

# The basic principles of building ABM models

When starting to build ABM models there are a number of things to consider before plunging into the detail. As always, some thought and planning at an early stage will prevent a path being taken that leads to an inefficient model or one that does not answer the business issues ABM was hoping to address. When structuring a model there are a number of key points to consider.

We start with a schematic plan of the flow of costs in the model. Next we'll need to understand the general ledger and determine how we will assign costs to activities. We will need to consider the level of detail required during activity data collection and whether we will use attributes to facilitate extracting data of interest to illustrate particular issues.

Cost drivers, both resource and activity, will need to be considered early as the sources of data may be lacking or difficult to obtain. This will also be part of the discussion concerning how to assign costs to frontline activities, re-assign internal service costs to frontline activities and onwards to products and customers.

We will need to consider how we will show Product and Customer profitability. Will this be at an individual level or will we choose product categories or customer segments.

Many useful outputs will be obtained. We need to consider how we will use unit cost data for budgeting or benchmarking, or to use in simulation models of other scenarios for running the business.

We'll look in depth at each of these considerations.

## The flow of costs in the model

An ABM model is a large assignment engine. It moves costs from one entity to another based on a cascade of assignments. The entities are:

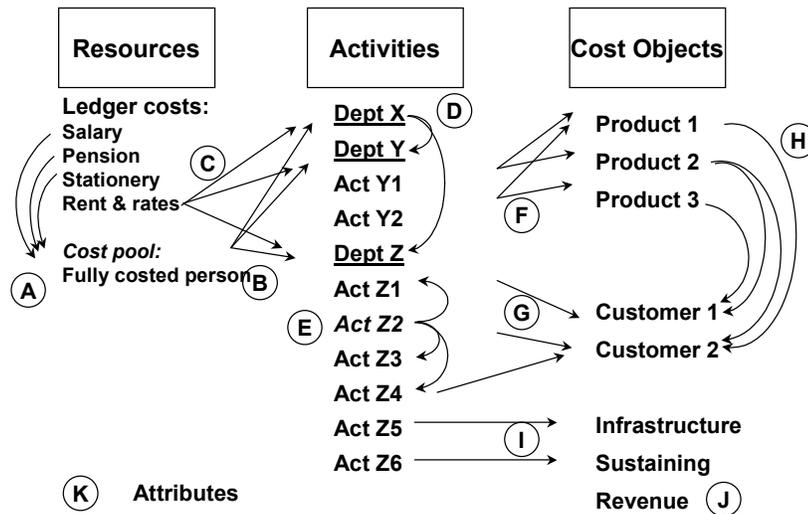
- Cost elements in the ledger; the resources so work can take place
- Functions, departments, sections and finally activities; where the work is done
- Cost objects; the products and services, channels of supply, and the customers, the reason work is done.

The logic is the cost drivers:

- Resource drivers to assign costs to functions, departments, sections or activities.
- Activity drivers that assign the costs of activities to other activities or to the costs objects

The term 'cost drivers' or just 'drivers' are often used generically and in this context are used to define the basis of the logic to move one cost from one entity to another. Depending on where you are in the model they could be specifically a resource driver or an activity driver.

Diagrammatically the cascade of assignments is in the figure below.



- A. Use Cost Pools to reduce complexity in the model. (consolidate a number of cost elements into a Fully-costed-person)
- B. Assign costs using resource drivers (fully-costed-person cost pool on the basis of numbers of people in each department)
- C. Assign costs using resource drivers (rent & rates on the basis of space used in each department)
- D. Assign an Internal Service department's costs to other departments using activity drivers (Training department on the basis of the numbers of people being trained in other departments)
- E. Assign some activities to other activities using activity drivers (Managing staff on the basis of the percentage of time staff spend on activities in the department)
- F. Assign activities (and direct costs) to products using activity drivers
- G. Assign activities to customers using activity drivers
- H. Assign products to customers
- I. Assign Infrastructure and Sustaining costs and activities to similar cost objects
- J. Add in the revenue by product and customer and so calculate profitability
- K. Use attributes to add further dimensions of analysis. The attributes can be added to resources, activities and cost objects. Attributes provide an easy mechanism to extract data from the model.

When planning the construction of a model it is wise to start with a schematic version drawn on paper showing the logic that will be used to assign resources to activities and activities to cost objects. Also, some thought should be given as to how each part of the model will be structured.

For resources, the structure will generally match the ledger. This is the source of all the costs and the main link to the company's ledger systems. However, if the model is going to consolidate cost elements from the ledger into cost pools, then the basis for this and any assumptions made concerning which cost elements are to be pooled should be clearly noted. At a later date, the assumptions may change, either in the interest of materiality or accuracy or because 'what-if?' scenarios are to be tested.

For activities, there are a number of considerations. The activities can be shown in the model grouped within departments and functions. This would match the organisation structure and current boundaries of cost centres shown in the accounts. If the company is keen to have the model show how activities and costs appear within processes, then rather than use process attributes for each activity, the structure of the model can be in processes and activities assigned to the processes.

As it is simpler to collect activity data by departments, rather than by multi-department processes, the model can have two stages. Firstly, resources are assigned to departments and the department costs assigned to their activities. Secondly, departmental activities are assigned to the processes. The activities now in processes would be assigned to the cost objects.

On the planning schematic the basis for assigning resources to departments should be shown. These are the resource drivers. For example, the driver could be square metres for accommodation costs although finding out the actual areas would be part of data collection. Again, any assumptions concerning the application of the drivers should be logged. Accommodation costs may be treated as one grand total to be assigned or it may be necessary to take the actual costs of each building where there are significant differences between types of buildings. In this case a two step process is used, firstly to assign costs to each building, then secondly to assign the building costs to the departments that occupy the buildings.

Prior to collecting activity data the planning schematic should show, for each department, the level of detail to be collected and whether attributes will be used and which ones. In some cases it might be expedient to consider creating a common activity dictionary, particularly where the same departments or sections are repeated at a number of locations. For example, a branch network in a number of geographic regions. Before collecting data it is prudent to test how representative the dictionary will be from a single branch before using it to collect data from all branches. Having a common dictionary is very useful where all the branches are to be compared in terms of use of time in relation to each branch's performance. This highlights where best practice might exist which can be implemented across all branches.

It is very easy to get swamped by activity data. The planning schematic should indicate where it is appropriate to collect activity data at a high level or at a detailed level. For the initial model whole departments in the Infrastructure and Sustaining categories would pass as single activities to Infrastructure and Sustaining cost objects. Internal Service departments could be represented as single activities if there will be single cost drivers to assign their costs to other departments.

Frontline activities are assigned to cost objects using activity drivers. The activities need only be collected down to a level where a single primary activity driver assigns the costs to the cost objects. Although an activity such as 'Visit customers' may have a number of sub activities that take place during a visit, if they are all triggered by the occurrence of a visit to a customer then adding all the sub activities to the model introduces unnecessary complexity.

For cost objects, the primary consideration is to set down on the planning schematic the final definitions of the destinations of all the costs in the model. These can be products, or channels or customers, and any combination of the three to any level of detail for which data exists. For example, a bank may want to calculate the profitability of customer segments, such as all those with mortgages, rather than go down to each customer's individual profitability. The latter may be a more important criterion for a Utility company that wishes to link customer profitability to data that highlights characteristics of customer behaviour from other sources found by their individual post-code.

For products, the cost objects could be individual contracts for large equipment, such as power generation sets, or it could be segments, such as generators within a particular power range. In a bakery, product cost objects could be by type, such as bread and cakes, or down to every single product.

For an Insurance company, the channels of supply could be important cost objects. The same product could be sold through the Direct Call-Centre channel as well as through brokers.

An important consideration at the planning stage is to define the sources of activity driver data. Much of the data will come from the company's current transaction files, such as the sales ledger. Other necessary data may be non-existent, such as logs of visits to customers. Knowing this at the planning stage allows more time for data creation in the areas where the driver volumes and proportions by cost object will be assigning significant costs through the model.

## The general ledger

In many companies the general ledger will have been around for a long time and probably in a form that does not lend itself readily to being the start point for an ABM model. The ledger will probably suffer from some or all of the following hindrances:

- the structure will not have been reviewed for years
- expense headings will have proliferated
- redundant codes will remain
- the discipline and accuracy of ledger entries may be poor
- cross-charging will be obscuring any valuable meaning
- managers will have a low level of ownership of the data posted to their cost centre

Although the ledger may satisfy the needs of financial accounting, it may be necessary to spend some time on cleaning up the ledger if it is to be used as a dependable source of data for an ABM model.

The key requirement is to be able to extract costs from the ledger in a way that facilitates making the links between the activities and the ledger costs.

## Categories of costs and activities

It is useful if the ABM model can be structured to recognise that all costs and activities fall into one of four categories. The categories help understand the nature of various costs and activities and how they need to be considered in the short and long term.

Some resources are devoted to **Frontline** activities, such as making parts or processing customer orders. These activities have a direct cause-and-effect relationship to the cost objects such as products, services, customers, or channels.

Some resources are devoted to **Internal Service** other parts of the business. Personnel and Training are a service to parts of the business and so have only an indirect link to the cost objects. The internal service costs and activities are re-assigned to the other categories of activities based on a secondary cost driver. For example, training could be re-assigned on the basis of the headcount of the other departments that receive training or the training hours devoted to each department.

Some resources are devoted to **Sustaining** the future, such as product development, and have no direct link to the cost objects. Sustaining costs should not be assigned to current products or customers when using the data to investigate customer profitability. Current customers have to generate an ABM Customer Contribution that can then be used to pay for sustaining costs. If the sustaining costs were assigned to current products and customers then either or both could become 'unprofitable' and dropped. However, the sustaining costs would still remain, as they had no cost driver link to products or customers.

Some resources are devoted to the **Legal entity**, such as running the business and are independent of business volumes. Statutory accounts, the annual audit, and producing health and safety policies would fall into this category. No cost drivers link to products or customers, and no secondary cost drivers link to any of the other activities. Current customers have to generate an ABM Customer Contribution that has to cover legal entity costs.

## Assigning costs from the general ledger

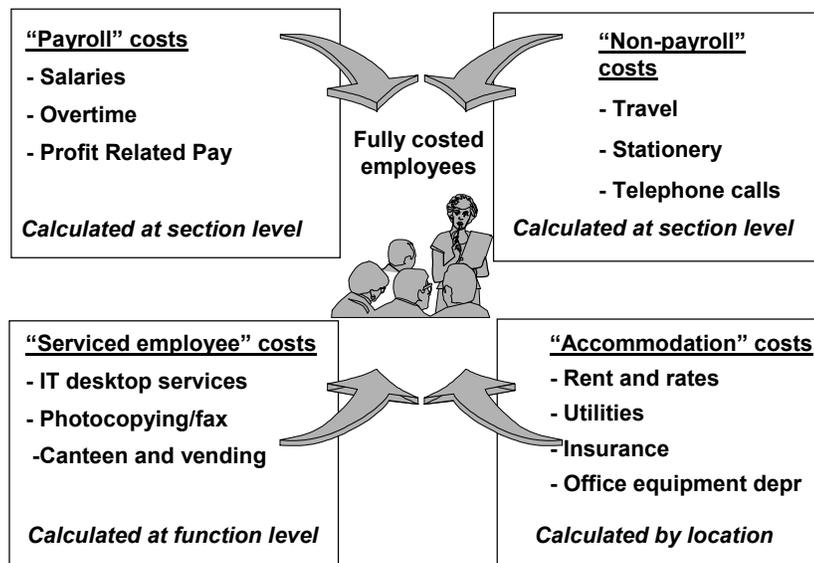
The general ledger is the source of all the costs that go into the ABM model. The first requirement is to ascertain if the figures shown in the ledger can be assigned with confidence to the degree of detail that is needed in the model. How the costs are reported in the ledger will determine how much work will have to be done to get the right costs into the departments prior to assigning them to activities.

A very simple ledger may only have the costs shown as expenditure types at the highest summary level, some of which are shown below.

Expenditure type	Amount
Payroll	£2 700 000
Travel	£119 000
Rent	£1 000 000

The first step would be to assign the total payroll costs to each department. A simple means would be to assign the total payroll based on the headcount in each department. Based on headcount, the department payroll costs would not be accurate, as each department would have different salary rates. Depending on the purpose of the model, this may or may not be a big problem. However, in most organisations the starting point is usually a ledger that has the numbers already broken down in some detail for such costs as payroll showing costs by functions and departments. The total payroll cost would then be accurate for each department, as it would be based on the actual salaries.

To reduce model complexity without loss of accuracy, ledger costs may be consolidated into 'cost pools'. A cost pool collects costs together that can be assigned to activities as a single cost element. Cost pools can be created at various organisational levels as shown in the figure below.



For 'Payroll' costs, rather than individually assigning the separate cost elements in the ledger of salaries, overtime and profit related pay to activities, a single cost pool for each organisational section could be created. The 'Serviced employee' cost pool makes more sense to be created at function level. This pool would be assigned to sections in the function based on headcount.

At the lowest organisational unit, say a section, a final cost pool of the 'Fully costed employee' would then be assigned to the individual activities in each section.

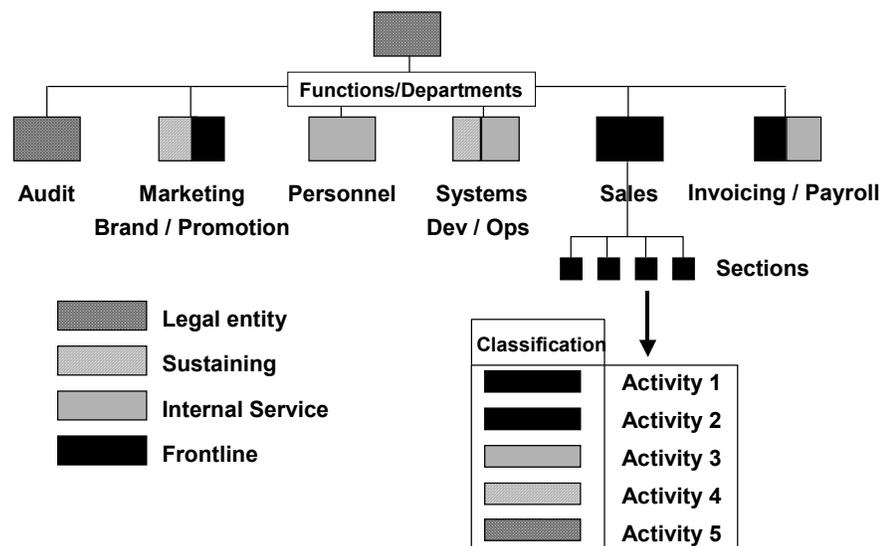
Where a Cost Centre manager cannot generally influence costs then these ledger lines may only appear at the highest level. Accommodation costs could be such an example. Rent could then be assigned to departments on the basis of area occupied.

A key issue when determining how to handle each type of cost in the ledger is its materiality. If the accommodation costs were small relative to other costs that were being assigned throughout the model then a broad calculation of the average costs for an area will suffice without incurring large distortions in the model. However, where there are real material differences in the type of buildings that are used by different departments then care must be taken to account for this in the model. A Pharmaceutical company may have a high-tech research facility, a processing factory, office blocks and warehouses. All of these will have quite different costs on a square metre basis.

A weighting could be used to reflect the degree to which the average area costs should be assigned to each department. A more detailed ledger may already have the actual costs shown for each building or occupying department.

A building can be made into a cost pool by bringing together such things as rent and rates, utilities, cleaning contracts, maintenance costs and so forth. The cost pool would be assigned to the occupying sections on an area or headcount basis and then assigned to activities.

The key to breaking down the ledger costs is to know how the resources and department data are to be used at the level of activity analysis. The categorisation of costs can be at function, department, section or activity level as shown in the figure below.



For example:

1. Marketing costs could be treated as a 'Total' as these could be considered as 'Sustaining' costs and would not be analysed at the activity level. However, Marketing expenditure may be in two parts, the Sustaining element of brand advertising and a specific promotion being assigning to the product being promoted.
2. Personnel costs can be treated as a 'Total' as these could be the 'Internal Service' costs and would be re-assigned to all other departments on, say, the basis of each department's headcount.

3. Finance costs could be broken down into:
  - 'Invoicing' would be a 'Frontline' customer related cost to be analysed at the activity level.
  - 'Payroll' which would be a 'Internal Service' cost and would be re-assigned to other departments on, say, headcount.
  - Both Sales and Operations costs would be broken down into more departments with some detailed sub-expenditure headings, and then analysed at the activity level.
  - 'Audit & Legal' would be treated as a 'Total' as this function would be a 'Legal entity' cost and would not be analysed at the activity level.

For a detailed analysis, the attributes of cost type can be used at the activity level. In this case, some activities in a Frontline section, such as Sales, could have a Sustaining activity such as 'Contribute to 5 year planning forecasts'. In the model the Sustaining activities would be assigned to a Sustaining cost object such as '5 year planning costs' which would collect activity costs from all sources that have something to do with this topic.

## **Understanding cost drivers**

The key to assigning costs throughout an ABM model is the use of resource and activity drivers. It is useful to think of cost drivers under four categories:

1. Volume cost drivers
2. Structural cost drivers
3. Change cost drivers
4. Introduction cost drivers

### *Volume cost drivers*

These are the familiar drivers of activity and are expressed in basic throughput terms. The activities could be driven by weight (tonnes of coal shovelled), volume (gallons of beer bottled), labour hours (machining aluminium castings), claims paid (in an insurance company), loans advanced (by a bank). Activities linked to volume cost drivers are generally known as 'direct' activities. This category is known well in manufacturing companies but can be used equally well in service industries.

### *Structural cost drivers*

Structural cost drivers uncover the segmentation that exists within the business, the root of complexity, and the cause of a high proportion of the costs.

They expose the impact of such things as the:

- Range of components
- Range of suppliers
- Range of product types
- Types of deliveries made
- Mix of order types
- Range of customers

If the cost of handling all these variants were subsumed in treating them as being directly linked to volumes of throughput, then the real cause and effect relationship would remain hidden.

## *Change cost drivers*

No organisations remain static for long periods. Change, of various sorts, drives many activities within a business. Two significant examples of change are:

1. The introduction of new products, or services
2. The 'churn' experienced by companies when old customers are 'changed' for new ones.

We will look at the characteristics of these 'change' cost drivers in turn.

If the standard cost of introducing a new component only considered the 'direct' costs of acquisition, then a significant number of activities remain buried in the general overheads. When a new component is created the stock management system will require updating, the stores will need to allocate additional stock locations, staff may need training to apply a different technique in assembly, quality assurance may need upgrading, special testing equipment may have to be leased, and so on. All these additional costs are a consequence of introducing the new component.

Externally driven churn arises when the market for a product or service is very competitive and customer loyalty is low. This can be exacerbated when competing companies encourage churn by offering inducements for companies to switch suppliers. The finance sector edged into this trap. The inducements cost money and the cost of customer churn increased.

Internally driven churn could be a factor such as staff turnover. People leave companies for many reasons. Each time it happens, a churn cost is created.

## *Introduction cost drivers*

Another type of cost is associated with the introduction of something, such as the activities of design and development. These costs would generally be classified as Sustaining but they have a very high leverage on the direct and frontline activities at a later time. Although the introduction costs may be small in relation to the main stream production costs, the introduction activities determine the level of main stream costs. Ongoing costs are designed into the product or service. A traditional approach to product or service development was to have a process that passed the work of one department over a 'high wall' into the next department. Multi-discipline parallel development, also involving suppliers, is now commonly found to create right-first-time designs, designed for production, developed in shorter lead times, to arrive at a lower designed-in cost.

## **Cost driver variability**

The relationship of a cost driver to the costs it drives is fundamental to ABM. Total costs divided by the volume of the driver provides the cost per unit cost driver. The assumption in this statement is that each occurrence of the driver creates the same amount of cost. In reality, this cannot be true in every case. The question is therefore one of assessing how appropriate the assumption is. If the actual measured costs of processing every single sale invoice were exactly the same then there would be no distribution curve to represent the cost profile.

By taking a number of samples of invoices we might find a flatter distribution or even two points to the curve. Where the data suggests that the average value may be misleading then it may be necessary to find a suitable segmentation of the data by having two activities instead of one and thus two cost drivers. In the case of sales invoices, this may be due to the different processes involved in dealing with two quite different types of customers.

The scale of the activity has to be taken into account when considering whether to split activities in relation to cost drivers. For a manufacturing company the set-up time could be a significant proportion of total machining time, so set-up time should be considered separately. This would be a cost driver that reflected the frequency that set-ups were required. However, set-ups may be component or product specific in the sense that the variability depends on the sequence that batches are run.

When should you take account of variability? The issue is again one of materiality. The balance is between complexity in the model and the credibility of the results from the model. For the model to be useful, and accepted by management as a decision making tool, then any variability of key cost drivers should be included. This usually results in activities being split down into smaller ones and separate cost drivers being found for each smaller activity.

## Activity data

The key factor to consider when collecting data is the purpose to which the ABM model is to be put. Data can be collected at various levels of detail as shown in the figure below.

<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>
<b>Summary level</b>	<b>Cost model</b>	<b>Process improvement</b>
(Process)	(Activities linked to drivers)	(Understanding the types of activities to improve processes)
<b>Key customer management</b>	<b>Customer maintenance</b>	<b>Administration</b>
		<b>Travelling</b>
		<b>Problem solving</b>
		<b>Analysis</b>
		<b>Reporting</b>
	<b>Prospecting for new customers</b>	<b>Research</b>
		<b>Planning</b>
		<b>Travelling</b>
		<b>Meetings</b>
		<b>Quotations</b>

Level 1: Costs grouped together for high level reporting, such as by function or process.

Level 2: Costs in the ABM model, where activities are at a level where one cost driver is linked to a particular activity.

Level 3: A level of detail whereby the type of activity can be examined with a view to improving a process.

For both levels 2 and 3 it is essential that the data be collected through face-to-face dialogue with the people doing the work. The data is then not only a truer reflection of what is actually happening, but it also creates ownership of the decisions resulting from the analysis of the data in the ABM model.

During the planning stage of building the model care should be taken to determine which functions, departments or sections will have which level of activity detail. Clearly, every section in an organisation can detail all its activities. However, in an Internal Service Department, such as Training, it may only be necessary to have an activity at level 1. However, if the Head of Training is particularly interested in knowing the unit cost of one of the activities such as 'Setting up a course' then more detailed activity and cost driver data can be collected in a later development of the model.

The risk with all model building is that it feels safer to collect detail on everything on the basis of not wanting to miss anything. ABM models are very flexible. If more detail would provide more valuable information then it can be collected at a later date. Starting by being buried in data can mean that no results ever appear.

## Assigning costs from the ledger to activities

Costs in the ledger shown by department have to be assigned to the activities in the department. Taking a simplified example, Salaries featured on the ledger of a company as actuals for each Department. Rent & rates were simply assigned to each department on the ledger on the basis of the area occupied by the department. The business only occupied one building.

The next step was to decide the basis by which costs were to be assigned to the activities in the department. For the cost elements of Salaries and Rent & Rates for the Call-Centre, the resource driver was determined to be Headcount. Percentage of time on each activity is the equivalent of Headcount.

Through interviews with supervisors and staff in the Call Centre, the activities and percentages of time were as shown in the figure below.

<b>Activity</b>	<b>Description</b>	<b>Use of time</b>
C1 Perform COTs	Change of tenancy details	25%
C2 Complaints	Handle customer complaints	10%
C3 Telephone reads	Customer rings in meter reading	55%
C4 Queries	Customer disagrees with bill	10%

Applying the resource driver volumes (Percentage of time) to the cost elements enabled the costs for each activity to be calculated in the model.

Once all the activities were in the database, each activity was given a process 'attribute'. Activities in all the other departments in the same process were given the same attribute so they could be brought together from the database. The activity 'C3 Telephone reads' is part of the 'Collections process'. Other activities from different departments featured the same 'Collections process' attribute, such as 'Read meters' in Field Services and 'Bank money' in the Cashiers Department.

When building an ABM model the planning stage is used to determine how costs on the ledger will be assigned to functions, departments, sections and activities.

### Re-assigning Internal Service department costs to other departments

In the example the Call Centre was a Frontline department. For an Internal Service department such as Training the costs from the ledger would only be assigned to the department and not onwards to its own activities, as the whole of Training would be re-assigned to other departments who receive training.

The model had already assigned ledger costs to the Training Department. These costs were re-assigned to other departments on the basis of the 'Headcount' in other Departments that received training. The training costs for a Department were then further re-assigned to the activities in the Department on the basis of the percentage of time on each activity.

So far, in this example, the methods to assign general ledger costs (the cost elements) to the activities have been straightforward. However, in most cases concerns about the assignment methods start to arise for many reasons to do with the complexities in the organisation.

Some examples of complexity are illustrated below.

Managers and supervisors costs may not be in the total staff costs for a department. In this case, if the managers and supervisors costs were a separate line on the ledger at departmental level then they can be treated as an Internal Service cost and are re-assigned over the frontline activities on the basis of percentage of time that staff spend on the activities.

We may only have total staff costs but members of staff who are paid a considerably different amount to people working on the most activities could perform a specialist activity in the department. For example, the more highly skilled staff who handle 'Queries' might be paid twice as much as colleagues in the same department. In this case we can use weighting to calculate the equivalent number of normal staff that the 'Query' staff represent. The new headcount equivalent percentage is then used to calculate any costs being assigned using the Headcount resource driver.

Sometimes we will find that an activity should be re-assigned to other activities to better reflect the influence of certain cost drivers. In this Electricity Supply Company example, the Meter Reading department had listed 'Travel' as a separate activity. After discussions with staff it made more sense to re-assign the travel to the reasons for travel, namely the activities of 'Read meters (normal)' and 'Read meters (emergency)'. The proportions of travel associated with the two other activities were found and used to re-assign the travel activity cost. The key cost drivers were then those that applied to the reading meter activities (number of customers requiring each type of service), rather than the number of miles travelled in total.

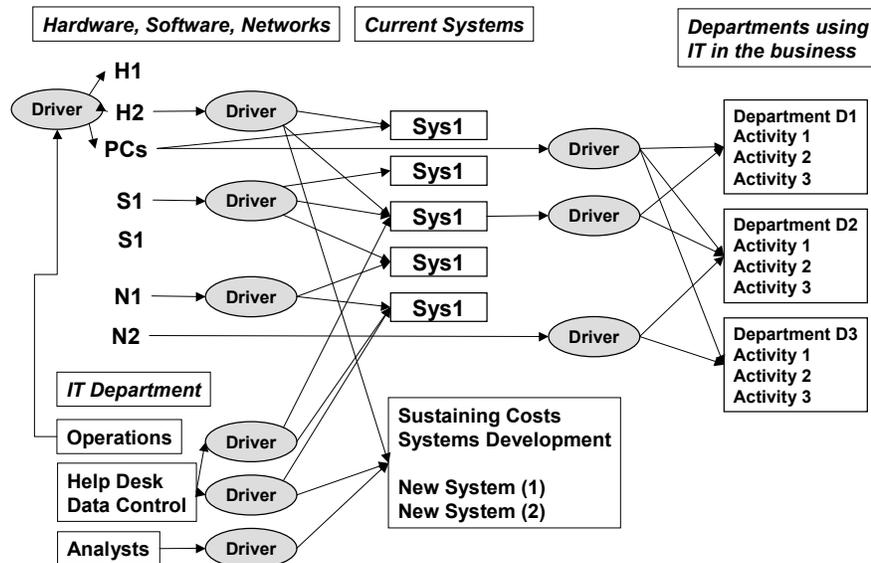
Certain costs, such as sub-contracted work for a particular customer are assigned directly to the final cost object (the customer) as there are no internal activities to allocate the cost to. This is similar to the way that direct materials are assigned to particular products.

Each organisation building an ABM model will find that many questions arise as the model progresses. There are few standard answers. However, you must always come back to the same overarching questions; what business issues is the model trying to address, is the cost in question material to the outputs from the model, has a reasonable balance been struck between credibility of the model and the model's complexity?

Whenever a discussion concerning the options around treating a cost has reached a conclusion the ABM team should employ a constant diligence and discipline to write down the arguments and final assumptions that are being used in the model. At a later date when an argument for using a different option is found to be superior then this should also be written up when the model construction is changed. One's own memory should not be trusted, even for a day. Also, when the model is periodically refreshed and updated it is virtually impossible to trace all the assumptions built into it purely by extrapolating from all the links between resources, activities and cost objects.

## Re-assigning IT department costs to other departments

Assigning the IT department's costs is a multi-stage process to ensure simplicity and clarity in the model. The IT department would have great difficulty trying to find out how much of their Operations Section's costs should be assigned to activities in other parts of the business. There are no obvious cost drivers that link the two. Similarly, departments using IT would have difficulty trying to assess what proportion of a Network's costs should be assigned to their activities. The multi-stage process is shown in the figure below.



The definable entities that link the IT department to the users of IT are the current systems being used. The first stage assigns the costs in the IT department to the systems. For example the Operations section's costs could be assigned to the hardware using the cost driver of the proportion of time spent in running the various types of hardware being used. The hardware costs (lease or depreciation) plus the Operations costs could be assigned to each system based on the proportion of time each piece of hardware is used to run the systems.

From the user's perspective, the activities using various systems are easy to identify. The System costs are then assigned to activities based on the activity times (or percentage of time, or headcount). In most cases this approach passes the test of materiality. Other approaches may claim greater accuracy but introduce greater complexity and make the model difficult to refresh and update.

Within the IT department there will be a level of systems development taking place. These costs are in the category of Sustaining; they are an investment to get a return in the future. Such costs are not assigned to current systems and therefore do not pass on to activities in the user departments. As well as the costs of the analysts and programmers working on developments, parts of the hardware, software and network costs would also be assigned to the Sustaining category. Reporting the Sustaining costs by each system being developed helps IT management track costs and benefits once a new system is introduced.

## Product and Customer profitability

The next step to complete a model is to assign the Frontline activities to the cost objects; the products, channels and customers. Activity drivers and their volumes have to be found that relate activities to the cost objects. For products there will be direct costs associated with the people costs where the cost driver would be, say 'Machining hours'. Other direct costs would be raw material, say 'Tonnes used', or the actual cost of bought-out parts. Indirect costs like Inspection or Machine Setting would have cost drivers based on, say 'Batches loaded'. Further away from direct manufacture other overhead activities such as Materials Handling require cost drivers that reflect the way the work is being done and how that work is associated with each product.

In the Service Sector the nature of the product may be harder to define. A product could be 'Bank Loans' or broken down into types of loans. For an Insurance company the product could be defined as all the costs and activities to set up a particular type of new policy on the system. Subsequent activities and processes to do with handling the customers' changes of address and other servicing costs could better be analysed through a customer dimension although such costs could also be brought within the product. The cost of claims on insurance policies would be interesting to analyse both as a product cost and a customer cost. The key is to decide on the issues to be analysed by the model during the planning stage and then to construct the model with the least complexity to provide the answers.

For an Electricity Company the notion of product is unusual. The product of electricity was associated with the tariff structure and related more to the costs of buying electricity from the Generators. The key product splits were between the tariff structures for Business Customers and Domestic customers. Within Domestic the key split was between the Standard Domestic Tariff and the Economy Tariffs for customers receiving a reduced rate for night time use through a special meter. Certain customer costs could be seen in the context of products, such as fitting special meters. However, the overhead costs in the business that directly related to products, such as the cost of the buyers, were very low in relation to the majority of costs that were associated with customers.

Customer profitability is generally the least understood within companies as the costs of dealing with customers, other than the Sales department, are largely lost within the normal accounts. Even where the Sales Department's costs are clearly known, allocating them on the basis of the sales value taken by each customer would lead to highly erroneous calculations of profitability.

In the ABM model the products (or services) that the customer is buying are assigned to customers as well as the costs and activities to service the customers. If, for example, the customers fell into three segments, X, Y and Z, then for the activity of 'Visit customers' the activity driver of 'Visits' needs the total volume of visits split between the three segments. The proportions of activity driver volumes determine how much of the activity cost is to be assigned to each of the cost objects.

Driver volumes are generally found from transaction files that already exist in the organisation. For example, the salesforce's log-sheets of how they used their time or the Sales ledger for number of customers by type. Where the data does not exist then a first approximation would be someone's best guess though it is always prudent to start some level of data recording for a representative period in order to have credible figures.

But what determines the customer segments to use as cost objects? Any parameters that are known about the customers can be used to create segments. The issue for each organisation undertaking ABM is to decide what will be the relevance of the data coming from the model and how would it be used to improve processes and customer mix. At the highest level the segment could just be 'All customers'. In our example company, the two major segments of Business customers and Domestic customers was a first split. Within Domestic they could be further split by geographic location, those in the North and South, or further down to individual Post Code District. The segmentation could be by the type of process they initiate in the business, such as the method used to pay bills, or it could be by the customers' behaviours, such as those that pay bills on time and those that don't.

For the Electricity Company a key issue to resolve concerned finding out which customers were profitable or unprofitable and why, then using this data to create an acquisition and retention strategy for profitable customers and not waste money on unprofitable customers. The latter segment could drift to competitors. However certain unprofitable segments were likely to stay customers so the extra processes they initiated had to become highly efficient. The ABM model thus had to provide the profitability of every single customer and then by using a range of attributes for each customer aggregate them into meaningful segments based on the sub-process they created in the business.

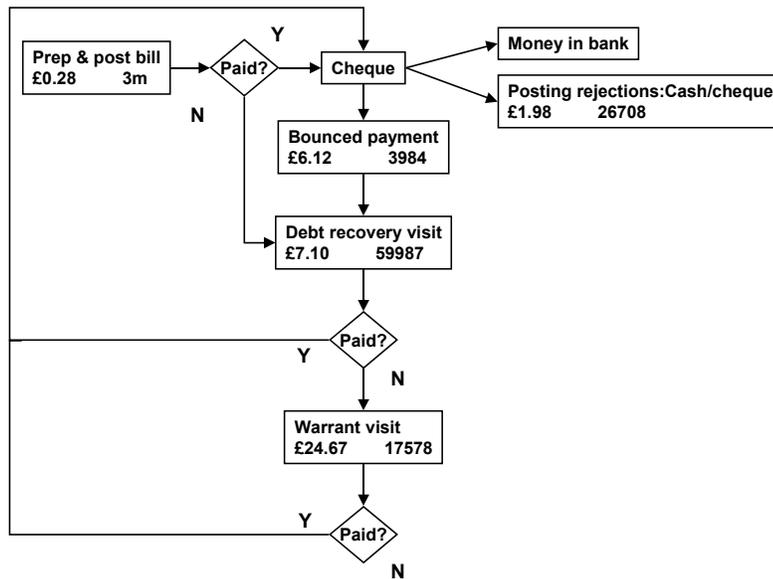
A segment could be 'All customers who pay by direct debit'. Another could be 'All customers that only pay when a final demand is issued'. For each customer so defined the ABM model provided all the costed activities that could be set against the revenue to determine customer profitability.

## Using unit costs for analysis

Unit costs, the total activity cost divided by the driver volume, are a powerful means to display the data. The costs of all the activities that could occur in the 'Bill creation' process, best and worst case, are shown in the figure below.

<b>Meter reading activities</b>	<b>Unit Cost</b>	<b>Cumulative process costs</b>	
		<b>Ideal</b>	<b>Worst case</b>
<b>Access on first visit</b>	<b>0.51</b>	<b>0.51</b>	
<b>No access on first visit</b>	<b>0.46</b>		<b>0.46</b>
<b>Access on second visit</b>	<b>1.98</b>		
<b>No access on second visit</b>	<b>1.65</b>		<b>1.38</b>
<b>Appointment</b>	<b>14.78</b>		<b>16.16</b>
<b>(evening or Saturday)</b>	<b>2.01</b>		<b>18.17</b>
<b>Compiling warrant, swearing in court</b>	<b>12.11</b>		<b>30.28</b>
<b>First Warrant Visit</b>	<b>24.67</b>		<b>54.95</b>
<b>Second Warrant Visit</b>	<b>24.67</b>		<b>79.62</b>
<b>Bill prepared &amp; posted to customer</b>	<b>0.28</b>	<b>0.79</b>	<b>79.90</b>

Clearly any customer that incurs the whole sequence of activities is very expensive to the business. The requirement is to uncover the population of customers that incur the various mixes of activities and then propose ways of changing the mix of customers or reduce the unit costs. In a typical core process such as Billing, unwanted activities occurred either created by certain customers (they failed to pay on time) or by internal process failures (Posting payments to wrong accounts). To make all the processes, unit costs and driver volumes visible an event chart can be drawn to display the ABM data. A simplified version of the 'Collections' process is shown in the figure below.



Management now had a simple means to formulate plans to address the issue of segments of customers that created unwanted costs in the business. The event chart can be used to track the impact of changing the customer mix over periods of time. Where there were significant process failures, actions could be put in place and the impact on unit and total costs tracked over time. To initiate process improvements, event charts were used to bring together representatives from the various departments that featured in the overall process.

Unit cost data also provided a means to benchmark parts of the process, either internally by comparing various geographic regions, or externally with comparable organisations or published best-practice data.

The unit cost data formed the basis for 'Better Budgeting'. By predicting a number of scenarios concerning customer attrition by customer segment as well as customer gain by segment, the new mix of customers could be fed back into the model and the new level of activities and then resources calculated. The power of the ABM data is that any number of what-if scenarios can be modelled quickly and related to other initiatives such as specific marketing campaigns with their associated costs. The predicted outcome and the actual outcome of a specific promotion can be monitored and the results used to refine the next campaign.

#### Key points.

- An ABM model is a large assignment engine. It moves costs from one entity to another based on a cascade of assignments.
- Cost drivers are used to define the basis of the logic to assign costs and activities. When planning the construction of a model it is wise to start with a schematic version drawn on paper showing the logic that will be used to assign resources to activities and activities to cost objects.
- Any assumptions concerning the application of the drivers should be logged as the basis may be challenged in the future and changed as a result. (eg start with average costs per square foot but change to actual costs for each building as a later refinement of the model)
- Activities can be shown in the model grouped within departments and functions. This would match the organisation structure and current boundaries of cost centres shown

in the accounts.

- Prior to collecting activity data the planning schematic should show, for each department, the level of detail to be collected and whether attributes will be used and which ones.
- An important consideration at the planning stage is to define the sources of activity driver data. Much of the data will come from the company's current transaction files, but other data may be non-existent. Knowing this at the planning stage allows more time for data creation in the areas where the driver volumes and proportions by cost object will be assigning significant costs through the model.
- A key issue when determining how to handle each type of cost in the ledger is its materiality. Agonising over how to assign a cost that is 0.01% of the total is not material to the outcome from the model.
- Volume Cost Drivers are expressed in basic throughput terms. eg gallons bottled, invoices processed.
- Structural Cost Drivers uncover the segmentation that exists within the business. eg range of components, suppliers, product types.
- Change Cost Drivers uncover how changes to the status quo impact the business. eg new product introduction, customer churn.
- Introduction Cost Drivers relate to the activities to do with the future. eg design and development.
- Cost Driver variability tests how strong a suspected pro-rata relationship exists between an activity and the chosen driver. Variability exists if it is found that more than one driver is acting on the activity. This usually results in activities being split down into smaller ones and separate cost drivers found for each smaller activity.
- Unit costs, the total activity cost divided by the driver volume, are a powerful means to display the data. Unit cost data also provides a means to benchmark parts of the process, either internally by comparing various geographic regions, or externally with comparable organisations or published best-practice data. Unit cost data forms the basis for 'Better Budgeting'.