	**Job order 410**	**Job order 411**
Materials handling	20%	80.0%	6.25%	93.75%
Lathe work	25.0	75.0	6.25	93.75
Milling	12.5	87.5	6.25	93.75
Grinding	20.0	80.0	6.25	93.75
Testing	4.8	95.2	6.25	93.75

Areas where the differences in product cost figures might be important to Aircomposystèmes include:

- *Product pricing and product emphasis*. The activity-based accounting approach indicates that Job 410 is being undercosted while job 411 is being overcosted. Aircomposystèmes may erroneously push Job 410 and de-emphasise Job 411. Moreover, by its actions, Aircomposystèmes may encourage a competitor to enter the market for Job order 411 and take market share away from itself.
- *Product design*. Product designers at Aircomposystèmes will probably find the numbers in the acrtivity-based costing approach more believable and credible than those in the existing system. In a machine-paced manufacturing environment, it is unlikely that direct labour-hours would be the major cost driver. Acitivity-based costing provides more credible signals to plroduct designers about the ways the costs of a product can be reduced – for example, use fewer parts, require fewer turns on the lathe, and reduce the number of machine-hours in the milling area.

An overview of the product costing system is given:


Indirect cost pool
Materials handling
Lathe work
Milling
Grinding
Testing
Cost allocation base
Number of parts
Number of turns
Number of machine-hours
Number of parts
Number of units tested
Cost object components
Indirect costs
Direct costs
Direct cost
Direct materials
Direct manufacturing labour