Developing OIS Cost Function Curves

1. **Activity-Based Costing (ABC) Data:** As described**,** while not well understood in industry, **OIS** cost function curves can be developed from ABC data. This has the significant advantage of requiring less time and cost than the three traditional techniques described below. For details, see the article "Enterprise Master Plan: Next Generation Planning with Activity-Based Costing" *Journal of Corporate Accounting and Finance*, May/June, 2014, Wiley, Miller et al

2. **Traditional methods for developing OIS cost function curves, from OIS User Manual**
   a. Accounting Approach
   The most popular approach to facility data preparation is based on a detailed analysis of historical cost accounting records. The basic idea is to assemble all relevant cost accounting records, remove extraneous information, ensure comparability, separate fixed and variable costs, perform consistency checks, and prepare final model inputs. If you choose the accounting approach, we recommend that you follow the step-by-step procedure outlined below.
   Step Action
   1 Identify all accounts that contain facility operating costs.
   2 Obtain historical data for each account identified in Step 1 for each facility active during the base period of the study.
   3 Identify and remove from each account any costs that are not related to facility operations.
   4 Carefully study reporting standards and practices by facility location. Attempt to identify discrepancies that would yield misleading results. The basic idea is to ensure later *apples-to-apples* comparisons across facilities.
   5 Identify and *temporarily* remove cost differences between facilities which are due to regional influences (for example, labor and utility rate differentials).You may wish to use the Regional Cost Indices included in IEO to facilitate this effort. This is done to ease Steps 6-8.
   6 Separate facilities by generic type and mission. For example, distribution centers should, at a minimum, be segregated into owned, leased, and public categories. Use additional subdivisions as required to account for important operating differences: dry vs. refrigerated, bulk vs. bin, etc. Review the discussion of noncomparable facilities, as necessary.
   7 Analyze carefully the results from Step 6 for consistency across facilities. *Within* a given facility type, perform ratio tests such as those described earlier. If discrepancies are present, you must attempt to explain them.
   Remember that you have already accounted for extraneous costs (Step 3), reporting practice inconsistencies (Step 4), regional influences (Step 5), and mission differences (Step 6). If discrepancies persist, then you are likely faced with the

delicate (and potentially explosive) matter of managerial and/or labor force performance deficiencies. Unless you have *compelling* evidence to suggest that such problems are *inherent*, we recommend that you do not represent them in your model. Choose a representative set of costs and ignore substandard operating practices. From a strategic point of view, such variances should not be the basis for a network redesign.

8 Categorize each account as either fixed or variable. (Refer to our earlier definitions of fixed and variable costs, if necessary.) This step will almost certainly involve some judgment calls on your part.

9 Reintroduce regional differences removed at Step 5.

10 Prepare final inputs for your model.

b. Statistical Analysis Approach

One of the most difficult challenges that you must face when analyzing historical facility costs is the segregation of accounts into fixed and variable categories. The statistical approach circumvents this problem because it is completely independent of the nature of individual cost accounts. The basic idea is to derive a mathematical function that best describes the observed relationship between total cost and facility volume. The statistical technique that you will normally use is single variable linear regression.

The statistical approach to facility data preparation is summarized next:

Step Action

1-7 Follow steps 1-7 from Accounting Approach, earlier.

8 Perform regression analysis of total facility costs (dependent variable) and volume (independent variable).

Interpret resulting equation coefficients as follows:

y-intercept: fixed cost

slope: variable costs

9-10 Follow steps 9-10 from Accounting Approach.

These cost coefficients probably will bear little resemblance to those you derive via the accounting

approach. Nevertheless, if the equation fits observed historical data reasonably well, it is equally valid.

Furthermore, you are relieved of the difficult task of attempting to classify accounts as fixed or variable.

Rather, you are simply asserting that the total cost function for a given facility type behaves in a

predictable, justifiable way; the underlying components of total cost are unimportant to the solver.

c. Engineering Approach

Suitable historical facility operating costs may not be obtainable from your accounting records. Even if they are available, you may be unwilling to use them as the basis for your analysis for several reasons, including

a. base period that contains abnormal events such as strikes or national disasters;
b. reporting discrepancies that are so severe they cannot be reconciled, and
c. missing information from one or more facilities

In such instances, you may conclude that standard costs should be used instead of accounting data. If your firm has recently built, or plans soon to build a new manufacturing or distribution center facility, it is virtually certain that the planning phase involved detailed estimates of facility operating costs. Assuming that the facility size specified in the analysis represents those you wish to evaluate, you can incorporate these values in your IEO model. Alternatively, you can commission special studies to develop such estimates.

Following is the recommended step-by-step procedure:

Step Action

1 Obtain engineering cost estimates for each facility type to be evaluated.

2 Identify and *temporarily* remove regional influences built into the estimates (for example, labor and utility rate differentials). You may wish to use the Regional Cost Indices to facilitate this effort. You should perform this step even though you will almost immediately reintroduce such factors in Step 4. Remember that most engineering studies are confined to few sites. If you wish to use this data to evaluate a larger number of candidates, then the *base* cost estimates must be region neutral.

3 Ensure that your standard costs are divided into fixed and variable components. Obtain the assistance of the engineering design group responsible for the estimates, if required, to perform the required segregation.