Foundations of Accounting & Finance

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Lecture – 29

Activity Based Costing - Part I

Impacts of Activity-Based Costing

Continuing with the discussion on the impacts of activity-based costing (ABC), let us get into its benefits. ABC facilitates more precise planning of profits, pricing decisions, and product mix decisions.

ABC involves allocating overheads based on specific activities and their corresponding activity drivers. This entails identifying activities and their drivers, then allocating costs accordingly.

In essence, overhead costs form a pool from which we extract specific activity-based costs. These costs are then allocated to individual activities based on their respective drivers. This process enables a more accurate distribution of costs, aligning them with the activities that drive them.

By implementing ABC, businesses gain insight into the true costs associated with various activities. This understanding empowers better decision-making regarding resource allocation, pricing strategies, and product offerings. Moreover, ABC enhances cost control by pinpointing areas of inefficiency or excessive spending, enabling organizations to optimize their operations and improve overall profitability.

Disadvantages of ABC

Despite its advantages, activity-based costing (ABC) has certain drawbacks. One notable disadvantage arises when certain activities prove challenging to allocate due to difficulties in identifying the activity driver.

For instance, consider the scenario of managing welfare measures, such as operating a canteen for employees. While it is relatively straightforward to allocate costs based on the number of employees using the canteen, it becomes exceedingly complex when attempting to allocate costs based on individual employees' usage levels. The logistical challenges of tracking and quantifying each employee's usage can outweigh the benefits of such precise allocation.

In such cases, the cost of accurately determining usage by each employee may surpass the cost of the activity itself. As a result, attempting to allocate costs based on individual usage may not be cost-effective or practical.

To mitigate these challenges, organizations often opt for simpler allocation methods, such as allocating costs based on broader activity measures. By focusing on allocating costs based on activities and their drivers, while avoiding overly difficult allocation methods, organizations can strike a balance between precision and practicality in their cost allocation processes.

Illustration-3 of Activity Based Costing system

Let us look at a comprehensive example in this particular case.

Total overhead assigned to the machines department

Allocated overhead		
Setup	$3,000	
Receiving	300,000	
Engineering	500,000	
Packing	200,000	$1,003,000
Directly assignable overhead		
Machines cost (10,000 hours x $70/hr.)		700.000
Total Overhead		$1,703,000

In this example, the total overhead assigned to the machine department is $1,703,000. Traditionally, overhead costs were allocated arbitrarily, often based on factors like labor usage. For instance, if the total labor usage across all products amounted to 225,000 hours, the overhead rate would be calculated by dividing the total overhead by the labor hours. This rate would then be applied to each product's labor cost to allocate overhead costs. However, Activity Based Costing offers a more precise method by identifying specific activities and cost drivers. In this scenario, production data reveals the labor requirements for each product, allowing for a more accurate allocation of overhead costs. Overall, Activity Based Costing enhances cost allocation accuracy, enabling businesses to make more informed financial decisions.

The Traditional Approach to Calculating Unit Costs

Direct labor cost per unit and total direct labor cost

		A	B	C
Raw material		$20.00	$30.00	$10.00
Direct labor		10.00	6.67	5.00
Overhead (labor $ basis)		75.70	50.49	37.85
Set up	3,000			
Machines	700,000			
Receiving	300,000			
Engineering	500,000			
Packing	200,000			
Total	$1,703,000	$105.70	$87.16	$52.85

Overhead rate = $ 1,703,000/$225,000=757%
Total labor cost for manufacturing required number of units of all products is $ 225000

In the traditional approach for calculating unit costs, the direct labour cost per unit is determined individually for each product. For example, in case of Product A, the direct labour cost per unit is $10, for Product B it is $6.67, and for Product C it is $5. The total direct labour cost is then computed by multiplying the direct labour cost per unit by the number of units manufactured for each product. In this case, if we produce 10,000 units of Product A, 15,000 units of Product B, and 5,000 units of Product C, the total labour cost would be $225,000.

Once the total labour cost is determined, the overhead costs are allocated based on a predetermined percentage of the labour cost. For example, if the total overhead pool is set at 757 percent of the total labour cost, the overhead allocation per unit is calculated accordingly. This allocation results in a unit cost for each product, such as $105 for Product A, $87 for Product B, and $52 for Product C.

Data on Product Profitability

	A	B	C
Standard cost	$105.70	$87.16	$52.85
Target selling price	$162.61	$134.09	$81.31
Planned gross margin	35%	35%	35%
Actual selling price	$162.61	$125.96	$105.70
Actual gross margin	35%	31%	50%

Based on these calculations, the standard cost for each product is established, with Product A priced at $105.70, Product B at $87, and Product C at $52. These costs are compared against the target selling prices, set to achieve a 35 percent profit margin. Accordingly, the target selling prices are set at $162 for Product A, $134 for Product B, and $81 for Product C.

However, the actual selling prices diverge from the targets. Product A struggles to sell at $162, Product B is discounted to $125, and Product C is selling above target at $105. Consequently, the profit percentages vary, with Product C yielding a 50 percent profit, Product B at 31 percent, and Product A maintaining the target 35 percent.

The discrepancy prompts a strategic decision: to discontinue Product B and focus on increasing production of Product C. However, this decision is fraught with risk. Without understanding which product incurs the most overhead costs, reallocating resources to Product C could lead to overcharging Product A and undercharging Product C, potentially resulting in financial losses.

Therefore, a comprehensive analysis of overhead allocation is essential before making strategic decisions. Without accurate cost allocation, decisions to discontinue products or reallocate resources may lead to unintended consequences and financial setbacks.

Calculations

	A	B	C	
number of units	10000	15000	5000	
number of production runs	1	3	10	
number of shipments	1	5	20	
number of components	5	6	10	
cost per component $	4	5	1	
run labor in hours	1/2	1/3	1/4	
machine hours	1/4	1/3	1/2	
set up labor in hours	10	10	11	
Direct labor cost per unit	10	6.67	5	
total direct labor cost	100000	100050	25000	225050

The above table provides comprehensive data on various production factors for Products A, B, and C. For instance, it outlines the number of units manufactured, the number of production runs, and the required number of shipments. Product A is produced in one production run, yielding 10,000 units, while Product C requires ten production runs to manufacture 5,000 units. Additionally, shipping details are provided, with Product A shipped in one batch and Product C requiring 20 shipments.

Further, the table details the components required for manufacturing each unit of the product. Product A requires five components, Product B requires six, and Product C requires ten. The associated cost per component is also outlined, with Product A and B costing $4 each and Product C costing $1 per component.

Moreover, the table highlights labour requirements, including run labour and machine hours. Product A necessitates half an hour of run labour per unit, while Product B requires one-third hour, and Product C requires one-fourth hour. Machine hours vary accordingly, with Product A requiring one-fourth, Product B one-third, and Product C half. Additionally, setup labour hours are specified, with Product A and B requiring 10 hours per setup and Product C requiring 11 hours.

	A	B	C	Total
Production	10,000 units in 1 run	15,000 units in 3 runs	5,000 units in 10 runs	
Shipments	10,000 units in 1 shipment	15,000 units in 5 shipments	5,000 units in 20 shipments	
Selling Prices				
Target	$162.61	$134.09	$81.31	
Actual	162.61	125.96	105.70	
MANUFACTURING COST				
Raw material	5 components @ $4 ca. = $20	6 components @ $5 ca. = $30	10 components @ $1 ca. = $10	
Labor usage				
Set-up labor	10 hours per run	10 hours per run	11 hours per run	150 hours
Run labor	1/2 hour per part	1/3 hour per part	1/4 hour per part	11,250 hours
Machines usage	1/4 hour per part	1/3 hour per part	1/2 hr. per part	10,000 hours
Receiving department				$ 300,000
Engineering department				500,000
Packing department				200,000

There is only one production department - machines - and it takes a little more than 1 labor hour for each machine hour (11,250/10,000) at the current product mix. (Labor = $20 hr. including fringe benefits: machine cost = $70 hr.)

The table depicted above aggregate data to provide a comprehensive overview of production runs and setup labour hours for each product. For instance, Product A requires one production run, totalling 10 hours of setup labour. Product B necessitates five runs, equating to 50 hours of setup labour, while Product C requires 10 runs, totalling 110 hours of setup labour. This information aids in understanding the total setup labour required for each product.

Further, considering the setup labour requirement of 10 hours per run, the total setup labour hours for each product are calculated accordingly. For Product A, with one run, the setup labour remains at 10 hours. For Product B, with three runs, the setup labour totals 30 hours (3 runs x 10 hours per run). For Product C, with 10 runs, the setup labour amounts to 110 hours (10 runs x 11 hours per run). Summing these values yields the total setup labour hours for all products.

1) **Total set up hours**

The total setup labour hours are crucial for efficient production planning. Calculating this simplifies analysis and decision-making. Here is how it is computed:

For Product A:

- Setup labour hours per run: 10 hours
- Number of production runs: 1
- Total setup labour hours = 10 hours (1 run x 10 hours/run)

For Product B:

- Setup labour hours per run: 10 hours
- Number of production runs: 3
- Total setup labour hours = 30 hours (3 runs x 10 hours/run)

For Product C:

- Setup labour hours per run: 11 hours
- Number of production runs: 10
- Total setup labour hours = 110 hours (10 runs x 11 hours/run)

Summing these values yields the total setup labour hours for all products:

- Total setup labour hours = 10 hours (Product A) + 30 hours (Product B) + 110 hours (Product C) = 150 hours

2) Total run labour hours consumed

Calculating the total run labour hours consumed for each product provides insights into resource utilization. Here is the breakdown:

For Product A:

- Number of units manufactured: 10,000
- Run labour per part: 0.5 hours
- Total run labour hours consumed = 10,000 units × 0.5 hours/unit = 5,000 hours

For Product B:

- Number of units manufactured: 15,000
- Run labour per part: 1/3 hour
- Total run labour hours consumed = 15,000 units × (1/3) hour/unit = 5,000 hours

For Product C:

- Number of units manufactured: 5,000
- Run labour per part: 1/4 hour
- Total run labour hours consumed = 5,000 units × (1/4) hour/unit = 1,250 hours

Summing these values gives the total run labour hours consumed across all products:

- Total run labour hours consumed = 5,000 hours (Product A) + 5,000 hours (Product B) + 1,250 hours (Product C) = 11,250 hours

3) Total machine usage hours consumed

To determine the total machine usage hours consumed for each product, we consider the production volume and the time required per part:

For Product A:

- Number of units manufactured: 10,000
- Machine usage per part: 1/4 hour
- Total machine usage hours consumed = 10,000 units × (1/4) hour/unit = 2,500 hours

For Product B:

- Number of units manufactured: 15,000
- Machine usage per part: 1/3 hour
- Total machine usage hours consumed = 15,000 units × (1/3) hour/unit = 5,000 hours

For Product C:

- Number of units manufactured: 5,000
- Machine usage per part: 1/2 hour
- Total machine usage hours consumed = 5,000 units × (1/2) hour/unit = 2,500 hours

Summing these values gives the total machine usage hours consumed across all products:

- Total machine usage hours consumed = 2,500 hours (Product A) + 5,000 hours (Product B) + 2,500 hours (Product C) = 10,000 hours

With this information, we have a comprehensive view of both labour and machine resource utilization for each product.

Direct labor cost per unit	10	6.67	5	
total direct labor cost	100000	100050	25000	225050
total set up labor hours	10	30	110	150
total run labor hrs consumed	5000	5000	1250	11250
total machine usage hrs consumed	2500	5000	2500	10000

Improvisation of allocation (Refined Approach) – still traditional approach

		A	B	C
Raw Material		$20.00	$30.00	$10.00
Material overhead (Material $ basis), (300K/700K = 43%)		8.60	12.90	4.30
Set-up labor		0.02	0.04	0.44
Direct labor		10.00	6.67	5.00
Other Overhead				
(Machines hours basis)		35.00	46.67	70.00
Machines	$700,000			
Engineering	500,000			
Packing	200,000			
	$1,400,000			
Total		$73.62	$96.28	$89.74

Overhead rate = $ 1,400,000/10,000 = $140 hr. – Total Machine usage for manufacturing all three products is 10,000 hours

Previously, overhead costs were allocated in a traditional manner, lacking precision and efficiency. However, there has been a push for improvement in the allocation process. This refined approach aims to enhance accuracy and align costs with their respective drivers. To achieve this, the overhead pool, consisting of various cost elements, is scrutinized. Among these elements are receiving costs, setup labor, and machine-related expenses. The new strategy involves allocating receiving costs based on material consumption, setup labor costs based on the hours spent on setup activities, and the remaining overheads based on machine hours. By aligning each cost component with its relevant activity, this approach ensures a more accurate distribution of overheads. Let us implement this refined allocation method in table.

1) **Direct materials**

Let us analyse the costs associated with products A, B, and C. For product A, the direct material cost per unit is approximately $20, for product B it's around $30, and for product C, it is roughly $10. Calculating the total material consumption or cost involves multiplying the cost per unit by the number of units manufactured. For instance, with product A, at $20 per unit and 10,000 units manufactured, the total material cost amounts to $200,000. Similarly, for product B, with a cost of

$30 per unit and 15,000 units manufactured, the total material cost comes to $450,000. Lastly, for product C, priced at $10 per unit and 5,000 units manufactured, the total material cost sums up to $50,000. Therefore, the overall total material cost across all products totals $700,000.

2) **Receiving cost**

Let us break down the receiving cost allocation method we have adopted. Initially, we have identified the total receiving overhead, which amounts to $300,000. Then, to determine the receiving cost per unit, we divided this total by the overall material cost. So, $300,000 divided by $700,000 equals approximately 0.043, or 43%. This is interpreted as 43% of the material cost being allocated as overheads. Consequently, we applied this percentage to each product's material cost to calculate the receiving cost per unit. This refined approach aims to provide a more accurate distribution of overhead expenses. So, for each product, the receiving cost per unit is obtained by multiplying the material cost per unit by 43%. This method ensures that the receiving cost is proportionate to the material cost incurred for each product.

3) **Setup cost**

To allocate the setup cost, initially we have opted for a method based on the number of hours required for setup. Looking at the setup labor hours, we observed values of $10 and $11 for different products. Considering the labor cost per hour, which is $20, we derived this by doubling the cost per part due to the half-hour duration per part. This aligns with the labor cost stated in the problem at $20 per hour. Therefore, for each product, the total setup cost is calculated by multiplying the total setup hours required by the labor cost per hour, which remains consistent at $20. For instance, if a product necessitates 10 setup hours, the total setup cost would amount to $200 (10 hours * $20/hour). Similarly, if another product requires 30 setup hours, the total setup cost would be $600 (30 hours * $20/hour). This approach ensures that setup costs are accurately assigned based on the time needed for setup, contributing to a more refined cost allocation process.

4) **Setup labour cost per unit**

To determine the setup labor cost per unit, we first calculate the total setup labor cost, which is $3000, as mentioned. Then, this total cost is divided by the total number of units produced. For example, if 10,000 units are manufactured, the setup labor cost per unit would be $0.30 ($3000 / 10,000 units). Similarly, if 15,000 units are produced, the setup labor cost per unit would be $0.20 ($3000 / 15,000 units). Finally, for a production of 5,000 units, the setup labor cost per unit would be $0.60 ($3000 / 5,000 units). This approach ensures that the setup labor cost is evenly distributed across all units manufactured, providing a fair representation of the cost per unit.

5) Rest of the overheads

In this refined allocation approach, we have further allocated the remaining overheads based on machine hours. The total overheads, amounting to 14 lakhs, are divided by the total machine hours consumed, which is 10,000 hours. This calculation yields a rate of $140 per machine hour. Then, for each product, they multiply the number of machine hours consumed by this rate to determine the overhead cost allocated to each. For instance, if a product utilizes 2500 machine hours, the allocated overhead cost would be $350,000 ($140 * 2500 hours). Similarly, if another product uses 5000 machine hours, the allocated overhead cost would be $700,000 ($140 * 5000 hours). This process ensures that overhead costs are distributed in proportion to the machine hours utilized by each product, resulting in adjusted costs per unit. For product A, the cost decreases to $73 from the previous $105, for product B it increases to $96 from $87, and for product C it rises to $89 from $52. This example prompts the question of whether this revised cost allocation method accurately reflects the actual cost distribution or if there are alternative approaches that may be more suitable. The allocated overhead based on refined approach is depicted below:

if allocation is based on machine hrs the rate would be				140
Direct materials	20	30	10	
total material cost	200000	450000	50000	700000
Receiving cost per unit	8.6	12.9	4.3	
total Set up cost	200	600	2200	3000
set up labor cost per unit	0.02	0.04	0.44	
allocation based on machine hrs	350000	700000	350000	1400000
per unit total overhead cost	35	46.67	70	