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Summary

Introduction

Earlier we discussed contribution margin and analysis techniques for evaluating the performance of a particular product line. Often there exists a substantial level of overheads which cannot be readily traced to a particular segment of the organisation and which are not of a discretionary nature. These costs were previously cast as untraceable and classed as a plant-wide overhead. We also argued that to price long term on a marginal basis was one sure way of moving to insolvency. The firm needs a method(s) of allocating costs to the different segments which gives a total cost for the ‘product’ and which can then be part of the information necessary for a pricing decision. Before looking at specific methods of allocation it must be stressed that a manager of a segment within an organisation can only be held accountable for those costs which are discretionary and changes to the segment should only be made on that basis. Thus, the principal purpose of cost allocation is to enable appropriate pricing strategies to be formulated with regard to market research and product development information.
Cost Allocation

The process of allocating costs to segments/departments will typically proceed in the following fashion:

1. **There must be a clearly defined cost objective.** The target for the accumulation of costs might be a division, a department, or a relatively small element of the production process. Where the objective or target is a small element there will be few direct costs clearly traceable, and there will tend to be a high level of allocation.

   For example, consider the allocation of Salaries personnel within a Government Department:
   - The Salaries personnel are themselves a direct cost with respect to the Department as a whole. In other words, if the Department is disbanded those Salaries personnel would immediately lose their jobs and their wages would be saved. Thus, the costs are clearly discretionary with respect to Department wide decisions.

   If we consider, however, a small draughting section within the Department:
   - this section clearly benefits from the services provided by the Salaries personnel but if the draughting section were disbanded there would be little or no Salaries personnel saving. Thus, the Salaries personnel wages are not discretionary with respect to the draughting section.
   - Yet when pricing the services of the draughting section it would be quite reasonable to include an overhead figure that took into account the benefit received from the salaries personnel.

   Typically as one moves to smaller and smaller elements within an organisation the level of allocation becomes higher and the level of direct costs as a percentage of total costs becomes lower.

2. **Average figures for allocation will generally be used** when allocating overhead costs since there are typically a number of ‘grey’ areas.

   For example, in the above illustration using personnel costs of the Salaries section, one might generalise and group all Salaries personnel costs together and then allocate these costs on a pro rata basis to different segments within the organisation on an appropriate basis. This clearly generalises the function of Salaries personnel, who may spend a disproportionate amount of their time dealing with wage and piece rate workers, as opposed to salaried workers.

   When making allocations the groups of items to be allocated must be clearly defined or discrete and distinguishable from one another in order to achieve a total allocation, no more and no less.

3. **A basis for allocation must be determined.**
   This is often more difficult than it might appear at first, since it must be as representative as possible yet still be practical in use.
Using the Salaries personnel example above, an appropriate basis might be employee numbers. It could also be argued that it should be on the basis of wages/salaries paid. The first method assumes that it takes no more time to organise the pay for a person on $100,000 than it does for one on $20,000; thus, personnel resources of Salaries involved in paying the Managing Director are no different from the resources used in paying the gardener. The second method could be argued on grounds of equity, that the higher sum being paid in salaries implies a greater ability to pay (this argument is dubious but sometimes used) or that management of superannuation or pension funds as well as perks and fringe benefits involves greater resources being used for the Managing Director than the gardener.

Whichever method is used - preferably the former - there will be some degree of compromise and generalisation about the nature of the work involved. Allocation determinations invariably involve these sorts of decisions.

4. **The actual method of allocation must then be determined** depending on the size and complexity of the organisation and the level of costs that are to be allocated. The method used can vary from one of relatively high algebraic complexity to a relatively simple, rule-of-thumb allocation. All have their place and it is important that the method chosen appropriately reflects the needs of the organisation.

Thus, when allocating costs the process will typically follow these steps:

- Definition of the target for cost accumulation
- Determination of allocatable costs
- Determination of allocation basis
- The actual method of allocation.

**Allocation of Overhead Costs**

The Production Departments are the end recipients of the Service or Overhead Department costs as it is the product that must eventually be priced. Thus, the costs of the Service Departments must be allocated to the Production Departments. The allocation takes place on a number of levels.

**Step A**
All direct costs in the organisation are traced to their relevant departments whether they are production or service.

**Step B**
All indirect costs are allocated to the particular departments, whether production or service.

**Step C**
The Service or Overhead Departments’ costs are then allocated to the Production Departments.
Step D
The Production Departments will now have accumulated all relevant costs for the pricing decision and these are then allocated directly to the product.

We have already considered the tracing of direct costs to individual departments, and thus we will concentrate on the second and third stages above. To do this, we will use an extended example.

Allocation - An Extended Example
The example relates to a manufacturing concern which, in addition to producing goods, also has Research and Development and Design Departments. For the purposes of this example, it is assumed that direct labour and materials costs have already been traced to the relevant departments as in Step A above. The next step is to allocate the indirect costs to the relevant departments (Step B). To do this, information has been obtained from the organisation which can be used as the basis for allocation.

Data on which to base the allocation are given in Exhibit 12.1.

<table>
<thead>
<tr>
<th>Exhibit 12.1</th>
<th>Total</th>
<th>R &amp; D</th>
<th>Design</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine Hours</td>
<td>2,000,000</td>
<td>250,000</td>
<td>100,000</td>
<td>450,000</td>
</tr>
<tr>
<td>Value Facilities($)</td>
<td>2,000,000</td>
<td>250,000</td>
<td>100,000</td>
<td>450,000</td>
</tr>
<tr>
<td>No. Phones</td>
<td>50</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Area Occ sq m.</td>
<td>3,000</td>
<td>300</td>
<td>100</td>
<td>800</td>
</tr>
<tr>
<td>Value Depreciable Items ($)</td>
<td>1,500,000</td>
<td>200,000</td>
<td>50,000</td>
<td>250,000</td>
</tr>
<tr>
<td>Estimated % of Work - R &amp; D</td>
<td>100</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>- Design</td>
<td>100</td>
<td>25</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

Further to the above, various total costs that have to be allocated are as follows:

| $ |
| Indirect Labour | 170,000 |
| Indirect Materials | 60,000 |
| Security | 20,000 |
| Phone | 10,000 |
| Rates | 10,000 |
| Depreciation | 30,000 |
| 300,000 |

These amounts were allocated on the following bases:
- Indirect labour and materials
  These overhead items should be allocated on a usage or direct basis.
Depending on the relative value of overhead items, careful usage recording systems may be necessary. The breakdown in Exhibit 12.2 is assumed to have been derived from other records.

- Security
  Allocation on a value basis would seem to provide a reasonable linkage between the expenditure and the reason for it.

- Phone
  The use of total number of phones is a relatively unsophisticated measure, but nevertheless used in this example. In practice, it may be better to use a two-tier allocation with total number of phones used for base rental charges and then tolls accumulated via the telephonist and charged directly to the particular departments.

- Rates
  This allocation will depend on the nature of the rate assessment. If the rates are levied on unimproved value then an allocation based on the percentage of occupied area is appropriate. If, for instance, water rates and improvements are included in the rate assessment, then a more appropriate basis of allocation would be warranted.

- Depreciation
  Allocation is based on the value of the machines/plant. Users must be aware that depreciation is not taxation-based, but is tied to actual wear and tear and loss in value.

Using these bases for allocation, the costs may be allocated as shown in Exhibit 12.2. This is Step B.

<table>
<thead>
<tr>
<th>Exhibit 12.2</th>
<th>Allocation Basis</th>
<th>Total</th>
<th>R&amp;D</th>
<th>Design</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ind. Labour</td>
<td>Direct</td>
<td>170,000</td>
<td>30,000</td>
<td>20,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Ind. Materials</td>
<td>Direct</td>
<td>60,000</td>
<td>10,000</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Security</td>
<td>Overall Value</td>
<td>20,000</td>
<td>2,500</td>
<td>1,000</td>
<td>4,500</td>
</tr>
<tr>
<td>Phone</td>
<td>Number</td>
<td>10,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Rates</td>
<td>Area Occ Value of Machines</td>
<td>10,000</td>
<td>1,000</td>
<td>333</td>
<td>2,667</td>
</tr>
<tr>
<td>Depreciation</td>
<td>Value of Machines</td>
<td>30,000</td>
<td>4,000</td>
<td>1,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300,000</td>
<td>49,500</td>
<td>29,333</td>
<td>54,167</td>
</tr>
</tbody>
</table>

Having allocated all indirect costs to the departments, the R and D and Design Departments’ costs must be allocated to the Production Departments. This step (C) may be done via a number of methods:
Direct Method

This is the most commonly used method and allocates service departments’ costs directly to the producing departments, without recognition of any flows between the service departments. Many different bases may be used, including direct labour hours and total labour hours. In this example, an estimate of the work carried out by the two support departments has been made and the allocation made on that basis.

Exhibit 12.3

<table>
<thead>
<tr>
<th>Allocation Basis</th>
<th>Total</th>
<th>R &amp; D</th>
<th>Design</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300,000</td>
<td>49,500</td>
<td>29,333</td>
<td>54,167</td>
</tr>
<tr>
<td>R &amp; D Est % of work carried out</td>
<td>(49,500)</td>
<td>16,500</td>
<td>16,500</td>
<td>16,500</td>
</tr>
<tr>
<td>Design Est % of work carried out</td>
<td>(29,333)</td>
<td>10,476</td>
<td>8,381</td>
<td>10,476</td>
</tr>
<tr>
<td></td>
<td>300,000</td>
<td>81,143</td>
<td>94,548</td>
<td>124,309</td>
</tr>
</tbody>
</table>

A departmental overhead rate based on machine hours (it could be on direct labour hours or an alternate basis if appropriate) can then be calculated giving:

Departmental Overhead Rate (based on machine hours) $16.23 $11.82 $12.43

Sequential Method

This method recognises that the service departments provide benefits to each other as well as to the production departments. Normally, the service department whose costs would be allocated first is either:

- that which contributes to the greatest number of other service departments,
- or,
- where there is an equal situation as in the example used here, the service department with the greatest cost.

In this example, there are only minor differences between the overhead rate determined under the Direct and Sequential Methods. This can often be the case in practice, hence the reason the Direct Method is able to be justified. However, it is possible to obtain significantly different overhead rates in particular circumstances, in which case either the Sequential Method or the Reciprocal Method should be used.
Chapter 12: Allocation of Departmental Overhead

Exhibit 12.4 Allocation of Total R & D and Design Overhead

<table>
<thead>
<tr>
<th>Basis</th>
<th>Total</th>
<th>R &amp; D</th>
<th>Design</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300,000</td>
<td>49,500</td>
<td>29,333</td>
<td></td>
</tr>
<tr>
<td>R &amp; D Est % of work carried out 15,25,25,25</td>
<td>(49,500)</td>
<td>8,250</td>
<td>13,750</td>
<td></td>
</tr>
<tr>
<td>Design Est % of work carried out 25,20,25</td>
<td>(37,583)</td>
<td>13,422</td>
<td>10,739</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300,000</td>
<td>81,339</td>
<td>94,156</td>
<td>124,505</td>
</tr>
</tbody>
</table>

This can then be allocated to the product via an overhead rate, giving:

Departmental Overhead Rate (based on machine hours) $16.27 $11.77 $12.45

**Reciprocal Method**

This method takes account of the interdependence of the two (or more) support departments more accurately than in the Sequential Method. This is done via a series of simultaneous equations.

Let \( R \) = total cost of the R & D department

Let \( D \) = total cost of the Design department

\[
R = 49,500 + (25/95)D
\]

and \( D = 29,333 + (15/90)R \)

Therefore:

\[
R = 49,500 + 25/95 (29,333 + [15/90]R)
\]

\[
R - (0.04386)R = 49,500 + 7,719
\]

\[
R = 57,219
\]

\[
0.95614
\]

\[
R = 59,844
\]

and \( D = 29,333 + (15/90)59,844 \)

\[
D = 39,307
\]

The allocation to production departments may then be made as shown in Exhibit 12.5.

Exhibit 12.5 Allocation of Total R & D and Design Overhead

<table>
<thead>
<tr>
<th>Basis</th>
<th>Total</th>
<th>R &amp; D</th>
<th>Design</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300,000</td>
<td>49,500</td>
<td>29,333</td>
<td></td>
</tr>
<tr>
<td>R &amp; D Est % of work carried out 15,25,25,25</td>
<td>(59,844)</td>
<td>9,974</td>
<td>16,623</td>
<td></td>
</tr>
<tr>
<td>Design Est % of work carried out 25,20,25</td>
<td>(39,307)</td>
<td>10,344</td>
<td>8,275</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300,000</td>
<td>81,134</td>
<td>94,565</td>
<td>124,301</td>
</tr>
</tbody>
</table>
These totals can then be allocated to the product using a machine hour basis, giving:

| Departmental Overhead Rate (based on machine hours) | $16.23 | $11.82 | $12.43 |

It can be seen that the Reciprocal Method gives the same rates as achieved under the Direct Method. In cases where there exist shared uses by the service departments at a similar level, this outcome is common. The conclusion is that, in many instances, there is little to be gained by using more complex methods of allocation as long as you have ascertained a basic level of symmetry between the service departments.

**Special Considerations**

The allocation of overheads is done for the two principal purposes of pricing and performance appraisal. The pricing decision, as a minimum, must cover the variable costs (as discussed earlier) and in the longer term, the fixed costs of both production and organisation. The question of marginal pricing and new market development, response by exporters/importers to exchange rate changes and associated questions can only be effectively addressed with reference to details of the nature of costs.

Performance appraisal is, however, a different and more difficult question. Traditionally, virtually all period costs have been allocated to individual segments or products in the organisation. This approach is not legitimate since it does not take into account the nature of the linkages between the various elements of the organisation. For performance appraisal, costs should only be allocated to a segment of the organisation if they are discretionary with respect to that segment or if management of that segment has substantial influence over the nature and control of those costs. These two aspects may be viewed in more detail:

**Discretionary**

Examples include extra machinery on short term lease, sales commissions, product-specific advertising, direct labour and materials, expansion of facilities directly related to that particular segment with the decision being made predominantly by management of that segment.

**Substantial Influence**

Examples include salaries, company wide image advertising, phone bills, rates, security. These costs are necessary for the continuance of the segment and as long as segment management has influence over these expenditures, then they may be legitimately allocated.

However, where management has no effective input or control over expenditure of its segment, and particularly where there is a poor nexus between the expenditure and the activities of the segment, then for performance appraisal purposes the costs should not be allocated. Thus, the criteria for allocation are causality and control.
A common method of ensuring that only legitimate costs are allocated is to allow the segment to buy the inputs from the open market if it is felt that allocated costs are excessive. This approach ensures that costs are accumulated on an ‘arm’s length’ basis and are fair. For example, a firm contracts security for the entire organisation and allocates costs on a basis that an individual manager feels is grossly unreasonable; further, the manager makes objections but these are ignored. The manager should be able to employ a security service for the segment or obtain an allocation based on the costs of that separate security contract. In this example, the criteria of control and causality can be clearly seen.

A final and less important purpose of allocation is to determine an approximate inventory value which assists in the management and insurance of inventory.

**Joint Costs - A Particular Allocation Problem**

In many production processes a number of inputs will go into a common pool out of which will flow a number of products. There will often be no obvious linkage between the inputs and the individual outputs (refer Exhibit 12.6). In this case, these inputs are referred to as joint or common costs. For example, in the meat industry a lamb is purchased from the farmer, a number of costs are incurred and a number of products eventuate. To some extent these final products have processing that can be directly traced to them such as grading and treating of pelts or skins, but many costs are absorbed by the initial processing of the carcass up until the initial cut up stage. It is those initial costs that are common and not directly traceable to particular end products. The question of how joint costs should be allocated is the subject of this section.

**Exhibit 12.6**

The problem with common cost allocation is that there is no legitimate method of allocating the initial costs to the later products. If there is a direct connection between costs and the product then the costs would not be common. Thus, common or joint cost allocation methods are arbitrary and thus not defensible. There exist a number of methods for allocating joint costs based on different assumptions. It must be emphasised that common cost allocation should therefore only be used as one input into the pricing decision and must not be used for management decisions after the split-off point. Only incremental factors should be considered, i.e. further processing, etc.
There are two general approaches to joint cost allocation:

- quantity, which is typically measured in terms of labour hours, volume output or machine hours; and
- sales value, which is based on the relative total value of the products beyond the split-off point.

The approaches are demonstrated in Exhibit 12.7.

### Exhibit 12.7

<table>
<thead>
<tr>
<th>Raw Materials</th>
<th>Joint Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>$60,000</td>
</tr>
<tr>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

### Variable Costs

- **X**: $6 per unit
- **Y**: $4 per unit

### Sales

- **X**: $15 per unit
- **Y**: $9 per unit

#### Quantity Approach

(a) Based on the number of units produced.

This approach is frequently used when the outputs of the joint processing are similar.

<table>
<thead>
<tr>
<th>Product</th>
<th>Units</th>
<th>Share</th>
<th>Joint Costs</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>4,000</td>
<td>4/12</td>
<td>$20,000</td>
<td>$5.00</td>
</tr>
<tr>
<td>Y</td>
<td>8,000</td>
<td>8/12</td>
<td>$40,000</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

12,000 $60,000

(b) Based on machine hours.

If machine hours was a major input into the process and was thus central to both products, then this method could be used.

<table>
<thead>
<tr>
<th>Product</th>
<th>Total Mach.Hrs</th>
<th>Share</th>
<th>Joint Costs</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>8,000</td>
<td>8/16</td>
<td>$30,000</td>
<td>$7.50</td>
</tr>
<tr>
<td>Y</td>
<td>16,000</td>
<td>8/16</td>
<td>$60,000</td>
<td>$3.75</td>
</tr>
</tbody>
</table>

(c) The further processing costs may be treated as a surrogate for quantity if there is little obvious physical linkage between the inputs and the outputs. This approach should only be used if none of the more direct physical bases can be applied. Generally this basis is not recommended.
Chapter 12: Allocation of Departmental Overhead

Sales Price Approach
This approach allocates common costs on the basis of the sale price or worth of the further processed items. It assumes that there is some linkage between final worth and input cost. This assumption is dubious at best.

<table>
<thead>
<tr>
<th>Product</th>
<th>Units</th>
<th>Sales Price</th>
<th>Value</th>
<th>Share</th>
<th>Joint Costs</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>4,000</td>
<td>$15</td>
<td>$60</td>
<td>60/132</td>
<td>$27,272</td>
<td>$6.82</td>
</tr>
<tr>
<td>Y</td>
<td>8,000</td>
<td>$9</td>
<td>$72</td>
<td>72/132</td>
<td>$32,728</td>
<td>$4.09</td>
</tr>
</tbody>
</table>

A summary of the different allocated common costs on a per unit basis is shown in Exhibit 12.8.

Exhibit 12.8

<table>
<thead>
<tr>
<th>Units Produced</th>
<th>Machine Hours</th>
<th>Cost Basis</th>
<th>Common Cost Allocation Approach</th>
<th>Allocated Unit Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units Quantity Approach</td>
<td>Sales Price Approach</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Product X $5.00 $7.50 $6.43 $6.82 $5.00-$7.50
Product Y $5.00 $3.75 $4.28 $4.09 $3.75-$5.00

It is clear from this that material fluctuations occur in the common costs allocated on a per unit basis depending on the method used. As stated earlier, no justifiable method exists due to the common nature of the inputs.

The sales price approach is favoured by many firms since it matches costs with revenue and appears to make low value items profitable - as it must if the high value items are allocated a greater proportion of costs. Quantity methods attempt at least to form some linkage between a major element of the common cost process, for example, machinery or labour hours, and thus have some argument of reasonableness in their favour. It is therefore recommended that quantity measures be used wherever possible.

Summary
Allocation takes place in most organisations and is frequently used for performance appraisal as well as pricing decisions. The method and extent of allocation will differ depending on the purpose of the allocation. In many cases there will be little benefit in using a more sophisticated method than the Direct Method of allocation,
but the results should from time to time be checked using other methods to ensure fairness.

The key bases for legitimate allocation are control and causality and these apply no matter what the activity - manufacturing, service or professional setting. Due to the effects allocation can have on motivation and performance, it is essential that allocation issues are treated seriously by personnel and not considered merely as bookkeeping adjustments.

### Glossary of Key Terms

- **Causal Linkage**
  A clear cut relationship between one item or event and another item or event, for example, the labour input into a product to process it further into another product; these linkages are the basis for legitimate tracing of costs.

- **Common Cost**
  See Joint Costs

- **Cost Centre**
  Part of an organisation, frequently a department, which provides a logical basis for the grouping of costs.

- **Direct, Sequential, Reciprocal (Linear Algebra) Methods**
  Methods of allocating overhead costs to production departments.

- **Joint Costs**
  Costs that relate to more than one product but which cannot be traced to a particular product.

- **Split-off Point**
  Where several products become identifiable and free standing from a single group of inputs.

### Selected Readings


Questions

12.1
Explain why joint costing may be misleading for decision making purposes.

12.2
What are the main objectives of tracing costs to departments?

12.3
Do you consider ‘sales’ or ‘a measure of total costs’ to be the more equitable basis for the allocation of administrative overhead to production departments? Explain your answer.

12.4
As allocation gives a reasonable estimation of the cost of the product this cost should be the basis of pricing. Discuss.

12.5
Discuss how overheads may be applied to product areas.

12.6
Discuss the merits of considering reciprocal service provision between service departments when allocating overheads to production departments. What are the practical justifications for many firms ignoring reciprocal services in their cost allocation procedures?

12.7
XYZ Company operates single product sales by two methods, mail order and personal sales, each controlled by a separate department. The firm has two service departments, promotion and maintenance of buildings and equipment. The maintenance department provides annual service to each of the three other departments (personal sales, mail order sales and promotion). You are given the following information:

<table>
<thead>
<tr>
<th>Department</th>
<th>Direct costs</th>
<th>No. of units sold</th>
<th>No. of employees</th>
<th>Floor space (sq. m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail order</td>
<td>$70,000</td>
<td>6,200</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Personal sales</td>
<td>$93,000</td>
<td>7,400</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Maintenance</td>
<td>$36,000</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Promotion</td>
<td>$48,000</td>
<td>-</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Company policy requires that maintenance be allocated on the basis of the number of square metres occupied by a department, and promotion on the basis of the number of units sold.
Required:
a. Show the direct and sequential allocation of the service departments’ costs to the trading departments.
b. Determine the cost per unit sold in each of the two trading departments, under each method used in (a).
c. What, if anything, can you say about the performance of the Managers of the mail and personal sales departments, based on these results?

12.8
Alpha Corp has two production centres which are serviced by two service centres, Maintenance and Canteen. The Maintenance Department spends 1/12 of its effort on maintaining the canteen premises, and the canteen provides 1/9 of its service to the employees of the maintenance department. Total costs in the maintenance department are $74,000 and total costs in the canteen are $42,000.

Required:
Using simultaneous equations, determine what the total costs of these two departments are, for allocation to the production departments.

12.9
What is a ‘joint cost’?

12.10
Multicorp produces two products jointly called Whosits and Howsits. Whosits sell for $80 each, and Howsits for $30. Joint production costs total $32,000. After passing through this joint production phase, Whosits cost a further $80,000 to complete, and Howsits a further $46,000. Total production of Whosits was 1,400 units and of Howsits 2,000 units. Selling costs are negligible.

Required:
Assuming the firm uses the total sales revenue basis for allocation of joint costs to products, what is the unit cost of each product?

12.11
Angus Agricultural Tool Company has two service departments (administration and maintenance) and three production departments (spades, axes and saws). The two service departments supply a small proportion of their services to each other:

- administration supplies 1/14 of its services to maintenance
- maintenance supplies 1/20 of its services to administration.

Once these mutual services have been accounted for, the service departments are allocated the remainder accordingly:

<table>
<thead>
<tr>
<th></th>
<th>Spades</th>
<th>Axes</th>
<th>Saws</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>25%</td>
<td>30%</td>
<td>45%</td>
<td>100%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>30%</td>
<td>40%</td>
<td>30%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Chapter 12: Allocation of Departmental Overhead

Other information is given below:

<table>
<thead>
<tr>
<th>Department</th>
<th>Traceable Fixed Costs</th>
<th>Units Sold</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>20,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Maintenance</td>
<td>40,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Spades</td>
<td>160,000</td>
<td>60,000</td>
<td>240,000</td>
</tr>
<tr>
<td>Axes</td>
<td>140,000</td>
<td>40,000</td>
<td>310,000</td>
</tr>
<tr>
<td>Saws</td>
<td>200,000</td>
<td>40,000</td>
<td>220,000</td>
</tr>
</tbody>
</table>

Untraceable fixed costs = $420,000 for the year.

**Required:**

a. Using simultaneous equations, determine the total cost to be allocated for each of the administration and maintenance departments.

b. What are the administration and maintenance costs apportioned to each of the three production departments?

c. Calculate the TOTAL cost allocation to each of the three production departments, allocating untraceable fixed costs by:
   (i) units sold, and
   (ii) total contribution.

12.12

Match the following terms and definitions.

1. Split-off point
2. Quantity basis
3. Joint production cost
4. Sequential method of allocation
5. Cost allocation base
6. Service department
7. Linear algebra method

a. An input cost in a process where more than one product is created.
b. Non-producing departments that provide services to other departments.
c. The point in the production process where joint-cost products become separated into individual products.
d. Mathematical allocation method that correctly accounts for reciprocal services between departments.
e. Allocation basis where the cost per unit produced is the same for all joint products.
f. Any basis used for the allocation of untraceable costs to production departments.
g. A method of cost allocation of reciprocal services between service departments, which is useful but not mathematically perfect.
12.13
Which of the following is the BEST definition of ‘common cost’?

a. The cost which most frequently recurs in the production process.
b. Cost not inherently traceable to individual departments or products.
c. Costs which do not require the use of an allocation basis.
d. A cost which is not a ‘joint cost’.
e. Both a. and c. above.

12.14
Which of the following is not a recognised cost allocation basis:

a. Contribution margin basis
b. Quantity basis
c. Usage of facilities basis
d. Machine hours basis
e. Product quality basis

12.15
Which of the following statements is untrue?

a. Service department costs are indirect costs to the production departments and must be allocated on some selected basis.
b. For decision making and evaluation purposes, cost allocation based on ‘relative contribution margin’ would be better than a ‘units of production’ basis.
c. Joint costs are irrelevant to any production decisions which occur after their point of allocation.
d. The allocation of service department costs tells us nothing about possible inefficiencies in such departments.
e. Joint cost allocations are arbitrary and therefore prone to subjectivity.

12.16
Paul’s Placemats Ltd produce two placemat designs, ‘Summer Rose’ and ‘Bold Bronze’. These designs sell for $12 and $16 respectively. Joint production costs up to the surfacing phase are $48,000 per annum and after the split-off point ‘Summer Rose’ costs a further $8,000 and ‘Bold Bronze’ a further $8,600. Selling costs are negligible. Total production of ‘Summer Rose’ and ‘Bold Bronze’ were 4,000 units and 2,000 units respectively.

Required:
Assuming that joint costs are allocated on a total sales revenue basis, what is the unit cost of each product?
12.17
Fresco Company has two untraceable overhead costs to allocate to their three different production departments. The first of these is the canteen running expense and the second is the maintenance of plant and equipment. Which of the following allocation bases do you think would be most appropriate?

a. Relative total contribution margin used for both.
b. Employee numbers and net realisable value, respectively.
c. Employee numbers and machine hours, respectively.
d. Contribution margin and machine hours, respectively.
e. Floor space and net realisable value, respectively.

12.18
Place in the correct order, these steps in the sequence of apportioning costs for the determination of departmental overhead rates:

a. Service departments’ costs are allocated to the production departments
b. All direct departmental costs are traced to their appropriate production or service departments
c. The producing departments’ fully allocated costs are applied to the product using the overhead application rates
d. All indirect departmental costs are allocated to the different departments

12.19
What is the most important consideration in choosing an allocation base for the apportioning of indirect costs?

12.20
Dual Corp has two service departments which provide mutual services to each other as well as to the four production departments. The firm has elected to use the linear algebra approach to accounting for these mutual services, and provides the following information:

- Service department A has $23,400 of direct labour costs, and $12,000 of materials cost incurred per annum. It provides 1,000 hours of service per annum, 100 of which are provided to service department B.
- Service department B has $16,900 of direct labour cost and $3,000 of variable operating overhead per annum. It provides 15% to service department A.

Which, if any, of the following linear algebra equations are correct? (Note: ‘A’ means annual cost of department A, ‘B’ means annual cost of department B)

a. \( B = 19,900 + (15\% \times A) \)
b. \( (B \times 0.985) = 23,440 \)
c. \( A = 35,400 + (0.015 \times B) \)
d. \( A = 16,900 + 3,000 + (10\% \times B) \)
e. \( (A \times 0.985) = 38,385 \)