CBRE Business Analytics

BENCHMARKING AND BEYOND

Whitepaper

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Global Workplace Services

BENCHMARKING AND BEYOND

Evaluating the facility costs of a real estate portfolio is one of the more difficult challenges faced by corporate real estate (CRE) executives today.[1] Large corporate occupiers must address a collection of cost-related issues, including how to:

- Comparatively rank one's facility cost performance with peers;
- Advocate for a budget sufficient to maintain asset productivity and value;
- Gain a detailed view of costs by building, asset type, or budget category;
- Identify specific and actionable targets for savings or additional investment;
- Anticipate long-range capital requirements;
- Understand the cost impact of changes to service levels, sourcing, and the macroeconomic environment.

In CRE, the typical approach to these issues is a "benchmarking" exercise in which conclusions are drawn from a survey of similar facilities. Provided by many industry sources, survey results provide an intuitive and compelling point of reference. Yet such benchmarks (e.g. the operating cost per square foot of a two-story office building in Denver) have a fundamental limitation. Surveys tell us what *was spent* rather than what *should have been spent*. This is not a subtle distinction. Inadequate funding has left many facilities in disrepair and operating at low levels of service; conversely, inefficiencies in actual operations mask potential savings opportunities. Surveys represent prevailing practices among peers, which are not necessarily the *right* practices.

The purpose of this paper is to present benchmarking in the context of other approaches for estimating and validating facility costs. These include:

1. Formula Budgeting
2. Delphi Method
3. Benchmark Surveys
4. Lifecycle Modeling
5. Simulation Models

Each of these approaches is described in terms of their scope, strengths and weaknesses, and cost of implementation. We conclude with a summary of the applicability of each approach to common issues, and offer suggestions to guide the implementation of comparative facility cost studies.

[1] For the purposes of this report, "facility costs" are those costs typically attributed to facility operation, including M&R and recapitalization. Any costs related to the productive activity within the building are not included.

FIVE APPROACHES FOR ESTIMATING FACILITY COSTS

1. Formula Budgeting

Popularized by Walter Kraft in the 1950's, the Formula approach applies a single rate, typically derived from the historical costs of a building(s), to estimate future cost.[2] The Kraft formula for the M&R budget of buildings was 1.7% of replacement value, a rate used throughout the real estate industry during the 1980's. More generally, any historical facility costs (M&R, custodial, energy, etc.) could be reduced to such a rate and applied for near term forecasts. This is also known as *straight-line budgeting*.

The Formula approach provides a defensible summary of actual spending that is easily understood and requires little input data. This simple method works best when limited to short term projections for a geographically fixed portfolio of assets. Its use is less appropriate when applied to different portfolios or building types that do not share the same geographic distribution or asset type composition.

M&R = 1.7% of PRV for buildings without air conditioning

Single rate, based on historical experience

Definition	■ Single rate based on historical experience
Scope	■ Often extended to all O&M expenses
Pros	■ Simple ■ Stable ■ Objective
Cons	■ Oversimplified (e.g. no capex oscillations) ■ Inflexible (constant across use types) ■ Reflects historic spending rather than best practice
Good For	■ Short-term budgeting easily understood and requiring little input data (plant replacement value)
Use Caution If	■ Making comparisons across institutions or locations; budgeting for individual buildings; plant replacement values are incomplete or poorly defined.

[2] The term "Formula Budgeting" is described in a 1980 APPA publication, *Formula Budgeting: an Approach to Facilities Funding* by David McClintock.

2. Delphi Method

Also developed in the 1950's, the Delphi method entails a group of experts who, through some form of discourse, achieves an expert consensus on a complex issue. Regarding facility costs, perhaps the most noted Delphic exercise was conducted by the National Research Council (1990). Here, a group of distinguished facility experts determined that annual M&R portfolio funding for buildings should fall between 2 to 4 percent of plant replacement value. This range provides a bounded estimate that has been broadly accepted and is consistent with most anecdotal experience (the Kraft rate cited earlier is a clear exception). The Delphic approach could arguably be adopted by any CRE organization with its own facility experts.

The method is compelling in its simplicity and minimal data requirements; however, when employed without an experienced facilitator or a statistical analyst to validate conclusions, the utility of the approach is limited. It simply lacks the credibility of historical data or statistical validation.

A single rate or range prescribed by experts based on personal opinion

Definition	■ A single rate or range prescribed by experts based on personal opinion
Scope	■ Past focus has been on M&R; could be extended to other O&M categories
Pros	■ Simple ■ Stable ■ Little input data required
Cons	■ Requires facilitation and statistical validation ■ Inflexible ■ Subjective; no actual data or stated assumptions
Good For	■ Summary of a well-studied building or portfolio, as with the formula approach
Use Caution If	■ Rate is expressed as a broad range, but is applied to a specific building, portfolio, or location with which there is less familiarity

3. Benchmark Surveys

Benchmark surveys are the most common facility cost approach utilized by CRE organizations today. Building owners have been asked about their financial experience at least since the 1920s. With Benchmarking, an average (or median) cost or range of costs is derived from surveys of similar organizations and are typically used for competitive ranking and comparative cost analysis.

Actual cost data received from end users is usually more persuasive than simple rates based on ad-hoc historical data or personal insight, and the fact that the information is drawn from a specific industry or asset class makes the Benchmark approach even more compelling. Some of the more prominent industry groups that publish Benchmarking surveys include IFMA, BOMA, APPA, and IREM, though similar studies are done by many other groups.

The advantages of the Benchmark survey are the transparency of the process, the objectivity in the calculation of the results, and the statistical validation possible (if not always acted upon). A disadvantage of the approach is that surveys tell us what *was spent*, rather than what *should have been spent*. The result of using an M&R cost benchmark derived from a sample of organizations that underfunds maintenance is to institutionalize underfunding and increase deferred maintenance.

A rate or range based on a survey of end users

Definition	■ A rate or range based on the survey of end users
Scope	■ Often extended to all expenses
Pros	■ Based on actual experience
Cons	■ Based on past experience reflecting prevailing practice ■ Power of analogy is limited to similar assets ■ Self-selecting sample
Good For	■ Generalizing from survey results to facilities that share the same characteristics for comparative purposes
Use Caution If	■ Rate is applied to a specific building type, age or location not reflected in the sample ■ Best practice is defined exclusively by benchmark results

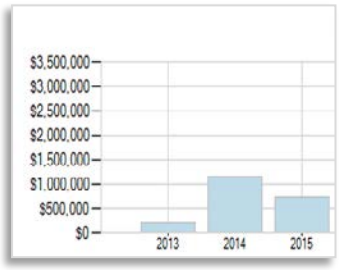
4. Lifecycle Modeling

A Lifecycle model generates a schedule of capital requirements based on the service life of facility systems and their replacement costs. With the Lifecycle method, knowing a building's age allows one to approximate the schedule of capital requirements over a prescribed investment period.

In 1981, Biedenweg and Hutson developed a Lifecycle model that was seen as an advance over flat rate approaches that do not identify the actual oscillation that occur in capital needs.[3] It was also the first prescriptive model, specifying what *should be* spent.

Despite its conceptual advances, the Lifecycle model has been criticized for oversimplifying building systems (roofing, plumbing, HVAC, etc.), and for overstating replacement costs. For example, the entire plumbing system is unlikely to be replaced in its entirety at age 50, nor are entire HVAC systems replaced at age 15. In reality, major building systems consist of many components, some of which are never replaced or are rebuilt at a cost lower than full replacement. Nevertheless, the Lifecycle model in modified forms continues to be used by well-known facility inspection firms.

Lifecycle modeling also requires additional data—building age, replacement costs and service lives of building systems – that may not be readily available for certain buildings.



Forecast based on the lifetime of facility systems and their replacement costs

Definition	■ Forecast based on facility system replacement values and simple replacement cycles
Scope	■ Typically limited to capital expenditures
Pros	■ Incorporates age ■ Objective ■ Proxy for costly inspections ■ Prescriptive rather than descriptive (should spend rather than did spend)
Cons	■ Limited scope ■ More data inputs than earlier methods (replacement values required)
Good For	■ Simple approximation of capital replacements over time
Use Caution If	■ Used to represent entire M&R budgets ■ Applied to individual components

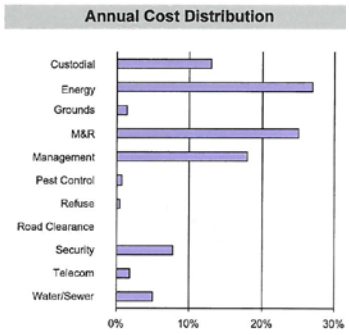
[3] *Before the Roof Caves In: A Predictive Model for Physical Plant Renewal*, Stanford University 1981

5. Simulation Models

A simulation model provides cost forecasts with a level of detail and flexibility not provided by earlier approaches. To provide a complete view of O&M costs, an elaborate library of data is required, including individual building components, repair schedules, domestic and international trade labor rates, service-related commodities and utilities, operations levels of service, geographic location and climate, among others. Only in the last ten years has this data become available, and only in the same period of time has computing power developed to efficiently process it. The ability to alter the values of any input data allows CRE management to simulate current and future facility costs under any number of scenarios.

One such system is COSTLAB, developed by CBRE | Business Analytics. Capable of forecasting costs for the entire facility chart of accounts, its algorithms estimate repair and replacements requirements in a manner similar to the Lifecycle model, but at a much finer level of detail (individual building component). Other costs are estimated based on attributes of the building or demand loads generated by occupants.

The key advantages of simulation models are their transparency. Their statistical behaviour can be described by Monte Carlo analysis and their accuracy determined through controlled comparisons with actual cost experience. Such a study for a client with a large (7 million square feet) technical campus, found simulation estimates to be within 6 percent of actual costs. One potential drawback of simulation models is the detailed component level data necessary for each building. Missing data can be addressed either through traditional building condition assessments or – a more cost effective approach – by using typical component lists derived from buildings of similar size and use type.



Forecast of multiple outcomes based on variable inputs and sophisticated algorithms

Definition	■ Forecast of multiple outcomes based on variable inputs and sophisticated algorithms
Scope	■ All O&M expenses, staffing, risk exposure, others
Pros	■ Flexibility to alter assumptions, add building types, locations ■ Objective based on industry specs and standards ■ Prescriptive rather than descriptive
Cons	■ Model data intensive ■ Computationally complex
Good For	■ Approximating deferred maintenance and estimating future operating costs at all levels of detail (component, building, portfolio, organization) ■ "What if" analysis
Use Caution If	■ Default assumptions are used as inputs for actual facilities

SUMMARY AND SUGGESTIONS

In the beginning of this paper, we identified a variety of common issues related to CRE facility costs. We went on to discuss five of the typical approaches to predicting and validating facility costs. Cross referencing the issues to methods provides a guide to the applicability of each approach.

Facility Cost Issue	Formula Budgeting	Delphi Method	Benchmark Surveys	Lifecycle modeling	Simulation Models
Comparatively ranking among peers (actual spending)			■		
Advocating for sufficient budget	■	■	■	■	■
Gaining a detailed view of operating expense costs			■		■
Identifying specific targets for savings			■		■
Anticipating capital requirements				■	■
"What if" impacts of changes to service levels, location, etc.					■

Finally, we note that selecting an appropriate methodology is only the first step in conducting an effective facility cost study. Based on our experience, we offer a number of suggestions.

Ensure "apples to apples" comparisons. Regardless of the choice of approach, it is critical that the scope of the method is the same as the scope of the study. With the Benchmark approach, questions used in surveys should be consistent with survey respondents' chart of accounts. For example, at most facilities, M&R expenditures are divided among annual operating budgets (usually preventive maintenance and smaller repair tasks) and projects funded from capital accounts (major repairs and renovations). Yet surveys we have reviewed do not make this distinction clearly, either focusing exclusively on operating expenses, or being worded so vaguely that it is not clear that respondents have considered capitalized costs.

Consider using a number of approaches. Comparison of the outcomes of different approaches can increase the credability of study findings. For example, in an analysis of the U.S. market for commercial M&R services, we found the predicted value of $210 billion (simulation) fell roughly in the center of the 2 to 4 percent range (of replacement value) identified by the National Research Council (Delphi).

Balance precision with your study budget. An expensive project may not be necessary to provide a reasonable answer to a facility cost question. As an example, a large multi-campus university required a simple way to justify operating budgets, but without the cost of collecting detailed data for thousands of buildings. For this client, we provided detailed forecasts for representative buildings for major asset classes, and then simplified these to simple cost per square foot ratios. We developed a similar approach for over 400 asset classes for a large public landholder.[4] This provided a defensible estimate of the M&R budget for almost 500 thousand buildings and other structures by referencing a simple table of rates.

[4]Called "unit sustainment costs" at https://www.wbdg.org/ccb/DOD/UFC/ufc_3_701_01.pdf

Document technical assumptions. The findings of any study should be suspect in the absence of a discussion of the key assumptions and limits of the methodology employed. When possible, report measures of accuracy and variability. This should be straightforward for benchmark surveys. For simulation models, the sensitivity of estimates to alternative data assumptions should be noted, particularly when statistical evaluations such as Monte Carlo Analyses are available. For simple funding formulas and delphi opinions, measures of accuracy might be derived by comparison with actual historical costs.