

# Chapter 2

## Theoretical Consideration



### 2.1 Activity Based Costing

Activity Based Costing or ABC is an essential part of the functional process improvement and reengineering effort since it captures quantified cost and time data and translates this into decision information. ABC measures process and activity process and activity performance, determines the cost of business process outputs, and identifies opportunities to improve process efficiency and effectiveness. Qualitative evaluation and determination alone is totally inadequate as a single method of improvement since it does not contribute to other meaningful decisions such as what is cheaper and faster. It is the integration to these two dimensions that is the critical decision support element of the total process. In other words, ABC is the mechanism to integrate these two views.

ABC is a technique to quantitatively measure the cost and performance of activities, resources and cost objects, including when appropriate, overhead. It also captures organisational costs for the factors of production and administrative expenses and applies then to the defined activity structure. Although the method may be as rigorous as a definite mathematical distribution but ABC is a process of simplifying and clarifying decision.

Therefore ABC is a process of simplification, not complication and is a powerful tool for measuring business performance, determining the cost of business process outputs and as a means of identifying opportunities to improve business process effectiveness and efficiency.

#### 2.1.1 The use of ABC

ABC provides analysis information for consideration and evaluation of the processes of the organisation activity model. It is specifically intended to further the accomplishment of the objectives of the functional process improvement, which are to:

- Reconfigure the current organisation into an activity structure.

- Select an “as-is” process flow for review and improvement.
- Make radical changes to develop a “to-be” process flow for dramatic improvements in performance

ABC functions in this process and enhances the analysis of selected opportunities and alternatives by gathering and interpreting existing organisational costs and translating the cost data into the activity structure. It also provides a meaningful appraisal of the identified activity cost along several dimensions.

### **2.1.2 ABC Methodology**

The Department of Defense (DoD) of US (1995) stated the methodology of ABC has five steps as follows:

#### **1. Analyse Activities**

The first major step “Analysed Activities” in the ABC process is preparatory. It must be decided how large the activities scope will cover. Besides that, it must also determine whether a given activity is value or non-value added, primary or secondary which means whether that activity support the organisation’s mission or support the primary activities and required or discretionary which means whether the activities are those that are always performed or need to be allowed by operating management.

The name, “Activity Based Accounting”, implies that the managerial cost data cannot be applied until the activities are defined for the organisation model or the selected portion of the organisation under review by the project team. The creation of the activity model is not traditionally considered as an integral part of the activity accounting structure, but cost allocation cannot take place with it, hence it is the first step, and therefore, necessary knowledge to the activity account

#### **The Activity Model**

An activity model is a tool to assist in understanding and defining the organisation since it realigns the resources and managerial effort along the real functions of the organisation rather than the structure of the organisation elements. The basic modeling techniques for functional process improvement is IDEF0

for process modeling. While for the business rule or data modeling uses IDEF1X as the basic techniques.

### **Analysed Activity**

The first step defined in the ABC process is the activity "Analysed Activities". An activity which is identified in a process flow or activity model represents all of the effort that it takes to perform the identified task by subdividing into subordinate activities, which will enhance detailed understanding and further define the work done to complete this task.

The activity interacts with other activities in the process flow and activity model by processing inputs (materials or information) from other activities or outside the organisation and has outputs (products or information) which are used by other activities or the ultimate customer. While outputs are produced using resources (mechanism) within designated restrictions (controls and standards). Restated, "*An activity is the transformation of inputs into outputs performed by mechanisms under the constraints set by controls.*"

### **Developing the Activity Model**

In developing the activity model, the project team usually possesses subject area knowledge of the organisation or project area to be analysed model which normally doesn't include accountant unless that individual is otherwise a member of the project team. Through interviews with other subject matter experts within the organisation and from other available relevant materials, such as existing documents or results of previous Total Quality Management/Total Quality Leadership (TQM/TQL) project, the team's knowledge is augmented and validated.

Usually an accountant is not needed in the project area but it would be more efficient if he/she can participate as an observer or non-voting participant from the very beginning since it allows a full understanding of the model and many of the assumptions which were used in its construction. In the later stages of ABC when costs and costs drivers are under development for each of the activities, the innate understanding becomes very critical because it provides opportunities to ask for more complete definitions of terms and activities at the time they are created and serve as another set of eyes for the project team.

### **The Scope of the Activity Model**

After deciding to undertake a business or functional process review, the next step would be to decide to what extent the organisation will be affected since it is extremely critical to the ultimate success or failure and credibility of the ABC allocations. The application of costs to the activity model from the current organisational structure accounting system will be more uncomplicated and supportable if the activity model as a portion of the organisation become more comprehensive.

A narrowly defined project may make the allocation of costs nearly impossible or at least far more creative. However it is easier to reapply total costs when the entire organisation is involved due to the accounting systems that capture and assign resource costs to the total organisational structure. The total costs are a closed system when the whole organisation is included which allows increased control to ensure total allocation. On the other hand, it is more difficult to allocate overhead costs for the total organisation, when only a portion of the organisation is under review.

A full organisation or "enterprise" model is the best approach when there is time and capability within the team. Several particular advantages include:

- All missions and objectives of the organisation are considered for inclusion. Since there is a restricted definition of the project or a misunderstanding by the project team members, major components are not accidentally overlooked.
- The total model easily interfaces external inputs and outputs. Smaller projects often mistake the source of their inputs and do not detect a direct link to an external customer when the borders of the model are arbitrarily restricted.
- An all inclusive model allows total participation of the organisation's members. There is much to be gained and learned from a simple but properly constructed activity models, even when a team is not working on a particular section. This will contribute to acceptance in the later stages of a major reengineering effort.

- A single organisation activity model allows for more than one project team to be in operation at the same time without each constructing different perceptions of the organisation. The single model serves to keep all individual initiatives to be targeted into a coordinated plan.
- The model can serve as a guide for future projects, even if other teams will not be operation. The completed and validated model will act as a set of guideposts for future initiatives and projects without duplication of the previous effort.

If there is a total enterprise model from which to capture and assign costs, the entire ABC process becomes much easier for the activity accountant. In the later stages of the process, it will be clearly seen that overhead is the most difficult portions of cost to capture and distribute and it would become even more difficult when there is no basis for allocating costs (from the total organisation's accounting system) into a partial model. Many of these inefficiencies in the existing accounting system can be overcome if an all-encompassing strategy is in place for identifying and allocating from the total closed system.

## **2. Gather Cost Data**

The second major activity of the ABC process is "gather cost" which usually performed concurrently with the activity analysis step that result in reducing the program's total elapsed time. Gathering cost capture all relevant expenses that pertain to the selected model and processes which may cover capturing, constructing or synthesising the correct cost figures to support the costing of the activities.

### **Scope of Cost Data**

The scope of the activity model and processes under review will help defining the scope of the data required. For the partial model, it will be all direct costs for the selected activities plus some portion of the total overhead costs. It is important to apply professional judgement when selecting the data and the source to be used.

### **Objective**

Start from the lowest possible structural layer, the costs should be gathered and allocated within the organisation since having all of the costs as the lowest level greatly facilitates translation from the

organisation to the activity model. Costs are usually allocated based on interviews with managers on the functions and estimates become more reliable when managers are closer to the actual work. Therefore the objective is to align cost data at the lowest organisational element which will lead to less difficulty later when allocating costs in the activity model.

### **Credibility of the Cost Data**

Usually cost data is not perfect for ABC analysis and distribution. Traditional accounting systems are just not adequate and available cost data will have to be adjusted for change, corrected for undocumented element costs, or combined with different types of data from alternate sources which adds complexity to the process.

It is crucial to remember that the resultant cost of the activity model is not a "true" cost throughout the activity accounting process, rather it is a "representative" cost drawn from existing information. ABC costs serve as a basis for comparison and fairly represent the best approximate cost that can be determined. Therefore the data is credible for comparative analysis. Besides that, it must borne in mind that the costs assigned to activities and processes are the best professional estimates available and are intended to support comparative analysis.

### **Timing**

There are two basic points relating to timing of the data collection process that need to be considered:

- When to begin data collection: The gathering of the actual organisation costs can begin as soon as the scope of the activity model is determined.
- Amount of time that will be appropriate and sufficient for data collection: The best time frame to look for an appropriate and sufficient amount of data is the first previous full fiscal year and, when possible, the two previous full fiscal years.

### **Sources**

The major source of cost data would be the accounting records, but they are not the only source as there are lots of meaningful information available throughout the organisation including:

Accounting Records: There are various types of accounting records such as organisational accounting, budgetary account and traditional cost accounting.

Organisational Accounting: The organisational element accounting system will have direct costs associated with organisational elements. Overhead costs typically will be assigned to a single element within the organisation for control and payment which could be more than one elements. For indirect costs, it must undergo two translations, which are organisational structure and the organisational structure to activity model.

Budgetary Records: ABC can be used in the place of accounting direct costs. The indirect costs normally will be budgeted to a single location rather than divided.

Cost Accounting: The traditional cost accounting system will yield an abundance of usable data for example, the greatest benefit will be that indirect costs will be identified separately and are available for distribution into either cost centers or organisational elements.

Budgetary Records: There will be budgetary records maintained separately from the accounting systems.

Miscellaneous Records and Reports: Organisations will have various records and reports from past actions and initiatives which may be kept in the record workflow, specific costs or the usage of major pieces of equipment.

### **Categories**

For the activity model, there are multiple categories of costs that must be captured and identified. The objective of categorising is to obtain the best set of comparative and meaningful data available from existing data sources. The major categories of costs will be identified below:

Labor: Personnel cost is the most significant variable expense of the organisation which may be as much as 60-80% of the total organisation's costs. There are two data components of the labor force to be determined, number of employees and cost of labor. There are several factors to be taken into consideration when gathering the cost of labor as illustrated below:

- Salaries and Hourly Wages: The basic salary or yearly wages is the largest cost of the labor force. The actual amount of salaries from the accounting system is usually the best source. If for any reason this is skewed or cannot be subdivided, a standard payroll rate by grade and classification for the actual employee strength may be used.
- Pay Increases: This represents the best known cost for the period under consideration.
- Fringe Benefits: Fringe benefits are normally calculated as a percentage of the basic labor cost
- Overtime: Overtime must be analysed before it is used in the calculation. Overtime spent for emergencies and one-time events should not be included, since this will overstate the true cost of continuing operations.
- Vacancies: Unfilled positions of the past normally should not be taken into consideration since there will always be some positions in the organisation that are unencumbered.

Supplies: This kind of costs for supplies is normally easy to find, as it is one of the categories that management typically tries to keep under control. The only difficulty may be that the amounts are not divided down to the lowest level of the organisation.

Rental Equipment: This kind of expense is a variable expense that can be readily eliminated with organisational changes. If more than one element makes primary use of equipment, it will be allocated based on use.

Direct Materials: This kind of materials are used in the direct production of output and they are assigned to the organisational element which adds them to the process. These costs are simple to calculate but should not be confused with supplies.

Facilities: Depreciation could be the type of cost of facilities that are distributed since represents the cost of using the facility. However for the maintenance cost and cost of running the facilities are usually captured in overhead expenses.



Overhead Expenses: These types of cost include such as utilities, maintenance, security, etc., They must be identified for applicability and a relationship. Since many of the accounting systems used tend to consolidate these costs or pay them centrally, there are often problems with defining and documenting separate amounts by type.

### **3. Tracing Costs to Activities**

"Trace Costs to Activities" combines the first step "Analyse Activities" with the second step "Gather Costs." It brings together the results of analyzing activities with the gathered organisational inputs and costs and then produces total input cost for each activity. Organisational costs which were identified are divided within the organisation structure and then assigned to the activities. Despite it is a difficult mathematical formula but this meshing and allocation procedure will require the full measure of analytical skill and experience from the team members since they represents the best selection costs, decide the procedural priorities, and track appropriate organisational costs to every activity. Each activity will convert inputs that are the resulting costs that represented resources into outputs.

#### **General Data Flow**

The general flow of cost data from the organisation to the activities is done as a series of distributions, redistributions and allocations. Each organisational element costs that were identified must now be divided to the pertinent portions of the organisation and then allocated to the activity model. The entire flow can be broken into the following six phases below:

#### **Phase 1 - Identify organisation costs**

By using various sources from within the organisation, all the costs were identified and documented. This entire phase was accomplished in the second activity step, "Gather Costs."

#### **Phase 2 - Distribute organisational costs to the organisation structure**

The identified costs were divided up into the existing organisation structure which is already accomplished in the second activity step, "Gather Costs."

### **Phase 3 - Identify categories of organisational elements**

Usually in each organisational, its element serves one of three functions: managerial, support, or operational. Assignment or reassignment of cost depends on which category is selected which would allow distribution rules to be applied and costs reassigned to areas where ultimately they will be allocated in the activity. Each function will be described as below:

- **Managerial**: these elements serve as the leadership and coordination of the organisation. The contribution of the management personnel along with their small support staff does not go directly to the organisation's output so it must be distributed to the operational elements that do. In addition, operational and support elements also have managerial personnel within their elements.
- **Support**: This element does not contribute directly to the output but it performs important services that benefit the entire operation. These functions are important in order to smoothen internal operation which consist of elements such as: payroll, accounting, automatic data processing, etc. Therefore, costs for these internal requirements must be redistributed to the operational elements that they support.
- **Operational**: This element consists of ones that do the work of the organisation and contribute directly to the output which are usually referred to as the first-line or production at the lowest level of division on the organisation chart.

### **Phase 4 - Select the appropriate level of representative costs**

A critical decision must be made to select an appropriate tier of costs in the stage of allocation process. This decision defines the level of effort which will be made to capture and identify the organisational costs. Each tier includes a progressively greater percentage of the total costs which are:

- **Direct Cost**: Direct costs are the first tier that has an apparent relationship to the organisational element plus the allocated managerial costs. It does not include support costs and organisational overhead.

- Incremental costs: All of the costs of the first tier plus the support costs of the organisation become the second tier. This represents a larger portion of the total costs and a truer representation of the actual costs which include over ninety-five percent of the total organisational costs.
- Full costs: Full costs which is the third tier includes all of the organisation's costs which are direct, managerial, support, and general overhead. It has the capability of producing the approximate full cost of the output and all of the activities which is also misleading that this can be easily accomplished and still be a representative cost. This is the concept that would be employed to establish and maintain a fully functional activity-based accounting system rather than to capture costs for a project. Therefore, it is rarely used and is not recommended for functional process reengineering projects.

#### **Phase 5 - Redistribute organisation costs to operational elements**

For the cost distribution decision, some rationale will be selected which represents the relationship between the cost and the elements where the work is performed. The selected factor will be used to divide the pertinent cost and distribute the parts to the remaining organisational elements.

#### **Phase 6 - Allocate final distribution costs to the activity model**

There is no direct objective relationship between the activity model and the organisation structure that can be observed or measured since the division of the final organisation costs to the activity model is more of a subjective procedure. Therefore, the final distribution relies upon the judgement and knowledge of the operational element.

### **4. Establish Output Measures**

"Establish Output Measures", changes the focus from the macro-view to the detailed level – the activity. This step calculate the activity unit cost which each activity may have multiple outputs but only one output will be identified as the primary activity output. Up until this point, all effort has been aimed at interpreting existing structure and cost data into the newly created activity model. Now it is time to

examine the components of the activity and see how these pieces of information will be used as a source of improvement in the evaluation analysis.

Usually, while converting inputs to outputs, activities always consume resources. On the other hand, from the organisational view, outputs consume activities during their creation. Therefore, the matter at this point is how to measure the consumption of the activities that go into the outputs by considering two points:

- How much of the cost of an activity is used for a unit of output ?
- How much time, actual and elapsed does it takes for one unit of output ?

Direct answer of how many, how much, and how fast information needs of management and the ABC project team are served by activity or output which is ABC device. Since these output-activity relationships drive the cost of the activity during the creation of the output, they are also known as output drivers. Output measures display cost and time relationships of the individual activity and its output. Using these measures allows the cost and time requirements of output to be calculated and evaluated on an individual and comparative scale.

### **Creating The Output Measure**

Within a single activity model of any design, there will be a multitude of different types of output measures in order to form some sort of procedural control to ensure consistency and utility. Therefore, the determination of an activity output measure is an iterative process that must be repeated for each individual activity within the model. A standard approach is required to guarantee the compatibility of the process in order to ensure consistency from activity to activity. The following five-step approach is effective in extracting the key factors required:

#### **Step 1 - Analyse Activity Output and Performance**

This first step is a complete review of what the activity does and what it produces. The results will be information that can answer the following questions:

- What the activity output is

- How long it takes to produce the output

### **Step 2 - Select the Output Measures**

By using the analytical information from step, a decision on picking the output measures will be required. An ideal output measure is easy to understand, relatively simple to objectively measure, available from existing information sources, and directly related to the activity's output. It should also be economical and pragmatic.

### **Step 3 - Determine the Activity Output Costs Per Unit of Output**

In this step, it uses the amount of output measure that was selected in step 2 and the total cost of the activity that was calculated in previous parts of the ABC process. This is a mathematical calculation.

### **Step 4 - Determine the Time Requirements**

Information was gathered on the amount of time required to create one unit of output during the analysis in step 1. This data should have been captured and recorded in two parts : the first part is the amount of actual time, and the second part is the total elapsed time to complete one unit of output including all of the normal time delays.

### **Step 5 - Document the Output Measures**

For the validation of the reengineering project, every step taken and decision made should be documented. The documentation for output measures should include at a minimum:

- The identification of the activity
- The output-definition and measurement criteria
- Procedures used to determine cost per unit of output
- Actual and elapsed time measures - how they were measured and validated
- Any special information or considerations - additional data that may be important to an evaluation

## 5. Analyse Costs Data

This is the final step that uses the calculated activity unit costs and bills of activity to identify candidate improvements to the business processes. "Analyse Costs" is the culmination of all measurements and calculations that have occurred. As mentioned before, in this stage, the activity model and process flows, in conjunction with its cost and time measurements, will be reviewed and analysed in depth to determine the candidates for improvement that are the hallmark of the functional process review methodology. This step is relatively open-ended with undefined specifics, but will yield results equal in proportion to the amount of effort applied.

### **Identification of Change Opportunities**

The identification process begins when the activity model is constructed. The objective of the Functional Process Improvement methodology is improving the processes and activities. There is no set pattern or procedure for finding or discovering change opportunities therefore it is an entirely creative process.

In selecting possible change opportunities, there are two basic areas available for review. The first is the activity model and the second is the process flow. The ABC process has collected and stratified several bits of information about the activities in the activity model which can now be applied to both. Below is a list of the characteristics which are now available for review.

### **The Activity Model**

- Total cost of the activity - The sum of all mechanisms employed within the activity to produce output.
- Cost driver - The measure of activity output which quantifies what is produced.
- Elapsed time - The total amount of time it takes to produce one unit of output to include all normal delays.
- Cycle time - The actual time it takes to produce one unit of output not including any normal delays.

### **The Process Flow**

- Total cost of the process - The sum of all the activities employed to complete the process.
- Cost of output - The sum of all the cost driver determined costs applied to the output as it passes through the activities.
- Total elapsed time of the process - The sum of the elapsed times of the activities in the process flow.
- Total cycle time of the process - The sum of the actual times of the activities in the process flow.

### **Tools for Review Process**

- Pareto Analysis
- Benchmarking
- Best Practices
- Value Added Analysis
- Comparative Analysis
- Cost Benefit Analysis
- Economic Analysis
- Functional Economic Analysis (FEA)
- Structured Approach to Analyzing Costs
- The Bottom Line

## **2.2 Activity Modeling**

IDEF or Integrated definition methods are a structured approach to enterprise modeling and analysis. They are used to perform modeling activities in support of enterprise integration.

The original IDEF methods were developed for the purpose of enhancing communication among people who needed to decide how their existing systems were to be integrated which was the result of the U.S. Airforce Program for Integrated Computer Aided Manufacturing (ICAM). The aim of the ICAM program was to increase manufacturing productivity through the systematic application of computer technology.

There are six variants of the IDEF methodology, which were defined for specific purpose as following:

IDEF0 – Function Modeling Method. It is designed to allow the description of a system's functions through the process of function decomposition and categorisation of the relations between functions.

IDEF1 – Information Modeling Method. It is designed to allow the description of the information that an organisation deems important to manage to accomplish its objectives.

IDEF3 – Process Flow & Object State Description Capture Method. It is developed to support the structuring of descriptions of the user view of the system.

IDEF5 – Ontology Description Capture Method. It is developed to serve as a method for fact collection and knowledge acquisition.

IDEF1X – Data Modeling Design Method. It is developed to assist in the design of semantic data model.

IDEF4 – Object-Oriented Design Method. It is developed to address the need for a design method to assist in the production of quality designs for object-oriented implementations.

## **IDEF0**

IDEF0 is one of the most widely known tools for functional modeling. It is a top-down hierarchical method, which provides a description of functions and processes in manufacturing.

IDEF0 models are made up of three distinct components, which are diagrams, text and glossary all cross-referenced to each other. Each diagram represents activities in a pictorial form and is the most important element of any IDEF0 model. The codes that are used for graphical representation are ICOM (input, control, output, and mechanism) and each diagram can be decomposed indefinitely, depending



on the level of detail intended. For each diagram, there are supporting text, designed not repeat information presented in the diagram but rather to annotate and elucidate. Then, a glossary is provided to ensure that the terminology used is meaningful across functional and organisational boundaries. The typical figure of IDEF0 is shown in Figure 2-1.

As IDEF0 is a top-down approach, it is a very appropriate tool for the visualization of complex systems and so provides a structured representation of the functions, information and objects which are interrelated in a manufacturing system.

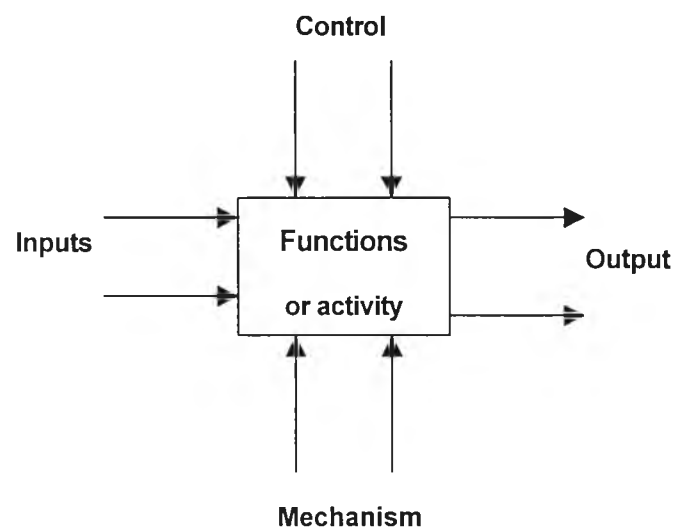


Figure 2-1: Typical IDEF0 model

### IDEF0 model

Inputs and Controls are objects or data required performing an activity as following:

- Controls trigger an activity or modify an activities behavior represents by an arrow enter the box from the topside.
- Inputs are objects or data that are transformed by the activity represent by an arrow enter the box from the left-hand side.
- All activities must have at least one control arrow but may not necessarily have an input arrow.

Objects and data resulting from an activity are outputs and are represented by an arrow leaving the right-hand side of the box. The mechanism by which an activity is performed, is represented by an arrow enter at the bottom of a box.

### Determining Activity Costs Using IDEF0

As mention in the beginning of this chapter, there are five major steps that must be performed as a part of ABC. These steps are generally performed by the core team, a small group of people working full time on the program which can take anywhere form a few days to a few weeks.

The diagram below illustrates the five steps in the node tree, as shown in Figure 2-2.

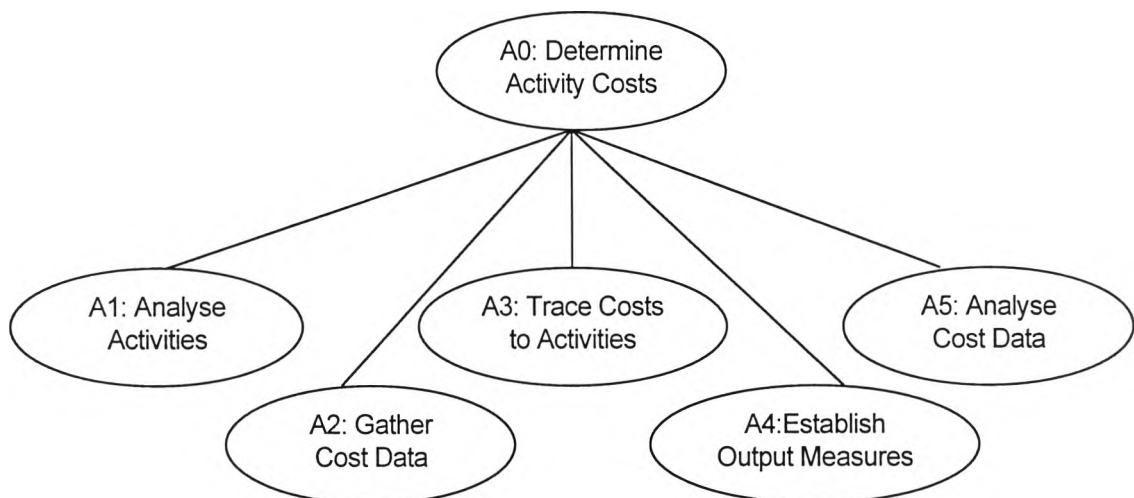


Figure 2-2: Node tree of determine activity costs (Source: Department of Defense of US, 1993)

### Refining IDEF0 Activities for use in ABC

An IDEF0 activity is in a refined state for use in ABC analysis when:

- It acts on at least one input or one initiating or triggering control
- It consumes the resources, or factors or production, supplied by at lease one input or one mechanism

- It produces at least one output therefore when an activity produces more than one output, only one output must be declared as primary activity output with all others being byproducts.
- When selecting the primary activity output, it will be the output whose variability is most directly proportional to the variability of its factors or production.
- The primary activity output is measurable and each unit of output has equal intensity. That is to say for any given time period each unit consumes from its cost pool the same amount of cost in the same proportional to cost elements.

## **2.3 Cost Reduction and Process Improvement**

Wiersema (1995) described that the activity based costing and activity based management are able to uncover inefficiencies by showing how resources are consumed. This allows us to understand what cause cost. The key to identifying inefficiency and showing hidden cost is to show the relationships between cost and their causes. There are two categories of inefficiencies As follows:

- Excessive resources consumption or workload is higher than warranted by output.
- Capacity mismatched with workload.

Wiersema (1995) also explained the reduction of workload and action for reducing workload as follows:

### **2.3.1 Reduction of workload**

The key to cutting cost and attaining efficiency is to decrease consumption of resource by reducing the quantity or cost of activity driver. There are two opportunities of cost reduction as follows:

1. Excessive number of activity drivers to produce a given output.
2. Excessive cost per unit of activity driver.

### **2.3.2 Action for Reducing Workload**

There are 17 action ideas for reducing workload as follows:

1. Analyse activity
2. Target output
3. Eliminate duplication
4. Remove downtime
5. Break system constraints
6. Match activities with resources
7. Centralize activities
8. Capture customer costs
9. Eradicate rework
10. Monitor quality cost
11. Recognize carrying costs
12. Truncate unnecessary handling
13. Track marketing and advertising
14. Attain lot-level efficiencies
15. Avoid over-automating
16. Focus on scrap
17. Investigate shrinkage

Turney (1991) explained the cost reduction in the activity based way and activity based improvement as follows:

### **2.3.3 Cost Reduction in Activity Based Way**

Turney (1991) said, "cost reduction is best achieved by changing the way activities are used or performed (managing the activities first), then redeploying the resources freed by the improvement."

There are five guidelines to reduce cost the activity based way:

1. Reduce the time or effort required to perform an activity
2. Eliminate unnecessary activities
3. Select low-cost activities
4. Share activities whenever possible
5. Redeploy unused resources

### **2.3.4 Activity Based Improvement**

Turney (1991) recommended three steps to improving activity performance as follows:

1. Analyse activities – to identify opportunities for improvement
  - Identify non-essential activities
  - Analyse significant activities
  - Compare activities to the best pictures
  - Examine the links between activities
2. Dig for drivers – look for factors that cause waste (cost driver)
3. Measure what matters – measure the things – time, quality, etc.
  - Determine the mission
  - Communicate the objectives
  - Develop the measure

### 2.3.5 Streamlining the Process

Harrington (1991) explained streamlining that it is the fundamental concept of improving the business process. It identifies the methods that create positive change in effectiveness, efficiency, and adaptability. There are 12 basic tool of streamlining that will allow us to make the initial changes to the process as follows:

1. Bureaucracy elimination – removing unnecessary administrative task, approvals, and paperwork.
2. Duplication elimination – removing identical activities that are performed at different parts of the process.
3. Value-added assessment – evaluating every activity in the business process to determine its contribution to meeting customer requirements.
4. Simplification – Reducing the complexity of the process.
5. Process cycle-time reduction – Determining ways to compress cycle time to meet or exceed customer expectations and minimise storage cost.
6. Error proofing – Making it difficult to do the activity incorrectly.
7. Upgrading – Making effective use of capital equipment and the working environment to improve overall performance.
8. Simple language – Reducing the complexity of the way we write and talk, making the documents easy to comprehend by all whom use them.
9. Standardisation – Selecting a single way of doing an activity and having all employees do the activity that way all the time.
10. Supplier partnerships – The overall performance of any process improves when its suppliers' input improves.

11. Bid picture improvement – this technique is used when the first 10 streamlining tools have not provided the desired results.
12. Automation and/or mechanization – Applying tools, equipment, and computers to boring, routine activities to free up employees to do more creative activities.

## **2.4 Literature survey**

Department of Defense of US (1993) described the ABC study of the Fort Sill Department of Public Works as follows:

One of the DOD's ABC projects was conducted at the Fort Sill Department of Public Works (DPW). The DPW's objective was to set its fees at a competitive level. Therefore, it must understand the overhead content of its business process costs and improve its business processes in a cost-effective manner.

The project scope was set for all DPW business functions and those of the co-located Directorate of Contracting, in sufficient depth to include both primary and supporting activities at the branch level of the organisation. The DPW's organisation comprised of 700 people. Two hundred of these people worked in the various craft shops, doing skilled trade. One hundred and seventy five people work in the billeting function doing housekeeping and related services. Three hundred people worked for support activities of the DPW and were the major focus of this project.

The basic approach used in this project involved four basic steps:

1. Determine the activities performed, and express them as a set of baseline (AS-IS) IDEF models.
2. Determine the proportionate effort used and resources consumed by each of the primary activities. If the primary activities comprise less than 80% of the total expenditures, examine secondary activities and allocate their costs in some consistent, reasonable and auditable way to the primary activities, until at least 80% of the total expenditures are accounted for.

3. Calculate business process costs as the sum of their non-overlapping component primary activity costs, and analyse these results for effectiveness and efficiency by comparing the measured outputs (performance measures) produced by the business process to the cost of producing them.
4. Generate alternative ways of producing the same or higher level of desirable outputs at a lower unit cost, by eliminating non-value added components or simplifying and consolidating business processes. Use the same modeling and cost analysis approach for evaluating recommended alternatives.

Before implementing the ABC concept, the unit cost was calculated as a cost per square foot for the various type of building. For example, a unit cost for maintenance and repair training building is \$0.1347 per square foot. When the ABC concept was conducted on the basis of interview results, the unit cost was calculated as the activity based unit costs for the major business process. Labor costs were determined by asking each interviewee to estimate the percentage of time spent on the separate activities comprising the interviewee's job. Non-personnel costs were first apportioned to organisational units at the branch level using three basic techniques. Directly attributable material, equipment, and rental costs were assigned in full to the individual branch using them. Utility costs were allocated based on the square footage occupied by the branch. Information processing costs were allocated based on the number of network terminals used by the branch.

The result of the study shows the activity based unit costs, for example, the unit cost of placing a service order into a craft shop foreman's hands underlying on the 'Prepare a Service Order' was \$2.40, the unit cost of approval/disapproval work order request was \$58.0. In addition, the DPW can assess the value added or non value-added activities. Non value-added activities are anything other than the minimum amount of time and resources necessary to produce the desired quantity of output, and can be eliminated without impairing the quality, timeliness, or mission effectiveness of the desired outputs. Therefore, eliminating the non value-added activities is one of the effective ways to reduce unit cost. The others are simplification and consolidation of value added activities.