

BusinessObjects EPO Suite

EPO Suite Calculation Process

Overview

This document discusses the calculation process of the Enterprise Performance Optimization (EPO) Suite. This process determines how results are produced in BusinessObjects Activity Analysis and BusinessObjects Predictive Planning.

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Introduction

This document discusses the calculation process of the Enterprise Performance Optimization (EPO) Suite. This process determines how results are produced in BusinessObjects Activity Analysis and BusinessObjects Predictive Planning.

The document is not meant to be exhaustive; the full scope of the EPO Suite would make such a document extremely long and very difficult to understand, which would rather defeat its purpose. Instead, the document aims to discuss the general principles of the calculation process, and to give a good flavor of what goes on when the system calculates its results. Because of this, there are occasional simplifications. However, the overall principles described here hold true, and the following information should give you a good understanding of how EPO's calculations are performed.

The calculation process is responsible for generating an EPO model's results. It runs on the model server, in the middle layer of the EPO architecture. Results can be generated as a result of

- Model rules
- Consolidations up the model's hierarchies.
- The Activity-Based Costing (ABC) engine

Each of these is discussed in this document.

Timing of Calculations

There are two kinds of calculation - "forced" and "background".

Forced calculation occurs either when a rule involved in the cost object calculation chain is invoked, or when a user opens a view that requires calculated figures

Background calculation is the process whereby the model server waits for a "quiet time" and uses that to process any rules and generate results that it does not yet have. "Quiet time" occurs when there is no user activity for a given period. After this period has elapsed, the model server decides that it has a chance to use its resources in calculating rules, so that they are ready at once if they are asked for later. It will happily continue calculating the model in this way until either the model is completely calculated, or the users start to use the model again. If the users start to use the model again, the background calculation will not get another chance until the next period of "quiet time". Depending on what the users do in the meantime, Predictive Planning might have to throw away some or even all of the results calculated during the last period of background calculation, and the system might just have to start the next background calculation right from the beginning again. But even if it does, nothing is really lost, since the last background

calculation used machine resources that were not being used by anything else.

The order in which a set of results is calculated is not defined, nor is it really relevant. For example, does EPO calculate results for Line Item Values before it calculates results for Resource Driver Splits? There's no fixed answer to that question. In some models, the results for the first will be required to calculate the second, but in others it will be the other way around. It all depends on the dependencies that you have built into your rules, and what will happen in practice is that EPO will determine its own calculation order, depending on how the model has been built. If a user is attempting to open a grid that requires calculated results, it will even attempt to provide those results as a priority, so results might be calculated in a different order each time, depending on what is happening within the application at the time.

Storage of Results

EPO results are not stored in the EPO database. Of the information that makes up a model, the database only retains model metadata, model relationships and input data. (Security data, which is not all related to individual models, is also retained in the database, but need not concern us here.) When required, EPO can always use this information to reproduce the model results with 100% accuracy, and not storing the results represents an opportunity to save a lot of resource both in terms of database size and input/output.

Instead of storing the results in the database, EPO holds them in memory on its Model Server, using a sophisticated memory management system, which spools to disk as required.

Model Rules

Some results are calculated according to model rules. The model builder has a lot of power to affect the way these results are calculated; he or she has almost unlimited flexibility to define how EPO will reach its result.

For other results, the costing methodology built into EPO largely defines the result. Built into EPO is a very sophisticated Activity-Based Costing methodology, and this largely governs the way in which Activity costs, Cost Object costs and Unit Rates are calculated. The model builder can define the items in the model and the relationships between them, and the model builder and the end user provide data values that feed into the ABC calculation, but the methodology is built into EPO and cannot be altered.

For almost any number that can be calculated by a rule, there are four different rules that might be applicable:

- Version rule

- Period rule
- Responsibility Center rule
- The rule for the grid value

For instance, a Line Item Value could be calculated according to a Version rule, a Period rule, a Responsibility Center rule or a Line Item Value rule. A particular cell can, of course, only contain one result, so which of these four rules takes precedence?

The order of precedence is actually exactly as above; Version, then Period, then Responsibility Center, then the rule for the grid value. In other words:

- If there is a Version rule that returns a result for the cell, use that.
- Otherwise, if there's a Period rule that returns a result for the cell, use that.
- Otherwise, if there's a Responsibility Center that returns a result for the cell, use that.
- Otherwise, if there's a rule for the cell's grid value that returns a result for the cell, use that.
- Otherwise, use any input value associated with the cell.
- Otherwise, the cell's result is zero.

NOTE

A few values – Spreads and Currency Values - are not dimensioned by Responsibility Center. For these, the order of precedence is simply Version, then Period, then the rule for the grid value.

Consolidations

In each of the EPO Suite's dimensions, it is possible to define consolidations. EPO calculates these according to the consolidation properties of each dimension member. A dimension member can be defined to consolidate into its parent as a sum, to be subtracted from its parent, or not to affect the value associated of its parent at all.

As well as the default consolidation, rules can be written that recalculate results at consolidated levels, instead of summarizing the results of the parent's children. This is especially useful in the case of calculated ratios.

EPO does not allow a model builder to define consolidation rules for Versions, Periods or Responsibility Centers. Consolidation rules can only be defined for grid values, so when calculating a consolidated value, EPO will use the consolidation rule for that grid value and dimension member (if it exists) or the normal consolidation paths (if it does not).

Cross Model Rules

Using EPO it is possible to write rules that reference values in other EPO models. This is useful for splitting an EPO project into separate modeling problems – very useful when attempting to model several complex situations is the same implementation – or when different parts of your project need to be modeled at different levels of detail, over different time spans, or with different frequencies of update.

Cross-model rules can be set up to either (a) get the latest data from the source model every time, or (b) get data from a “cache” of results associated with the target model, and updated when the model builder deems it appropriate to do so.

Design of such interfaces is beyond the scope of this document, but we can say a few things about the mechanics of cross-model rules.

When results are required from a source model, and they are not to be pulled from the local cache of previously fetched results, EPO must open the source model, if it is not open already. If the results required are available, they are supplied; if not, they are calculated there and then. EPO will attempt to calculate the results as efficiently as possible; that is to say that the model will be calculated only to the extent that is required to generate the required results. In effect, this is the same as the calculation process described in the [Timing of Calculations](#) section.

Activity-Based Costing

Not all calculated values are generated as a result of model rules or specifications. A very important part of the EPO calculation process is the Activity-Based Costing (ABC) part, and although the way that EPO calculates this part of a model is partly dependent on the relationships and values that exist in a model, it is also dependent upon a pre-defined ABC methodology that is built into EPO.

In very basic terms, the ABC process works like this:

- Input costs are held as Line Item Values in a multidimensional table, by Period, Version, Line Item and Responsibility Center.
- These Line Item Values are apportioned to Activities. “Resource Drivers” provide the basis for these apportionments, and the reassignment paths can be kept simple, or made more sophisticated by the use of overrides in specific cases.
- EPO supports reiterative reassignments, where the costs of Activities in a Responsibility Center can be reassigned to Activities in another Responsibility Center, and even to further Responsibility Centers or back to the original RC.
- Calculated Activity costs can then be apportioned to Cost Objects (Products, Customers, Channels and so on) using further drivers,

which in this case are called Activity Drivers. Cost Object costs are truly multidimensional, so it is easy to see the cost of, say, supplying a particular Product to a particular Customer via a particular Channel.

The following sections describe this process in more detail.

Pre-Reassignment Activity Costing

In this stage, EPO apportions costs to Activities, using the Resource Driver Split grid values. For each Line Item Vale cost record, EPO takes that record and determines the Resource Driver to use. The Resource Driver might simply be associated with the Line Item, or there might be an override Driver in place; override Drivers can be defined that take the place of the default Driver for particular Periods, Versions, or Responsibility Centers.

The Resource Driver Splits specify how the cost will be apportioned to the Activities that are carried out in the Responsibility Center.

Example:			
Your SALES Responsibility Center has a Line Item SALARIES, which has a cost of £10,000 and uses the Resource Driver FTE. There are eight FTEs in SALES, and they are deployed across the RC's Activities as follows:			
RC	Activity	FTE	
SALES	SELLING	5	
SALES	MANAGEMENT	1	
SALES	ADMIN	2	
The table above represents what is known in EPO as the "Resource Driver Splits".			
EPO assigns the £10,000 cost to the RC's Activities in the same proportions, and therefore will calculate the Activity costs as:			
RC	Line Item	Activity	Cost
SALES	SALARIES	SELLING	£6,250
SALES	SALARIES	MANAGEMENT	£1,250
SALES	SALARIES	ADMIN	£2,500

EPO actually stores the Resource Driver Splits table as values, although you can enter percentages or values; if you enter percentages, EPO automatically recalculates the values according to the Resource Driver Values. However, if you change Resource Driver Values, the Resource Driver Splits **percentages** will appear to change, because the **values** in the Resource Driver Splits table remain the same.

If you enter Resource Driver Splits that add up to less than 100% of the corresponding Resource Driver Value, then not all the cost will be assigned to Activities. This is called Spare Resource. EPO handles Spare Resource by assigning the shortfall to a predefined Activity, "Spare".

Example:			
In the previous example, suppose that the SALES Responsibility Center has 10 FTEs; according to the Resource Driver Splits, only 8 of those FTEs are assigned to Activities. There is a Spare Resource of 2, and EPO therefore creates a new dummy Activity to which it apportions two-tenths of the SALARIES cost.			

RC	Line Item	Activity	Cost
SALES	SALARIES	SELLING	£5,000
SALES	SALARIES	MANAGEMENT	£1,000
SALES	SALARIES	ADMIN	£2,000
SALES	SALARIES	SPARE	£2,000

If you enter Resource Driver Splits that add up to more than 100%, EPO deals with it in exactly the same way; this time, though, the cost assigned to Spare Activities will be negative, and represents an over-allocation of the available resource.

You can also assign a Line Item Value directly to an Activity, without the need to define a Resource Driver for the purpose. In this case, 100% of the Line Item Value is assigned to the nominated Activity.

Activity Unit Rate Calculation

EPO calculates Activity Unit Rates for each Activity carried out by each Responsibility Center. The Activity Unit Rate calculation is simple: EPO simply divides the Responsibility Center/ Activity Cost by the volume of the Resource Driver that was used to drive the cost to the Activity.

Example				
In the previous example, Activity Costs for the SALES Responsibility Center were calculated as follows:				
RC	Line Item	Activity	Cost	
SALES	SALARIES	SELLING	£5,000	
SALES	SALARIES	MANAGEMENT	£1,000	
SALES	SALARIES	ADMIN	£2,000	
SALES	SALARIES	SPARE	£2,000	
These costs were calculated using the Resource Driver FTEs, which had a value of 10 in the Sales Responsibility Center. To calculate the Activity Unit Rate, EPO simply has to divide the Activity Cost by the corresponding Resource Driver Value.				
RC	Line Item	Activity	Cost	Activity Unit Rate
SALES	SALARIES	SELLING	£5,000	£500
SALES	SALARIES	MANAGEMENT	£1,000	£100
SALES	SALARIES	ADMIN	£2,000	£200
SALES	SALARIES	SPARE	£2,000	£200

Reassignments

The final stage of Activity Costing is to perform the Activity Reassignments.

In this stage, EPO checks each record that was produced by the pre-reassignment Activity Costing, and reassigns the Activity cost on any record that relates to an Activity that has the attribute "Reassigned Activities". These Activities are typically services that one Responsibility Center carries out for another, or on behalf of the entire organization.

For any such record, EPO looks up the reassignment path for the record's combination of Responsibility Center and Activity. This reassignment path tells EPO the Resource Driver to use for the

reassignment, and the Responsibility Centers into which the Activity cost is to be reassigned.

Example:

Suppose that you have a PERSONNEL Responsibility Center with an Activity of RUN PAYROLL, and that you have set up a reassignment path to assign those costs to responsibility Centers PARIS, DALLAS and TOKYO based on a HEADCOUNT Resource Driver. The pre-reassignment Activity Costing assigned the RUN PAYROLL Activity in PERSONNEL a cost of £500.

RC	HEADCOUNT
PARIS	15
DALLAS	15
TOKYO	20

The reassignment process assigns the £500 of Activity cost to the three Responsibility Centers based on HEADCOUNT.

RC	Reassigned Cost
PARIS	£150
DALLAS	£150
TOKYO	£200

EPO then assigns the above costs to Activities within the PARIS, DALLAS and TOKYO Responsibility Centers according to the Resource Driver Splits for the HEADCOUNT Resource Driver in each of those Responsibility Centers.

So, if PARIS carries out the Activities MANUFACTURING, ADMINISTRATION and R&D, it may have the following Resource Driver Splits:

RC	Activity	HEADCOUNT
PARIS	MANUFACTURING	12
PARIS	ADMINISTRATION	6
PARIS	R&D	7

And therefore the Activities receive the following share of the £150 costs from the PERSONNEL Responsibility Center's RUN PAYROLL Activity:

RC	Line Item	Activity	Cost
PARIS	RUN PAYROLL	MANUFACTURING	£72
PARIS	RUN PAYROLL	ADMINISTRATION	£36
PARIS	RUN PAYROLL	R&D	£42

As seen above, the costs that are assigned into a Responsibility Center are subsequently apportioned to Activities within that Responsibility Center. By default, the Resource Driver used is the same Resource Driver that was used in the reassignment. However, you can also specify that EPO should use a different Resource Driver in any Responsibility Center.

When the costs have been apportioned to Activities, it is possible that costs may have been newly assigned to reassigned Activities. For this reason, reassignment may require several iterations to get to the point where all reassigned Activities have had all their costs apportioned to non-reassigned Activities.

Example:

In the previous example, you saw how costs ended up in three Activities – MANUFACTURING, ADMINISTRATION and R&D – in the PARIS Responsibility Center. However, any of these Activities could be reassigned Activities, in which case EPO will require at least another pass in order to apportion PARIS's reassigned costs.

It is quite possible for one Responsibility Center to be reassigning costs to a second Responsibility Center, at the same time as the second reassigns costs back to the first. This sets up a loop of reassignments,

which is quite valid. Normally, costs will be diverted out of the loop to other non-reassigned Activities over the course of several passes, as the amount being reassigned dwindles.

Reassignment paths can be even more complex in larger models, with large reassignment loops in which costs pass through several intermediate reassignments before being diverted back to their originating Responsibility Centers.

The amounts being reassigned will get less each time around the loop. EPO continues to pass around the loop until the amounts being reassigned are too small to measure. This is called convergence.

In the vast majority of cases, EPO does not require many iterations until this point is reached. Larger numbers of iterations are usually needed only when there are small numbers of Activities involved, and one of the Activities is receiving a very large proportion – close to 100% - of the cost. However, in such cases the amount of calculation required in each iteration is low, precisely because there are only a few Activities involved, and therefore convergence still tends to be quick.

Example:

In a very simple model, suppose you have two Responsibility Centers, PERSONNEL and ADMIN. PERSONNEL carries out two Activities, RECRUIT and MANAGE RESPONSIBILITY CENTER; ADMIN carries out ADMINISTER and CREDIT CONTROL.

PERSONNEL reassigns RECRUIT to ADMIN based on a Method HEADCOUNT. ADMIN, meanwhile, reassigns ADMINISTER to PERSONNEL, also on HEADCOUNT.

Suppose that the relevant Resource Driver Splits are:

RC	Activity	HEADCOUNT
PERSONNEL	RECRUIT	1
PERSONNEL	MANAGE RESPONSIBILITY CENTER	1
ADMIN	ADMINISTER	1
ADMIN	CREDIT CONTROL	1

And suppose that the pre-reassignment Activity costing produces the following results:

RC	Activity	Cost
PERSONNEL	RECRUIT	£16.00
PERSONNEL	MANAGE RESPONSIBILITY CENTER	£16.00
ADMIN	ADMINISTER	£16.00
ADMIN	CREDIT CONTROL	£16.00

In the first reassignment, the £16 from the Activity RECRUIT in PERSONNEL is reassigned to the two Activities in the ADMIN Responsibility Center, according to HEADCOUNT.

RC	Activity	Cost
PERSONNEL	RECRUIT	£0.00
PERSONNEL	MANAGE RESPONSIBILITY CENTER	£16.00
ADMIN	ADMINISTER	£24.00
ADMIN	CREDIT CONTROL	£24.00

In the second reassignment, the £24 now associated with the Activity ADMINISTER in ADMIN is reassigned to the two Activities in PERSONNEL, again on HEADCOUNT.

RC	Activity	Cost
PERSONNEL	RECRUIT	£12.00
PERSONNEL	MANAGE RESPONSIBILITY CENTER	£28.00
ADMIN	ADMINISTER	£0.00
ADMIN	CREDIT CONTROL	£24.00

In the third reassignment, the £12 at PERSONNEL/RECRUIT is reassigned to the two Activities in the ADMIN Responsibility Center, once more on HEADCOUNT.

RC	Activity	Cost
PERSONNEL	RECRUIT	£0.00
PERSONNEL	MANAGE RESPONSIBILITY CENTER	£28.00
ADMIN	ADMINISTER	£6.00
ADMIN	CREDIT CONTROL	£30.00

Notice how the total pool of costs remains at the original £64, but the costs associated with the reassigned Activities is gradually diminishing. Eventually, EPO will reach a point where the cost of each of the reassigned Activities has fallen to an insignificant level, and the reassignment process will stop.

RC	Activity	Cost on subsequent iterations		
PERSONNEL	RECRUIT	£3.00	£0.00	£0.75
PERSONNEL	MANAGE RESPONSIBILITY CENTER	£31.00	£31.00	£31.75
ADMIN	ADMINISTER	£0.00	£1.50	£0.00
ADMIN	CREDIT CONTROL	£30.00	£31.50	£31.50

EPO decides on the order in which iterative reassignment will be carried out, but the order in which the Activities are reassigned makes no difference to the final result.

It is possible (albeit by the unusual step of having negative resource driver splits) to set up an iterative reassignment that diverges instead of converging, and for which there is no solution. If EPO finds no convergence, the calculation process will produce an error.

A trace of the results of reassignments can be found in EPO's REASSIGNTRACE table, which allows you to analyze the costs flowing in and out of Responsibility Centers and Activities.

Cost Object Costing

Overview of Cost Object Costing

Cost Objects represent the outputs of your organization. Most often, they represent your products, customers and distribution channels, though they can represent other entities such as project and department. In EPO, you can use up to five Cost Object dimensions, and you can rename the dimensions according to your requirements. For example, the first Cost Object dimension is, by default, called "Cost Object 1", but you could rename it to "Products" if you wanted to.

EPO apportions the results from the Activity Costing, which was described in the [Activity-Based Costing](#) section, to Cost Objects. The model builder can define, for each Activity, what measure (or measures) will be the basis for the apportionment, the Cost Object dimensions across which the costs are apportioned, and which Cost Object or Cost Objects will receive costs. These measures are called Activity Drivers, and represent quantities that vary across Cost Objects. Examples might be "number of support enquiries", "stock levels", "number of deliveries", "sales volume", "number of account transactions" and so on.

In EPO, the Cost Object assignment is multi-dimensional, so that costs from an Activity can be assigned to a combination of dimensions. For example, the costs of the Activity "Provide Telephone Support" might be assigned across a combination of the Product and Customer dimensions. The model will be able to tell us cost of providing telephone support for a given product to a certain customer. Within the same model, it might make sense to apportion other Activities across more dimensions, or across less. The Activity "Design Advertisements", for example, would probably only be assigned to the Product dimension, because the costs are associated with products and not with specific customers.

When an Activity is apportioned across multiple dimensions, it is possible – though by no means compulsory – to use different Drivers for each of the dimensions. For example, you might want to apportion a particular Activity over Products and Customers; you could use one Driver (which is available only by Customer) to apportion the Activity over Customers in the first instance, and then a second Driver (which is available to Product and Customer) to further apportion the costs down to Products and Customers. This approach is often used when the model builder wants the costs to be apportioned to multiple Cost Object dimensions, but the most suitable Driver is not available across all the required dimensions. It is sometimes expedient to use a Driver that is not exactly the one required, but for which the data is at least obtainable.

The set of relationships – the Activity, the Activity Driver (or Drivers) used to apportion its costs, the Cost Object dimensions across which the costs are apportioned, and the Cost Objects that receive the costs – represent an *assignment path*. In many cases an Activity will have a single assignment path that is applied no matter what Period, Version or Responsibility Center is being considered. But EPO allows you to define assignment path overrides; in other words, you can optionally have assignment paths for an Activity that are different in different Periods, Versions or Responsibility Centers.

Assignment of Costs to Cost Objects

Using a Single Activity Driver

For each Activity that has an assignment to Cost Objects, EPO calculates the total Activity Driver Volume for assigned Cost Objects, and apportions the Activity cost across those Cost Objects in the proportions indicated by the Activity Driver Volumes.

Example			
The Activity INSPECT, which is carried out in the QA Responsibility Center, is assigned to Products CABINET, TABLE and CHAIR, but not to DESKLAMP, using a Activity Driver of PRODUCTION UNITS.			
The Driver Volumes for each Product are shown below.			
RC	Product	PRODUCTION UNITS	
QA	CABINET	200	
QA	TABLE	200	
QA	DESKLAMP	60	
QA	CHAIR	100	
The Activity costs for INSPECT, which are, say, £20,000, are apportioned across only the relevant Products, giving the following results.			
RC	Product	PRODUCTION UNITS	
QA	CABINET	£8,000	
QA	TABLE	£8,000	
QA	DESKLAMP	-	
QA	CHAIR	£4,000	

You can assign costs to Cost Objects across any combination of one, two or three Cost Object dimensions.

Example			
The Activity INVOICING is assigned to Products CABINET, TABLE, DESKLAMP and CHAIR, and to Customers HOME and ABROAD, using an Activity Driver of NUMBER OF ORDERS.			
The NUMBER OF ORDERS for each Product/Customer combination are shown below.			
RC	Product	Customer	
		HOME	ABROAD
FINANCE	CABINET	100	100
FINANCE	TABLE	50	120
FINANCE	DESKLAMP	60	20
FINANCE	CHAIR	40	10
The Activity costs for INVOICING, which are, say, £5,000, are apportioned across the relevant Products and Customers, giving the following results.			
RC	Product	Customer	
		HOME	ABROAD
FINANCE	CABINET	£1,000	£1,000
FINANCE	TABLE	£500	£1,200
FINANCE	DESKLAMP	£600	£200
FINANCE	CHAIR	£400	£100

If you have specified an assignment path that has fewer dimensions than the corresponding Activity Driver Volumes, EPO will roll up the volumes to the appropriate number of dimensions.

Example

You have an Activity BILLING, with an Activity Cost of £20,000, which you want to apportion to Customers based on the Activity Driver ORDERS. However, you have data on ORDERS by Customer and Product.

RC	Product	Customer	
		HOME	ABROAD
FINANCE	CABINET	100	100
FINANCE	TABLE	50	120
FINANCE	DESKLAMP	60	20
FINANCE	CHAIR	40	10

In order to apportion the costs to Customers only, EPO calculates the total ORDERS for the Customer HOME (250) and for the Customer ABROAD (250), and then does the calculation to Cost Object:

RC	HOME	ABROAD
FINANCE	£10,000	£10,000

It would even be possible for additional Activity Driver Volumes to be held by Customer only (at the Product <All> level) and this would be also be included in the calculation.

RC	Product	Customer	
		HOME	ABROAD
FINANCE	<All>	100	200
FINANCE	CABINET	100	100
FINANCE	TABLE	50	120
FINANCE	DESKLAMP	60	20
FINANCE	CHAIR	40	10

This time, EPO calculates the total ORDERS for the Customer HOME (350) and for the Customer ABROAD (450), and then does the calculation to Cost Object:

RC	HOME	ABROAD
FINANCE	£8,750	£11,250

Using Multiple Activity Drivers

For any Activity, you can use different Activity Drivers across different dimensions. For example, you could drive the Activity's costs to Customers first, according to one Activity Driver, then complete the apportionment by driving to Products and Customers using a different Activity Driver. If you want to do this, each subsequent Activity Driver used must be across more dimensions than the previous Activity Driver. So, you cannot use one Activity Driver to apportion an Activity's costs to Products, then use another Activity Driver to apportion the costs to *just* Customers. In this example, the second Activity Driver would have to be used to drive the costs to (a) Products and Customers, (b) Products and Channels, or (c) Products, Customers and Channels (assuming that our model has Cost Object dimensions Product, Customer and Channel).

You can use multiple Activity Drivers in whatever combinations you like across the three dimensions of Cost Objects. However, there is only one restriction; you cannot use the same Activity Driver to apportion costs to the first and third dimensions.

This gives seven ways of apportioning an Activity's costs across three dimensions; the seven ways are listed in the following table.

NOTE	"Dimension A", "Dimension B" and "Dimension C" each represent any of the three Cost Object dimensions.
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Allowed combinations of dimensions and Activity Drivers for apportionment of Activity costs to Cost Objects.
Driver 1 to Dimension A
Driver 1 to Dimension A; Driver 2 to Dimension A/Dimension B
Driver 1 to Dimension A; Driver 2 to Dimension A/Dimension B/Dimension C
Driver 1 to Dimension A; Driver 2 to Dimension A/Dimension B; Driver 3 to Dimension A/Dimension B/Dimension C
Driver 1 to Dimension A/Dimension B
Driver 1 to Dimension A/Dimension B; Driver 3 to Dimension A/Dimension B/Dimension C
Driver 1 to Dimension A/Dimension B/Dimension C

In models with more than three Cost Object dimensions, there are more ways of apportioning an Activity's costs.

If you use different Activity Drivers across different dimensions, EPO apportions the costs in stages; in other words it performs a calculation using the first specified Activity Driver, then uses the results of that apportionment to feed a calculation using the second Activity Driver. If the Activity Assignment calls for a third Activity Driver in the third dimension, the results from the second stage feed that third step.

EPO does not form a single matrix and apportion the costs according to that.

Example					
Your Responsibility Center FACTORY carries out an Activity MANUFACTURING, whose Activity Cost is calculated as £1,000,000. You make Products COMPACT and 4WD, which you sell to Customers DEALERS, DIRECT and OVERSEAS.					
Should you so choose, you can apportion the costs of MANUFACTURING to Products using the Activity Driver PRODUCTION UNITS, then to Products/Customers using the Activity Driver ORDERS.					
RC	Product	PRODUCTION UNITS			
FACTORY	COMPACT	900			
FACTORY	4WD	300			
RC	Product	DEALERS		ORDERS	
FACTORY	COMPACT	1200		DIRECT	OVERSEAS
FACTORY	4WD	2		2	1
So, in the first stage, the costs are assigned to Products:					

RC	Product	Result of first stage apportionment		
FACTORY	COMPACT	£750,000		
FACTORY	4WD	£250,000		

The result for each Product is then additionally apportioned across the relevant Customers using that Product's ORDERS. In other words, the £250,000 already apportioned to the 4WD Product is split across the three Customers in the proportion 2:2:1.

RC	Product	Result of second stage apportionment		
		DEALERS	DIRECT	OVERSEAS
FACTORY	COMPACT	£360,000	£300,000	£90,000
FACTORY	4WD	£100,000	£100,000	£50,000

Note that in this example, although the volumes for ORDERS differ wildly from one Product to the next, the final Cost Object costs are of a similar order of magnitude. This is due to the two-stage apportionment. The first Activity Driver used, which is often referred to in EPO as the **Primary Activity Driver**, has a more significant effect on the result than subsequent drivers.

Missing Activity Drivers and Assignments

Costs for an Activity that (a) has not been assigned to Cost Objects or (b) has no Driver Volumes for the Cost Objects in the assignment end up assigned to the predefined "unassigned" Cost Objects (Cost Object 1 Unassigned, Cost Object 2 Unassigned, Cost Object 3 Unassigned and so on).

If there are no relevant Activity Drivers in the second or third stage, then EPO apportions the costs according to the previous stage, and there they remain. For instance, suppose you assign an Activity's costs to Products on one Activity Driver, and to Customers on a second, but you fail to enter any Driver Volumes for the second Activity Driver. The costs will be apportioned to Products, but no further apportionment to Customers will take place.

Example			
Take the previous example, and assume that the volume for the Activity Driver ORDERS had not been entered.			
As before, the costs for the Activity MANUFACTURING are initially assigned to Products:			
RC	Product	Result of first stage apportionment	
FACTORY	COMPACT	£750,000	
FACTORY	4WD	£250,000	
EPO would then attempt to apportion these costs to Products and Customers, but since there is now no data for the Driver ORDERS, it cannot do so. The costs remain at the Product level and are not apportioned to Products/Customers.			

A similar result will be obtained if you enter volumes for the second Activity Driver, but for some reason do not enter the volumes by Product.

Example	
Suppose that, in the previous example, you assign the Activity MANUFACTURING to Products using the Activity Driver PRODUCTION UNITS, then to Products/Customers using the Activity Driver DELIVERIES – but that you only have DELIVERY information by Customer, not by Customer and Product.	

RC	Product	PRODUCTION UNITS
FACTORY	COMPACT	900
FACTORY	4WD	300

RC	Product	DELIVERIES
FACTORY	DEALERS	300
FACTORY	DIRECT	400
FACTORY	OVERSEAS	150

As before, the costs are first assigned to Products:

RC	Product	Result of first stage apportionment
FACTORY	COMPACT	£750,000
FACTORY	4WD	£250,000

But when it comes to the second stage of apportionment, EPO cannot perform the next stage, because the DELIVERIES Activity Driver is not by Products. When the time comes to apportion, say, the £750,000 associated with the Product COMPACT, there is no information about DELIVERIES for COMPACT, and therefore the costs are not apportioned to Products/Customers.

In other words, in an apportionment that involves multiple Activity Drivers, the dimensionality of the Activity Driver volumes at each stage must be a subset of the dimensionality of the following stage.

Primary Driver Unit Rate Calculation

EPO calculates Driver Unit Rates for each Activity carried out by each Responsibility Center. The Primary Driver Unit Rate calculation is simple: EPO simply divides the Activity Cost by the total Volume of the Cost Driver associated with the Department/Activity.

Example		
In a previous example, the Activity INVOICING had costs of £5000, and was assigned to Products and Customers based on an Activity Driver of NUMBER OF ORDERS.		
The NUMBER OF ORDERS for each Product/Customer combination were:		
	Customer	
Product	HOME	ABROAD
CABINET	100	100
TABLE	50	120
DESKLAMP	60	20
CHAIR	40	10
The total NUMBER OF ORDERS was therefore 500.		
This means that EPO will calculate a Primary Driver Unit Rate of £5,000/500, or £10 per order.		

If multiple Cost Drivers are used to apportion the Activity Costs, then the Primary Driver Unit Rate is only calculated for the Primary Driver. No Unit Rate is calculated for subsequent drivers.

Finding more information

For more information and resources, refer to the product documentation and visit the support area of the web site at

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