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A COST MODEL FOR THE IT DEPARTMENT

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Abstract: *Traditionally, it is believed that a busy IT Department (Information Technology Department) of an organization, with many services offered for other departments is very profitable, or at least "cost-effective". A real and precise calculation of costs per product or service have unveiled that the above is not necessarily true. Activity-Based Costing is a costing model that could assign precise costs to products and services. The combination of this method with the model for calculating the total cost of an IT Department, proposed by HP Laboratories in [1] is a powerful tool for improving IT services.*

Keywords: *Cost model; IT Department cost model; Activity-Based Costing; Cost Object; Cost drivers*

1. Introduction

The need for a cost model is given by the fact that it is necessary to identify the cost for each product or service in order to identify the profitability of IT activities and processes.

The objective of this paper is to introduce a precise method for calculating the costs of operating an IT Department. The method described in this paper extends the cost model proposed by HP Laboratories [1] with the Activity-Based Costing method to determine the real cost for each product or service. Practically, the costs calculated using HP method are tracked in activities and work processes.

2. The HP cost model for planning, development and operation of a Data Center

The cost model proposed by HP Laboratories take into account all costs which are involved in operating the data center of an organization: cost of power delivery, cost of cooling, cost of space and cost of operation. For many organizations, data centers are their own IT department. The total cost of ownership of an IT department is summarized in [1]as follows:

$$Cost_{total} = Cost_{space} + Cost_{power\ the\ hardware} + Cost_{cooling} + Cost_{operation} \quad (1)$$

Each of these costs express the "amount" of correspondent resource, consumed by the data center in a specific period of time. The methods for calculating them are detailed in [1]:

- Typically, the cost of space includes the cost of real estate necessary for the data center, for power generation systems and other auxiliary subsystems. It is considered that operating income is realized only in that portion of the data center space which is populated with computing equipment;
- Cost of power delivery includes conditioning, battery back-up, on-site power generation, and redundancy in both delivery as well as generation;
- Cost of cooling is the cost of power consumed by the cooling resources;
- Cost of operation includes personnel costs, depreciation of IT Equipment, software and licensing costs.

This model offers a method for calculating the total costs of a data center. It could be also used to calculating the total costs of an IT department. However, there is a strong need for calculating the cost of each service or product, in order to measure the performance of the IT department. To do that, it is necessary to calculate the exact "consumption" of each resource presented in relation (1) for obtaining an output (product or service). In other words, the indirect costs from (1) must be transformed in direct costs.

3. Activity-Based Costing method

Activity-Based Costing (ABC) is a cost accounting method used for understanding product, service and customer cost and profitability. Activity-Based Costing was first described in [2]. In IT domain, the directions of use for this method are:

- Supporting management decision regarding price, outsourcing or cost and revenue improvement;
- Improving IT processes;
- Calculating the cost of IT services.

Key elements of this method are *activity* and *cost driver*. Activity is defined as a set of complementary tasks, which are done with a specific purpose. Cost driver express the relation between an output (product or service) and the activities consumed by it.

Cost objects represents batches, activities, processes, products, services, customers and suppliers.

This method was developed because the traditional accounting system has a weakness with the assignment of indirect costs. Indirect costs are the expenses that don't directly generate profit, but are necessary for an organization (or department) to continue activity. Traditional accounting method arbitrarily allocates indirect costs to cost objects. Therefore, as the indirect costs increase, the traditional method will yield a less accurate result for the true cost of a cost object.

The ABC method solves this problem by transforming indirect costs to direct ones. It traces, rather than allocates, each expense category to a cost object. This method is applicable when indirect costs are greater than direct costs with 20 percents or more.

Essentially, this method groups the costs in "activity pools" instead of collecting them as indirect costs of a department. Similar processes or activities, which are driven by a common factor, are grouped in the same pool. Next step is to distribute collected costs to each product or service, by using a cost driver, as it is shown in relation 2:

$$\text{Unit Cost}_{\text{driver cost}} = \text{Cost}_{\text{activity pool}} / \text{Quantity}_{\text{driver cost}} \quad (2)$$

A cost driver is the common factor that groups activities or processes in a specific pool. Examples of cost drivers include: number of setups, number of tests, number of inspections, number of uptime hours for servers or computers, number of failures, number of cycle times, cost of providing resources, etc.. The total cost for each pool is distributed to products or services using the volume of cost driver assigned to the pool. For example, if

testing a server requires 30 percent of the testing activity and the cost driver is the number of tests, then the cost of the "testing a server" activity is 30 percent of the testing costs. The differences between the ABC and the traditional costing methods are discussed in reference [3]. These are also summarized below in table 1.

Table 1. Difference between ABC and Traditional costing [3]

	ABC method	Traditional costing method
Cost pools	Costs are grouped into *activity cost pools*, which correspond to the major activities or business processes.	Costs are grouped in pools using departmental costs. The cost pools are very heterogeneous and are not caused by a single factor.
Allocation bases	Costs are allocated to products or services by using cost drivers	Costs are allocated to products or services by using arbitrary percentage (based on products or services volumes).
Cost Objects	Intend to calculate the "real cost" of cost objects (activities, processes, products, services).	Calculate the "arbitrarily cost" of a cost object (either product or service).
Cost Drivers	Used to group costs into activity cost pool	Used to group costs into indirect/fixed costs.
Decision support	Can support strategic decisions with accurate information, because of the ability to align allocation bases with cost drivers.	Can cause problems of *overcosting* and *undercosting* because of the inability to align allocation bases with cost drivers.
Cost Control	By calculating the precise cost of organizational activities, ABC helps management to reduce costs and to prioritize efforts.	Cost control is based on a departmental approach of grouping costs.
Cost of implementation	Implementation is difficult and maintaining is expensive.	Implementation and maintaining are inexpensive because it is a traditional accounting method.

According to [4], ABC's basic premises are:

- Cost objects consume activities.
- Activities consume resources.
- This consumption of resources is what drives costs.
- Understanding this relationship is critical to successful budget management.

These premises are illustrated in figure 1:

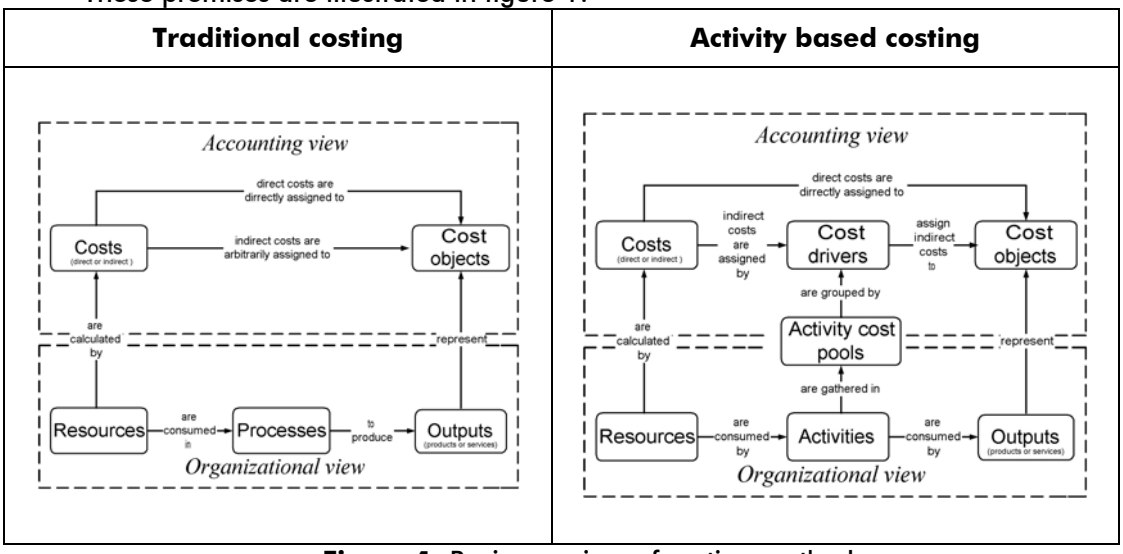

Figure 1. Basic premises of costing methods

The main benefits of Activity-Based Costing method are:
- ABC method offers a way for understanding various costs involved and offer information for: analyzing the costs, identify the activities which add value to a product or service and obtaining the benefits.
- ABC could improve organization performance, by increasing cost visibility.
- ABC could be used as a management tool that provides better allocation of resources.
- ABC offers a competitive cost advantage.

The main disadvantage of **Activity Based Costing** is given by the fact that the implementation is expensive and difficult. However, there are special activity based costing programs, which could be helpful.

4. Results and Discussion

The cost model proposed by the authors of this paper use the ABC method to identify the cost associated with an output service, for example the *"Administration of IT server"*.

As a starting point we take into consideration the terms from relation (1), calculated for a precise period of time (i.e. a month or a year), as exemplified in table 2:

Table 2. IT Department budget

Total Costs of IT Department	
Cost of space	24,000 RON
Cost of power	34,500 RON
Cost of cooling	9,000 RON
Cost of operation, which include:	
- Salary	36,000 RON
- Purchase of new products (hardware and software)	30,000 RON
- Courses for personnel	5,000 RON
- Purchase of spare parts for equipments	9,000 RON
- Programming	7,000 RON
TOTAL COSTS PER PERIOD	138,000 RON

This table shows also the organizational resource consumption for IT department, in order to produce outputs (products and services).

Evidently, the data and information offered by the Table are not enough for calculating the exact cost of the service called *"Administration of IT server"*.

The first three costs from Table will be allocated to service called *"Administration of IT server"*, using parameters like: total area of IT department, area occupied by server, total power consumed by IT department, total power consumed by server, total weight of IT equipment, weight of server .

The cost of space for server is calculated in table 3:

Table 6. Cost of space for server

1. Total cost of space	24,000 RON
2. Area of space occupied with equipments	20 square meters
3. Area of space occupied with server	0.5 square meters
4. Cost of space occupied with the server (= 1 * 3 / 2)	600 RON

The cost of power for server is calculated in Table 7:

Table 7. Cost of power for server

1. Total cost of power	34,500 RON
2. Total power of IT equipments	10 KWatts
3. Total power consumed by server	500 Watts
4. Period of time	8,760 hours
5. Total power consumed by IT equipments (= 2 * 4)	87,600 KWh
6. Total power consumed by server (= 3 * 4)	4,380 KWh
7. Cost of power consumed by server (= 1 * 6 / 5)^3	1,725 RON

The cost of cooling for server is calculated in Table 8:

Table 8. Cost of cooling the server

1. Total cost of cooling	9,000 RON
2. Total weight of IT equipments	1000 Kg
3. Total weight of server	30 Kg
4. Cost of cooling for server (= 1 * 3 / 2)	270 RON

For a precise allocation of the fourth term (cost of operation) to the cost object "*Administration of IT server*", the ABC method is necessary.

The steps necessary for applying ABC method are:

1. Identify activities.
2. Identify cost drivers.
3. Group activities into activity cost pools.
4. Determine the cost for each activity pool.
5. Identify outputs.
6. Assign activity costs to outputs.

We illustrate this methodology in the following sections.

1. Identify activities

In the first step, the main activities of the IT department must be identified and analyzed. This is the most time-consuming and costly step because it requires a great level of detail. The most common method for identifying IT processes and activities is based on IT employee surveys. The activities are, for example: setup and configuring equipments and programs, service of equipments and programs (maintenance and repairing), developing new programs, supporting the users of the IT systems. The method accuracy depends on the number of activities that are taking into consideration. In table 3 is presented the list of activities used for obtaining the output (service) called "*Administration of IT server*".

2. Identify cost drivers

In this step, cost drivers are associated with each activity as exemplified in Table 9:

Table 9. Identifying cost drivers

Activity	Cost driver
Setup and configuring equipments	Number of setups
Setup and configuring programs	Number of setups
Service of equipments (maintenance and repairing)	Number of incidents
Service of programs (maintenance and repairing)	Number of incidents
Develop new programs	Programming hours
Support for users	Number of calls

3. Group activities into activity cost pools

In this step, similar activities with the same cost driver are gathered together, as is shown in Table 10:

Table 10. Activity cost pools

Activity pool	Cost driver
Setup and configuring	Number of setups
Service	Number of incidents
Develop new programs	Programming hours
Support for users	Number of calls

4. Determine the cost for each activity pool

The cost of each activity cost pool is obtained from the accounting department. These data is collected in a table format such as the one presented in Table 11 below.

Table 11. Identifying cost objects

Activity	Value (cost of activity)
Setup and configuring	24,500 RON
Service	19,000 RON
Develop new programs	22,500 RON
Support for users	21,000 RON
TOTAL	87,000 RON

5. Identify outputs

The output is a product or a service. Every output could be a cost object. In this example, the output is the service called *"Administration of IT server"*.

6. Assign activity costs to outputs

In this step, the cost drivers determined in the previous step are used to assign cost objects (activity costs) to the output service *"Administration of IT server"* as presented in Table 12.

Table 12. Calculating the cost of Administration of IT server

Cost object	Value (cost of activity)	Number of activities per department	Number of activities allocated to *Administration of IT server*	Cost allocated to *Administration of IT server*
Setup and configuring	24,500 RON	15 setups	4 setups	6533,33 RON
Service	19,000 RON	18 incidents	5 incidents	5277,78 RON
Develop new programs	22,500 RON	160 hours	120 hours	16875 RON
Support for users	21,000 RON	800 calls	98 calls	2572,5 RON
Cost of operation for *Administration of IT server*				31258,61 RON

Finally, all costs presented in relation (1) are allocated to cost object *"Administration of IT server"*. So, the precise cost of this service can be calculated as is shown in Table 13:

Table 13. Calculating the total cost for output *Administration of IT server*

Cost of space occupied with the server	600 RON
Cost of power consumed by server	1,725 RON
Cost of cooling for server	270 RON
Cost of operation for *Administration of IT server*	31,258.61 RON
TOTAL COST for *Administration of IT server*	**33,853.61 RON**

Using this methodology a precise cost for each "output" (product or service) can be calculated based on "the consumption" of each activity and resource.

5. Summary and conclusions

The novelty of the approach presented by the authors consist in combining the two costing methods described above that results in an improved approach for calculating and budgeting the IT activities and ultimately in supporting management decisions.

HP Laboratories offer an exhaustive method for calculating the total cost involved in operating a data center that could be used also for IT department of an organization. However it doesn't contain any indication about how to assign the indirect costs to products or services. In order to exactly calculate the exact cost of resources consumed for a product or service (to transform indirect costs into direct costs), the method presented above can be applied

The precision of ABC method is increasing proportionally with the number of activities identified. For good results, a number of, at least, 100-150 activities must be considered.

Alternatively, traditional accounting methods could be applied in place of the ABC method; however, due to the way that they allocate the indirect costs, they are not precise enough. Therefore we consider the Activity-Based Costing model as a better alternative to the traditional methods because it uses an allocation model of indirect costs based on activities.

References

1. Chandrakant D. Patel and Amip J. Shahl, **Cost Model for Planning, Development and Operation of a Data Center**, HP Laboratories Palo Alto, 2005

2. Kaplan, R. S. and Bruns, W. **Accounting and Management: A Field Study Perspective**, Harvard Business School Press, 1987

3. Granof Michael, H., Platt David, E. and Vaysman, I. **Using Activity-Based Costing to Manage More Effectively**, University of Texas at Austin, 2000

4. * * * http://www.defenselink.mil/

5. * * * http://www.valuebasedmanagement.net/

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[3] Although the uptime for an average server is around 99.99 % of total time, during the maintenance and service periods the server actually is powered-on.