**Management Principles and Human Resources**

**Collection of exercise – MANAGEMENT ACCOUNTING**

ACTIVITY BASED COSTING

**EXERCISE 1 – SWEETY DUCK**

The Sweety Duck is a company specialized in the production of three type of cakes: Almond (M), Fruit (F) and Chocolate (C). In June, the following quantity of cakes have been produced: 5.000 cakes of M, 8.000 cakes of F and 7.000 cakes of C.

To produce the three types of cake, the following ingredients are used:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Flour** | **Sugar** | **Eggs** | **Almond** | **Fruits** | **Cocoa** |
| **Cake M** | 0,6 kg | 0,2 kg | 1 | 0,1 kg | - | - |
| **Cake F** | 0,5 kg | 0,2 kg | 1 | - | 0,45 kg | - |
| **Cake C** | 0,6 kg | 0,2 kg | 1,5 | - | - | 0,1 kg |

The price of each ingredient is reported in the following table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Flour** | **Sugar** | **Eggs** | **Almond** | **Fruits** | **Cocoa** |
| Price | 0,5 €/kg | 1 €/kg | 0,2 €/egg | 3,14 €/kg | 2 €/kg | 5,38 €/kg |

The production cycle is articulated into three productive phases: dough preparation (phase 1), cooking (phase 2) and packaging (phase 3). The following table provides information about the costs of plant used in each phase, year of purchase and residual useful life.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Phase 1** | **Phase 2** | **Phase 3** |
| **Price** | 48.000 € | 96.000 € | 30.000 € |
| **Year of purchase** | 1998 | 2000 | 1996 |
| **Useful life** | 8 year | 5 years | 3 years |

The first plant is supervised by 4 supervisor (annual cost 30.000 euro/supervisor), who are in charge of preparing ingredients for doughs and of supervising the functioning of the plant. Time required for preparing ingredients and for the overall functioning of the plant depends on the quantity of flour, not on the type of cake.

The same 4 workers are also in charge of the set-up activities related to the cooking-oven. They devote the 40% of their time to this last activity. Cooking activity is realized by batches properly because the different type of cakes requires a different cooking time (cake M 2,4 h/batch; cake F 1,6 h/batch; cake C 2 h/batch).

Moreover, each new batch requires a certain set-up time to prepare the plant and to insert the batch cake to be cooked. Overall time for set-up activities does not depend nor from the type of batch nor from batches’ sequence. Overall, the 25% of functioning time of the plant is used for set-up activities (in which the direct intervention of workers is necessary), while the 75% is devoted to the cooking activity (for this activity the plant is completely mechanized). Cooking batch are composed by: 100 cakes/batch for M for C and 80 cakes/batch for F.

Once cakes have been cooked they are packaged. 2 direct workers (annual cost 18.000 €/worker) are responsible for the activities of loading and supervision of the packaging plant. Packaging time is the same for the three cakes, as well as the cost of direct material (0,1 €/cake).

You also know that, in June:

* Total cost of energy is 2.500 euro (444 € are related to the plant of phase 1, 1.320 € for cooking cakes (during set up activities the plant does not consume energy), 400 € for packaging activities and 336 € for administrative and market offices).
* Initial inventories of finished goods are
* 6.000 units of cake M (value 12.600 euro)
* units of cake C (value 1.900 euro)
* 5.500 cakes M, 7.000 cakes F and 6.000 cakes C have been sold

You are required to calculate the Unitary full cost of three cakes

**EXERCISE 2 – SHAKESPEARE**

The core business of the Shakespeare Company is the production of personalized software based on clients’ demands.

During the first 6 months of 2017, the Shakespeare realized three types of software (G, R and M). For the production of software, the Company uses 7 workers, 2 external consultants and 5 programmers. The salary of external consultants depend on hours effectively worked for the Company and, during the time considered, their cost is 18.000 euro/consultant. With respect to the whole time worked for the company, activities they carried out are: 40% (of time) meetings with clients, 35% coordination meeting with programmers and 25% for defining technicalities of software.

Programmers are directly employed from the Company and their annual cost is 24.000 euro/person. The 60% of their time is devoted to programming activities, but they carry out other two activities: definition of technical documentation (20%) coordination meetings with external consultants (20%).

You also know that:

* Cost of administrative offices (4.000 euro) that can be allocated to:
* organization of meetings with clients (20%)
* (internal) coordination meeting (15%)
* Definition of technical documentation (65%)
* Cost of licenses (related only to programming activities), 81.000 euro and that will be depreciated in 3 years
* Computers (related use is 30% for defining technicalities in charge of consultants and 70% for preparing technical documentation in charge of programmers) have been bought using a leasing formula and their cost is 1.000 euro every 3 months
* Definition of technicalities for G software required two time that required by software R and M and 18 meetings with clients were necessary
* Man-hours required for programming activities are:
* 650 for R;
* 700 for M
* 1.400 for G
* Total number of coordination meeting is 42 (22 only for G)
* Technical documentation is composed by:
* 140 pages for G
* 70 pages for R
* 40 pages for M
* R products required 50% more coordination meetings with respect to product M, while 10 meetings with clients have been organized both for M and for R.

You are required to calculate the Unitary full costs for the three products.

**EXERCISE 3 – MAINTENANCE**

The Maintenance provides maintenance services and recently it started the production of a new hood designed by its technicians. Three models of hood are produced (A, B and C) and the productive process involves two organizational units: production and quality control.

The production cycle starts by receiving components that also pass a quality control check; time required for quality control does not depend on the type of component. Once the quality of components have been controlled, the production phase starts. When components’ production ends, all the final products pass another quality check, realized in a particular plant. Also in this case, time and cost for quality check do not depend on the type of final product.

In the quality control units work 2 supervisors and their time is devoted to quality control of finished goods (70%) and quality control of components (30%). The quality check is realized with two different plants:

* For finished products the company bought a plant in 2010 (value 43.375 €, useful life 5 years)
* For components the company uses a plant bought in 2005 (value 24.000 €, useful life 4 years)

Energy consumption refers for the 60% to quality control of finished products and for 405 to quality control of components.

In the production units work direct workers (i.e. direct labor) and 2 supervisors, who work on set-up activities and production control. With respect to set-up activities we know that:

Set-up activities are carried out when the plant is off

Time required by set up activities for all the three products is 100h/batch

In the following table information related to year 2011 is reported.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Description |  | A | B | C |
| Total roduction | unit / year | 100 | 150 | 50 |
| Batches | unit | 4 | 3 | 5 |
| N° of X components | component/ unit | 3 | 6 | 10 |
| N° of Y components | component /unit | 3 | 2 | 3 |
| N° of Z components | component /unit | 3 | 6 | 6 |
| Hour of direct labor for each product | h / unit | 20 | 20 | 15 |
| Cost of direct labor | € / h | 30 | 30 | 30 |
| Hour-plant for each product | h / unit | 25 | 30 | 28 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | X | Y | Z |
| Cost of each component | € / component | 15 | 25 | 10 |

|  |  |
| --- | --- |
| Other costs |  |
| Energy quality control unit | 13.875 €/year |
| Energy production unit | 63.000 €/year |
| Depreciation production plant | 500.000 €/year |
| Cost of each supervisor | 50.000€/year |
| Administrative costs | 80.000 €/year |
| Commercial costs | 60.000 €/year |
| Advertising costs product A | 20.000€/year |

You are required to determine the unitary full cost of each product.

**EXERCISE 4 – STEEL**

The Steel Company produces mechanical components for the energy market. In the first three-month of 2011 it realized only three products: X, Y and Z. Information of related direct costs are reported in the following table

|  |  |  |  |
| --- | --- | --- | --- |
|  | X | Y | Z |
| **Direct Material** | 45.000 € | 15.000 € | 32.000 € |
| **Direct Labor** | 14.000 € | 21.000 € | 39.000 € |

Overhead are related to:

5 supervisors (annual cos 16.000 €/supervisor) employed in the production unit

Depreciation of a plant (bought in 2010, value 1.200.000 €, depreciated in 5 years)

To allocate these costs using the ABC method, the following information are collected:

* The plant works for 5/6 of the time for producing the products, while the remaining 1/6 is devoted to set-up activities
* Time required by set-up activities does not depend on the type of product
* Set-up activities are carried out by supervisors for the 50% of their time. The remaining 50% of their time is devoted to quality control and eventual remedial action of products[[1]](#footnote-1)
* Cost of quality control activity depends on time needed by remedial actions
* During the three-month considered the following units have been produced: 400 units of X, 1.000 units of Y e 1.250 units of Z
* Product X is composed by 20 components, product Y of 50 components, and products Z by 10 components
* Production sequence is: Y, Z, X, Z, Y, Z, X, Z, Y, X;
* Remedial actions were required:
* 10 units of X (average time required: 3 h/u),
* 20 units of Y (average time required: 1 h/u)
* 25 units of Z (average time required: 2 h/u);
* Hour of direct labor:
* 2 h/u for X,
* 1,5 h/u for Y
* 2,5 h/u for Z
* Functioning time of the plant
* 3.000 hour for X
* 4.200 hour for Y
* 7.800 hour for Z

You are required to calculate the unitary full cost of the three products.

**SOLUTION**

**EXERCISE 1 – SWEETY DUCK**

Cost of DIRECT MATERIAL (flour, sugar, eggs, almond) + packaging costs:

* M: 0,6 x 0,5 €/kg + 0,2 kg x 1 €/kg + 1 x 0,2 €/eggs + 0,1 kg almond. x 3,14 €/kg =

= 0,3 + 0,2 + 0,2 + 0,314 = 1,014 €/cake. + 0,1 €/pack = 1,114 €/cake

* F: 0,5 x 0,5 + 0,2 x 1 + 1 x 0,2 + 0,45 x 2 = 1,55 €/cake + 0,1 = 1,65 €/cake
* C: 0,6 x 0,5 + 0,2 x 1 + 1,5 x 0,2 + 0,1 x 5,38 = 1,338 €/cake + 0,1 = 1,438 €/cake

1. **Identification of activities**

* act. 1: dough preparation
* act. 2: oven set-up
* act. 3: cooking
* act. 4: packaging

1. **Cost of each activity (depreciation; supervisors; energy)**

* act. 1: (48.000 / 8) / 12 (depr) + (4 x 30.000/12) x 0,6 (superv.) + 444 (en)= 6.944 €
* act. 2: (4 x 30.000/12) x 0,4 (superv.) + 0,25 x (96.000 / 5) / 12 (depr.) = 4.400 €
* act. 3: 0,75 x (96.000 / 5) / 12 (depr.) + 1.320 (en.) = 2.520 €
* act. 4: : 0 (depr) + 2 x 18.000/12 (workers) + 400 (en.) = 3.400 €

1. **Identification of driver**

* act. 1: kg of flour
* act. 2: number of batches
* act. 3: cooking time
* act. 4: number of cakes

1. **Allocation of costs to each activity (using the driver)**

* act. 1:
* total kg of flour: 0,6 x 5.000 + 0,5 x 8.000 + 0,6 x 7.000 = 11.200
* cost of activity: 6.944 € k = 6.944 € / 11.200 = 0,62 €/kg flour
* act. 2:
* total number of batches = 5.000/100 + 8.000/80 + 7.000/100 = 50 + 100 + 70 = 220 batches
* cost of activity: 4.400 € k = 4.400 € / 220 batch = 20 €/batch
* att. 3:
* total cooking time: 2,4 x 50 + 1,6 x 100 + 2 x 70 = 420 h
* cost of activity: 2.520 € k = 2.520 € / 420 h = 6 €/h
* att. 4:
* total number of cakes: 5.000 + 8.000 + 7.000 = 20.000 cakes
* cost of activity: 3.400 € k = 3.400 € / 20.000 u = 0,17 €/u

1. **Unitary full cost (DM + cost of each activity)**

* M: 1,114 + 0,62 x 0,6 + 20 / 100 + 6 x 2,4 / 100 + 0,17 = 2 €/u
* F: 1,65 + 0, 62 x 0,5 + 20 / 80 + 6 x 1,6 / 80 + 0,17 = 2,5 €/u
* C: 1,438 + 0, 62 x 0,6 + 20 / 100 + 6 x 2 / 100 + 0,17 = 2,3 €/u

**EXERCISE 2 – SHAKESPEARE**

OVH

* Consultant = 2 \* 18.000= 36.000 €
* Programmers = 5 \* 24.000 / 2 = 60.000 €
* Administrative costs = 4.000 €
* Depreciation and licenses = (81.000 / 3) / 2 = 13.500 €
* leasing computer and technical documentation = 1.000 \* 2 = 2.000 €

1. **Identification of activities**

* act. 1: meetings with clients
* act. 2: coordination meeting
* act. 3: definition of technicalities
* act. 4: programming
* act. 5: definition of technical documentation

1. **Identification of costs for each activity**

* act. 1= 0,4 \* 36.000 + 0,2 \* 4.000 = 15.200 €
* act. 2 = 0,35 \* 36.000 + 0,2 \* 60.000 + 0,15\* 4.000 = 25.200 €
* act. 3 = 0,25 \* 36.000 + 0,3 \* 2.000 = 9.600 €
* act. 4= 0,6 \* 60.000 + 13.500 = 49.500 €
* act. 5= 0,2 \* 60.000 + 0,65 \* 4.000 + 0,7 \* 2.000 = 16.000 €

1. **Drivers identification**

* act. 1: number of meetings with clients= 18 + 10 + 10 = 38
* act. 2: number of coordination meeting = 42
* act. 3: time (we know the % of time for each product) 50% for G, 25% R and 25% for M
* act. 4: Hour = 2.750 ( 650 for R, 700 for M, 1.400 for G)
* act. 5: Pages= 140 + 70 + 40 = 250 pages

1. **Allocation of ovh**

* act. 1: 5.200 € / 38 = 400 €/meeting
* 400 \* 18 = 7.200 € for G
* 400 \* 10 = 4.000 € for R
* 400 \* 10 = 4.000 € for M
* act. 2: 25.200 € / 42 = 600 €/meeting
* 22 meetings for G
* For M and R we have to consider that R requires the 50% more of meetings (of the remaining 20 meetings), therefore: R = 1,5 M 20 = R + M = 2,5 M
* M = 20/2,5 = 8 R = 1,5 \* 8 = 12
* 600 \* 22 = 13.200 € for G
* 600 \* 12 = 7.200 € for R
* 600 \* 8 = 4.800 € for M
* act. 3: 9.600 €
* 9.600 \* 0,5 = 4.800 € for G
* 9.600 \* 0,25 = 2.400 € for R
* 9.600 \* 0,25 = 2.400 € for M
* act. 4: 49.500 € / 2.750 = 18 €/h-man
* 18 \* 1.400 = 25.200 € for G
* 18 \* 650 = 11.700 € for R
* 18 \* 700 = 12.600 € for M
* act. 5: 16.000 € / 250 = 64 €/pages
* 64 \* 140 = 8.960 € for G
* 64 \* 70 = 4.480 € for R
* 64 \* 40 = 2.560 € for M

1. **Unitary full cost**

* G = 7.200 + 13.200 + 4.800 + 25.200 + 8.960 = 59.360 €
* R = 4.000 + 7.200 + 2.400 + 11.700 + 4.480 = 29.780 €
* M = 4.000 + 4.800 + 2.400 + 12.600 + 2.560 = 26.360 €

**EXERCISE 3 – MAINTENANCE**

**Direct costs** – reported in the table

1. **Identification of activities**

Act. 1 – Quality control of components

Act. 2 – Set up

Act. 3 – Production

Act. 4 – Quality control of finished goods

1. **Allocation of OVH**

*Act. 1 – Quality control of components*

Cost of activity: OVH ACT. 1= 0,3 \* (2 \* 50.000) + 0,4 \* 13.875 = 35.550 €

activity driver: controlled unit of components

Allocation basis: tot. AB = 900 + 2.100 + 950 = 3.950 units

Allocation coefficient: k = 35.550 / 3.950 = 9 €/units

OVHA = 9 \* 900 = 8.100 €

OVHB = 9 \* 2.100 = 18.900 €

OVHC = 9 \* 950 = 8.550 €

Depreciation and indirect costs are allocated using time

OVH = 500.000 + 2 \* 50.000 = 600.000 €

resource driver: time devoted to activities

* set-up: (4 + 3 + 5) \* 100 = 1.200 ore
* production: 25 \* 100 + 30 \* 150 + 28 \* 50 = 8.400 ore

Tot. AB = 1.200 + 8.400 = 9.600 ore

k = 600.000 / 9.600 = 62,5

OVH ATT. 2 = 62,5 \* 1.200 =75.000 €

OVH ATT. 3 = 62,5 \* 8.400 = 525.000 €

*Act. 2 - Set-up*

OVH ACT. 2 = 75.000 €

activity driver: n. Of setup

Tot. AB = 4+ 3 + 5 = 12 set-up

k = 75.000 / 12 = 6.250

OVHA = 6.250 \* 4 = 25.000 €

OVHB = 6.250 \* 3 = 18.750 €

OVHC = 6.250 \* 5 = 31.250 €

*Act. 3 – Production*

OVH ACT. 3 = 525.000 + 63.000 = 588.000

activity driver: hour

Tot. AB = 2.500 + 4.500 + 1.400 = 8.400 h

k = 588.000 / 8.400 = 70

OVHA = 70 \* 2.500 = 175.000 €

OVHB = 70 \* 4.500 = 315.000 €

OVHC = 70 \* 1.400 = 98.000 €

Act. 4 – Quality control of finished goods

OVH ACT. 4 = 0,7 \* (2 \* 50.000) + 0,6 \* (13.875) + 8.675 = 87.000 €

activity driver: n. Of units controlled

Tot. AB = 100 + 150 + 50 = 300 units

k = 87.000 / 300 = 290 €/units

OVHA = 290 \* 100 = 29.000 €

OVHB = 290 \* 150 = 43.500 €

OVHC = 290 \* 50 = 14.500 €

**Unitary full cost**

*Product A*

Direct Material (DM): 3 \* 15 \* 100 + 3 \* 25 \*100 + 3 \* 10 \* 100 = 15.000 €

Direct Labor (DL): 20 \* 30 \* 100 = 60.000 €

Overhead (OVH): 8.100 + 25.000 + 175.000 + 29.000 = 237.100 €/u

Tot. Costs A = 15.000 + 60.000 + 237.100 = 312.100 €

Unitary Full cost A = 312.100 / 100 = **3.121 €/u**

*Product B*

DM: 6 \* 15 \* 150 + 2 \* 25 \*150 + 6 \* 10 \* 150 = 30.000 €

DL: 20 \* 30 \* 150 = 90.000 €

OVH: 18.900 + 18.750 + 315.000 + 43.500 = 396.150 €

Tot. costs of B= 30.000 + 90.000 + 396.000 = 516.150 €

Unitary full cost B= 516.150 / 150 = **3.441 €/u**

*Product C*

DM: 10 \* 15 \* 50 + 3 \* 25 \* 50 + 6 \* 10 \* 50 = 14.250 €

DL: 15 \* 30 \* 50 = 22.500 €

OVH: 8.550 + 31.250 + 98.000 + 14.500 = 152.300 €

Tot. Cost C = 14.250 + 22.500 + 152.300 = 189.050 €

Unitary full cost C= 189.050 / 50 = **3.781 €/u**

**EXERCISE 4 – STEEL**

**Direct cost**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **X** | **Y** | **Z** |
| Direct Material | 45.000 € | 15.000 € | 32.000 € |
| Direct Labor | 14.000 € | 21.000 € | 39.000 € |
| **TOTAL** | **59.000 €** | **36.000 €** | **71.000 €** |

**Overhead**

* Supervisors = 5 x 16.000 / 4 = 20.000 €
* Depreciation = (1.200.000 / 5) / 4 = 60.000 €

1. **Identification of activities**

Act. 1: set-up

Act 2: production

Act. 3: quality control

1. **Cost of each activity**

Act 1: 1/6 time plant + 50% time supervisor = 1/6 x 60.000 + 0,5 x 20.000 = 20.000 €

Act 2: 5/6 time plant = 5/6 x 60.000 = 50.000 €

Act 3: 50% time supervisors = 0,5 x 20.000 = 10.000 €

1. **Driver identification**

Act 1: n. of set-up

Act 2: time functioning plant

Act 3: time remedial action

1. **Costs allocation**

*Act 1:*

N. if set up: 3 for A + 3 for B + 4 for C = 10 s-u

Cost of activity 20.000 €

k = 20.000 € / 10 s-u = 2.000 €/s-u

*Act. 2*

Time functioning plant: 3.000 + 4.200 + 7.800 = 15.000 h

Cost of activity: 50.000 €

k = 50.000 € / 15.000 h = 3,333 €/h

*Act. 3*

Time remedial action: 10 x 3 + 20 x 1 + 25 x 2 = 100 h

Cost of activity: 10.000 €

k = 10.000 € / 100 h = 100 €/h

1. **Unitary full cost**

X = (59.000 + 2.000 x 3 + 3,333 x 3.000 + 100 x 30) / 400 = **195 €/u**

Y = (36.000 + 2.000 x 3 + 3,333 x 4.200 + 100 x 20) / 1.000 = **58 €/u**

Z = (71.000 + 2.000 x 4 + 3,333 x 7.800 + 100 x 50) / 1.250 = **88 €/u**

1. These two activities are manually carried out. [↑](#footnote-ref-1)