Activity-Based Budgeting: A worked example

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One of the benefits of an activity-based costing (ABC) exercise is that it makes explicit information about the extent of the activities which must be performed in order to achieve certain levels of operations (such as production or customer service). ABC further involves measuring the cost of the resources which must be consumed in order to perform these activities. As its title suggests, activity-based **budgeting** (ABB) involves incorporating (into the budgetary process) information about the resources required in order to perform the activities necessary in order to enable operations to occur at the budgeted level. In the first instance, ABB is an operational exercise – in other words, things are measured in physical (rather than financial) terms, and this enables the resulting budget to be used to assess whether there are any excess resources (i.e., spare capacity) and / or bottlenecks (i.e., resource shortages which must be resolved if the desired level of operations is to be achieved). This operational exercise facilitates subsequent financial analysis of the costs associated with spare capacity and the costs and benefits of alleviating a bottleneck.

While textbooks typically explain the theory behind ABB fairly well, they often offer little in the way of worked examples. The purpose of this article is provide such an example in the hope that it will both help readers to understand the sequence of steps in ABB and also reinforce their understanding of the contribution which ABB can make to resource management in an organisation.

Jane's Production Company Ltd. (JPCL)

JPCL manufactures three standard products which it sells to several large wholesale chains. Production (which is highly automated) occurs in large batches, and goods are shipped to customers in slightly smaller batches. Details of a typical month's output are as follows:

Product:	**A**	**B**	**C**	**Total**
Units of output	100,000	200,000	450,000	750,000
Production machine hours (PMH), per unit of output	0.3 PMH	0.2 PMH	0.4 PMH	
Production batch size (units)	2,500	4,000	7,500	
Shipment batch size (units)	2,000	2,000	5,000	

Two types of indirect labour are employed, namely, 4 quality control inspectors (at a cost of €4,000 each per month) and 9 administrators (at a monthly cost of €3,500 each). Each employee works a standard 180 hours per month. The role of the quality control staff is to inspect a sample from each batch of output produced; this takes a standard 3 hours inspection time per batch produced. The administrators perform two tasks, namely, shipment processing work (which takes 2 hours per batch shipped) and monitoring of production (at the rate of one hour of administrator time for every 600 units of output).

In addition to the production machinery (which has a capacity of 225,000 production machine hours [PMH] per month) there are two additional types of specialized machinery which perform automated production setup and automated shipment loading procedures. Details of these two machines are:

	Production setup machinery	Shipment loading machinery
Monthly capacity	650 hours	400 hours
Usage rates	4 hours per batch produced	1.5 hours per batch shipped

Activity-based budget for JPCL: Step 1

The first step is to calculate the amount of activities which are necessary if operations are to occur at the level indicated in the previous section:

	Product A	Product B	Product C	Total
Number of PMH	100,000 * 0.3 = 30,000 PMH	200,000 * 0.2 = 40,000 PMH	450,000 * 0.4 = 180,000 PMH	250,000 PMH
Number of batches produced	100,000 / 2,500 = 40	200,000 / 4,000 = 50	450,000 / 7,500 = 60	150
Number of batches shipped	100,000 / 2,000 = 50	200,000 / 2,000 = 100	450,000 / 5,000 = 90	240

Activity-based budget for JPCL: Step 2

The second step involves calculate the amounts of the various resources (i.e., the different types of indirect labour and machinery) which are necessary in order to perform the amounts of activities identified at Step 1:

Indirect labour:

Quality control	(150 batches produced * 3 inspection hours) = **450 inspection hours**
Administration	(240 batches shipped * 2 administration hours) = 480 administration hours + (750,000 units of output / 600) = 1,250 administration hours = **1,730 administration hours**

Machinery:

Production machinery	250,000 PMH (already calculated above)
Setup machinery	(150 batches produced * 4 hours) = 600 hours
Shipment loading machinery	(240 batches shipped * 1.5 hours) = 360 hours

Activity-based budget for JPCL: Step 3

We can now assess whether the resources currently owned or employed by the company are sufficient to meet the requirements identified in the previous steps:

Indirect labour: staff numbers:

	Quality control inspectors	Administrators
Number employed at present	4 inspectors	9 administrators
Number required	450 hours / 180 hours each = 2. 5 inspectors	1,730 hours / 180 hours each = 9.61 administrators
Surplus (shortfall)	1.5 inspectors	(0.61 administrators)

Machine capacity:

	Production machinery	Setup machinery	Shipment loading machinery
Capacity of existing equipment	225,000 PMH	650 hours	400 hours
Capacity required	250,000 PMH	600 hours	360 hours
Surplus (shortfall)	(25,000 PMH)	50 hours	40 hours

Activity-based budget for JPCL: Analysis

We have now completed the operational phase of the ABB. Two resource shortages have been identified at Step 3 above: the company has two few administrators and too little production machine capacity, and unless these bottlenecks are "elevated" (i.e., removed) the budgeted levels of output of some or all of the three products will not be achieved. Sometimes, operational improvements – such as redeployment of surplus administrative staff from elsewhere in an organisation, or servicing of production equipment to improve its efficiency – can allow bottlenecks to be eliminated at little or no incremental cost to the organisation. However, if such operational improvements are not sufficient to solve the problem, then the company needs to analyse whether costly solutions (such as employing an extra administrator and acquiring extra production machinery capacity) are justified in cost-benefit terms.

Notice that, for at least one resource, the problem is that the company has far too much capacity. Specifically, the JPCL employs 4 quality control inspectors, which is 1.5 more inspectors than it needs. Since the cost of employing an inspector is €4,000 per month, the cost of this spare inspection capacity is (1.5 * €4,000 = €6,000). An important question which arises is whether and how this idle time cost can be avoided. Redundancy may be one option, but only after JPCL has considered the full long–term consequences (including redundancy payments). A more constructive option may be to redeploy the surplus staff elsewhere in the organisation, permanently or temporarily. For example, suppose that some of the tasks performed by administrators require skills that the quality control inspectors also have. If that is the case, then it may be feasible to ask each quality control inspector to take on some of the administrative tasks. This would avoid the need to employ an extra administrator while simultaneously reducing quality control inspector idle time, at no net cost to the company.