**Numerical Guide: Management Accounting Overhead Allocation**

**Given Information for the Example:**

1. **Working Days in a Year**: 260 days
2. **Hours per Day**: 8 hours
3. **Technician's Annual Salary**: £30,000
4. **Total Overhead Cost**: £63,500
5. **Number of Technicians**: 3
6. **Expected Sales for Each Model**:
   * Basic: 200 units
   * Advanced: 100 units
   * Professional: 50 units
7. **Cost of Components**:
   * Basic: £200
   * Advanced: £300
   * Professional: £400
8. **Technician Time per Model**:
   * Basic: 10 hours
   * Advanced: 12 hours
   * Professional: 15 hours

**Step 1: Calculate Working Days, Total Hours, and Salary per Hour**

1. **Total Working Days in a Year**: 260 days
2. **Total Hours Worked by Each Technician**:  
   Total Working Hours = 260 days \* 8 hours = 2080 hours
3. **Salary per Hour**:  
   Salary per Hour = Total Salary / Total Hours  
   = £30,000 / 2080 ≈ £14.42

**1. Direct Cost Calculation (Without Overhead)**

Using **direct cost** only, calculate the cost for each model:

Direct Cost = Cost of Components + (Technician Time \* Salary per Hour)

**Calculations:**

* **Basic Model**:  
  £200 + (10 \* 14.42) = £344.20
* **Advanced Model**:  
  £300 + (12 \* 14.42) = £473.04
* **Professional Model**:  
  £400 + (15 \* 14.42) = £616.30

**2. Overhead Allocation Methods**

**(a) Uniform Overhead Distribution**

1. **Overhead per Sale**:  
   Overhead per Sale = Total Overhead / Total Expected Sales

Total Expected Sales = 200 (Basic) + 100 (Advanced) + 50 (Professional) = 350 units

Overhead per Sale = 63,500 / 350 = £181.43

1. **Add Overhead per Sale to Direct Cost**:  
   Total Cost = Direct Cost + Overhead per Sale

**Calculations:**

* **Basic Model**:  
  344.20 + 181.43 = £525.63
* **Advanced Model**:  
  473.04 + 181.43 = £654.47
* **Professional Model**:  
  616.30 + 181.43 = £797.73

**(b) Proportional to Productive Hours Involved**

1. **New Total Hourly Cost**:  
   New Total Hourly Cost = (Salary / Total Hours) + (Total Overhead / (No. of Technicians \* Total Hours))

Total Hours for Technicians = 3 \* 2080 = 6240 hours

Overhead per Hour = 63,500 / 6240 = 10.18

New Total Hourly Cost = 14.42 + 10.18 = £24.60

1. **Recalculate Direct Cost with New Hourly Rate**:  
   Direct Cost = Cost of Components + (Technician Time \* New Total Hourly Cost)

**Calculations:**

* **Basic Model**:  
  200 + (10 \* 24.60) = £446.00
* **Advanced Model**:  
  300 + (12 \* 24.60) = £595.20
* **Professional Model**:  
  400 + (15 \* 24.60) = £769.00

**(c) Proportional to Total Sales**

1. **Calculate Total Sales for Each Model**:  
   Sales per Model = Direct Cost \* Expected Sales

Using direct cost without overhead:

* + **Basic Model**:  
    344.20 \* 200 = £68,840
  + **Advanced Model**:  
    473.04 \* 100 = £47,304
  + **Professional Model**:  
    616.30 \* 50 = £30,815

Total Sales = 68,840 + 47,304 + 30,815 = £146,959

1. **Calculate Overhead Proportion Factor**:  
   Proportion Factor = (Total Overhead / Total Sales) + 1

Proportion Factor = (63,500 / 146,959) + 1 ≈ 1.43

1. **Final Cost for Each Model**:  
   Multiply the direct cost by the proportion factor:
   * **Basic Model**:  
     344.20 \* 1.43 = £492.21
   * **Advanced Model**:  
     473.04 \* 1.43 = £676.44
   * **Professional Model**:  
     616.30 \* 1.43 = £881.31
2. **Summary Table for Comparison**

| **Model** | **Direct Cost (Without Overhead)** | **Uniform Overhead** | **Productive Hours Overhead** | **Proportional to Sales** |
| --- | --- | --- | --- | --- |
| Basic | £344.20 | £525.63 | £446.00 | £492.21 |
| Advanced | £473.04 | £654.47 | £595.20 | £676.44 |
| Professional | £616.30 | £797.73 | £769.00 | £881.31 |

Numerical Two:

Question-3. For a proposed software development project, do the DCF analysis, using the following data: Development cost(year-0) 10,5000, (year-1) = 55,125. Maintenance cost(year-2) = 38,588, (year-3)= 40,517, (year-4) 42,543. Sales and marketing Expense (year-0) = 10,000, (year-1) = 21,000, (year-2) = 22,050, (year-3)= 23,153, (year-4) = 24,310. Number of sales at $5,000/year in (year-1), $10,000/year in (year-2), $20,000/year in (year-3) and $40,000/year in (year-4) respectively.

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Calculate the Net cash flow, NPV, and Cumulative present value from (year-0) to (year-4). Hint: Discount factor for (year-1) 1, from (year-2) to (year-4) it is 0.9091, 0.8264, 0.7513 & 0.6830, respectively.

**Net Cash Flow, Present Value, and Cumulative Present Value Calculation**

**Given Data**

1. **Development Cost**:
   * Year 0: $10,500
   * Year 1: $55,125
2. **Maintenance Cost**:
   * Year 2: $38,588
   * Year 3: $40,517
   * Year 4: $42,543
3. **Sales and Marketing Expense**:
   * Year 0: $10,000
   * Year 1: $21,000
   * Year 2: $22,050
   * Year 3: $23,153
   * Year 4: $24,310
4. **Sales Revenue**:
   * Year 1: $5,000
   * Year 2: $10,000
   * Year 3: $20,000
   * Year 4: $40,000
5. **Discount Factor**:
   * Year 1: 1
   * Year 2: 0.9091
   * Year 3: 0.8264
   * Year 4: 0.7513
   * Year 5: 0.6830

**Formulas Used**

1. **Net Cash Flow (NCF)**:

NCF = Revenue - (Development Cost + Maintenance Cost + Sales and Marketing Expense)

1. **Present Value (PV) of Net Cash Flow**:

PV = NCF \* Discount Factor

1. **Net Present Value (NPV)**:

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NPV = Sum of (NCF \* Discount Factor) - Initial Investment

1. **Cumulative Present Value** is the sum of all present values up to that year.

**Year-by-Year Calculations**

**Year 0**

1. **Development Cost**: $10,500
2. **Sales and Marketing Expense**: $10,000
3. **Net Cash Flow (NCF)**:

NCF\_Year0 = 0 - (10,500 + 10,000) = -20,500

1. **Present Value (PV)**:

PV\_Year0 = -20,500 \* 1 = -20,500

**Year 1**

1. **Development Cost**: $55,125
2. **Sales and Marketing Expense**: $21,000
3. **Revenue**: $5,000
4. **Net Cash Flow (NCF)**:

NCF\_Year1 = 5,000 - (55,125 + 21,000) = -71,125

1. **Present Value (PV)**:

PV\_Year1 = -71,125 \* 1 = -71,125

**Year 2**

1. **Maintenance Cost**: $38,588
2. **Sales and Marketing Expense**: $22,050
3. **Revenue**: $10,000
4. **Net Cash Flow (NCF)**:

NCF\_Year2 = 10,000 - (38,588 + 22,050) = -50,638

1. **Present Value (PV)** (using discount factor 0.9091):

PV\_Year2 = -50,638 \* 0.9091 = -46,035

**Year 3**

1. **Maintenance Cost**: $40,517
2. **Sales and Marketing Expense**: $23,153
3. **Revenue**: $20,000
4. **Net Cash Flow (NCF)**:

NCF\_Year3 = 20,000 - (40,517 + 23,153) = -43,670

1. **Present Value (PV)** (using discount factor 0.8264):

PV\_Year3 = -43,670 \* 0.8264 = -36,085

**Year 4**

1. **Maintenance Cost**: $42,543
2. **Sales and Marketing Expense**: $24,310
3. **Revenue**: $40,000
4. **Net Cash Flow (NCF)**:

NCF\_Year4 = 40,000 - (42,543 + 24,310) = -26,853

1. **Present Value (PV)** (using discount factor 0.7513):

PV\_Year4 = -26,853 \* 0.7513 = -20,181

**Summing Up for NPV and Cumulative Present Value**

1. **Total NPV**:

NPV = PV\_Year0 + PV\_Year1 + PV\_Year2 + PV\_Year3 + PV\_Year4

NPV = -20,500 - 71,125 - 46,035 - 36,085 - 20,181 = -193,926

1. **Cumulative Present Value** (up to each year):
   * **Year 0**: -20,500
   * **Year 1**: -20,500 - 71,125 = -91,625
   * **Year 2**: -91,625 - 46,035 = -137,660
   * **Year 3**: -137,660 - 36,085 = -173,745
   * **Year 4**: -173,745 - 20,181 = -193,926

**Final Summary Table**

| **Year** | **Net Cash Flow (NCF)** | **Discount Factor** | **Present Value (PV)** | **Cumulative PV** |
| --- | --- | --- | --- | --- |
| 0 | -20,500 | 1 | -20,500 | -20,500 |
| 1 | -71,125 | 1 | -71,125 | -91,625 |
| 2 | -50,638 | 0.9091 | -46,035 | -137,660 |
| 3 | -43,670 | 0.8264 | -36,085 | -173,745 |
| 4 | -26,853 | 0.7513 | -20,181 | -193,926 |
| **Total NPV** |  |  | **-193,926** |  |

This table shows each year’s Net Cash Flow, Present Value (with discount factor), and Cumulative Present Value. The **NPV** of -$193,926 indicates a net loss, suggesting the project may not be financially viable under these conditions.