

Snapshot Benchmarking in the Operation and Maintenance of Constructed Facilities

Jake Smithwick, Ph.D., M.P.A. and Justin Dodd
University of North Carolina at Charlotte
Charlotte, NC

Kristen Hurtado, M.S.
Arizona State University
Tempe, AZ

Benchmarking is a commonly used practice in many business sectors. However, its adoption in construction and facility management has been limited. At its core, performance benchmarking measures correspond with the owner's strategic goals, are a team-oriented process requiring support from many different partners, and must be capable of being acted upon. While many measures typically consider "hard" data (such as financial or technical information), there has been minimal work done in the integration of customer satisfaction with the typical facility benchmarks. This paper summarizes the best practices for benchmarking and their application to the AEC and facility management industry. The researchers also conducted a pilot benchmark snapshot survey of 285 facility managers. The purpose of this pilot study was to explore several new benchmarking metrics, such as customer satisfaction, and to capture data on cost range information that will be used to develop ranges for an upcoming comprehensive benchmarking study. The survey collected data on the respondent's demographic profile (location, job title / role, and educational attainment), as well as cost and customer satisfaction in the areas of janitorial, utilities, and maintenance. The researchers found that facility managers with larger buildings typically had lower satisfaction with the organization's energy management and conservation efforts.

Key Words: benchmarking, performance, facility management, O&M costs, customer satisfaction

Introduction

Benchmarking is both a tool and process that has grown from isolated use in ground-breaking companies to that of widespread application in business. Its origin comes from the work of Robert C. Camp at Xerox who developed the process to seek out continual improvement (Camp, 1989). Its use has become a process designed to identify and emulate the best practices of comparable companies that excel in their individual fields. However, incorporation of benchmarking into the Architectural, Engineering, and Construction field has not seen as quick of an adoption of these practices as other industries.

The identification of current best practices in benchmarking for construction and facility management will need to incorporate the best practices utilized by other fields, while adapting them to fit their individual needs. Best practices cannot simply be transferred and imposed, but must be adapted to individual organizations (Bhutta, K.S. & Huq, F. 1999: Fibuch et al., 2013). Using Spendolini's (1992) approach, the researchers identify benchmarking best practices (identify benchmarks, create a benchmarking team, solicit partners, collect and analyze the data, and take action) over the course of the benchmarking process, and their application to the AEC / facility management fields. This paper also presents summary results of a pilot benchmarking study of 285 facility managers and service providers. The purpose of this pilot study was to explore several new benchmarking metrics, such as

customer satisfaction, and to capture data on cost range information. The results will be used to develop a future benchmarking effort to update the Operations and Maintenance Benchmarks survey from IFMA (IFMA, 2009).

Literature Review

Benchmark Identification

An essential aspect of best practices for facility benchmarking is the identification of the business needs of the facilities being managed. Benchmarking is superficial unless it is rooted in what is needed, rather than what is easy to acquire. That is, benchmarking should result in measures that are actionable, which are linked to strategic business planning, company goals, and objectives (Stauffer, 2003: IFMA, 2014, Camp, 1989). Part of the process of identifying needs is the realization that improvements can be made and compared to the best in class processes of similar buildings (Stauffer, 2003).

Customer Satisfaction

A growing trend in construction and facility management is the adoption of customer satisfaction as metric for measuring facility performance, and especially those measures which incorporate human factors (Simões et al., 2011). Maintenance decisions tend to come to the optimal solution using heuristics that are supported with qualitative and quantitative assessment data (Kumar et al., 2013). The goal of performance management is to produce a better product rooted in the needs of the users and customers. Often, it is suggested that the entire benchmarking process should be approached from the customer's point of view from the onset (Stauffer, 2003).

While the industry has traditionally used hard Key Performance Indicators (KPIs) for some time, soft KPIs (or subjective measures) are becoming more frequently tracked. Soft KPIs, such as customer satisfaction have been found to be one of the major contributing factors towards project success (Kärnä, S. & Junnonen, J., 2016). Research into the validity of subjective and objective measures suggests that both have an equivalent construct validity and thus should be used as a means of performance measurement (Wall et al., 2004). Several studies have examined the role of customer satisfaction in relation to maintenance services and strategy in facility management. User satisfaction was found to negatively correlate with office maintenance downtime variance in a survey of facility management professionals (Au-Yong, Ali, & Ahmad, 2015). End user satisfaction was also found to correlate with proactive maintenance and negatively correlate with corrective/breakdown maintenance (Rani, Baharum, Akbar, & Nawawi, 2015). Tucker & Pitt (2010) suggest that FM performance management should develop a mixed –model utilizing both qualitative data pertaining to customer perceptions of FM service, as well as quantitative data such as customer satisfaction. In the context of facility management, satisfaction can both be tracked for their customers, as well as for the FM professionals themselves.

Form a Benchmarking Team and Identify Benchmark Partners

It is necessary to employ proper participative mechanisms to ensure that the benchmarking process will ultimately lead to increased performance for company objectives (Au-Yong et al., 2015). Senior leaders and management must be involved in the process for the benchmarking efforts to truly be effective (Camp, 1989). All staff impacted by the benchmarking should be brought into the fold in

some manner to ensure their investment in the process. The purpose of the benchmarking and the goals should be disseminated among the participants and motivational or engagement techniques such as incentives will help to ensure that the benchmarking is recorded and undertaken for accuracy, resulting in better performance of the building (Stauffer, 2003, Camp, 1989).

Collect and Analyze Benchmarking Information

The frequency of data collection for benchmarking purposes should be carefully considered. Collecting data too frequently can result in unnecessary work that may detract from other primary functions of the staff involved. On the other hand, collecting data too infrequently can result in a lack of commitment from managing staff. A quarterly sampling of data is generally considered to be ideal (Stauffer, 2003). It is also important to only collect that data that is essential to the identified needs of the organization. Knowledge of a benchmarking system combined with a user-friendly environment for the computing of benchmarking is also essential to ensure a valuable analysis (IFMA, 2014).

Utility data tend to vary tremendously across regions and types of facilities. Instead, successful energy benchmarking then should focus on energy consumption to eliminate the variance caused by energy rates, as well as taking into account weather normalization (Padavano, 2004). Variables such as age of facility, floor area, type of facility, and region of the facility, can have tremendous impacts on building energy consumption and so these factors must be compared only across similar facilities. Even seemingly minor differences, such as type of student in an educational facility, have been shown to have a significant different pattern of energy consumption (Hong, Paterson, Mumovic, & Steadman, 2014). The potential inaccuracies of using specific numbers or averages have been noted in the literature in relation to their forecasting potential. One such method for overcoming the inaccuracies posed by this means of data collection is to collect data on ranges of values rather than exact numbers. Utilization of the mid-point method and interval computing has resulted in greater accuracy for forecasting than traditional methods (He & Hu, 2009).

When conducting benchmarking surveys, use of measures to ensure consistency of responses, such as a glossary of terms may be invaluable in ensuring equivalent measures and terminology across individual survey responses (Stauffer, 2003). The International Facility Management Association (IFMA) recommends that external benchmarking efforts be conducted on equivalent buildings for validity of the comparative interpretation. It should also be noted that the benchmarking process of identifying the best in class performers is itself subject to selection bias (IFMA, 2014). When utilizing industry data for benchmarking, there is the tendency for poor performers and failures to be excluded from analysis as businesses fail and the industry matures. Proper benchmarking should also include these failures or poor performers to avoid the tendency of this data to be skewed positively over time. If those numbers are unavailable, certain statistical assumptions can be made and tests performed to ensure a more accurate interpretation of the data (Denrell, 2005).

Take Action

"The primary objective of benchmarking is to take action" (Spendolini, 1992, p.181). The path for change can only be identified once equivalent comparisons have been made and the best practices identified in the best-in-class performers. Identification of this performance gap and the steps necessary to improve performance are critical for taking action and achieving organizational change. Spendolini's (1992) action plan consists of the following activities:

1. Produce a benchmarking report/summary
2. Present findings to benchmarking customers
3. Communicate findings to both internal and external functions
4. Look for opportunities in product/process improvement, organizational learning, or in forming functional networks.
5. Encourage recycling efforts such as recommendations for process improvement or benchmarking metrics (p. 183)

Benchmarking must be actionable if it is to be an effective tool for organizational change. It is the company participating in the benchmarking survey that must ultimately be responsible for taking action on the identified best practices and processes that will help them achieve their performance goals. Though Spendolini generally regarded this stage of the benchmarking process as the most straight forward and easy to conduct, there exists little literature on the exact methods that companies are utilizing to incorporate the change and take action (Spendolini, 1992).

Research Objectives

The purpose of this research was to develop a pilot benchmarking study in preparation for a comprehensive benchmarking study designed to recreate and update IFMA's 2009 Operations and Maintenance Benchmarks report (IFMA, 2009). This pilot study was designed to include updated benchmarks based upon literature and to develop range values for cost information to be used in the follow up survey. The primary objective of this survey was to develop a snapshot portfolio for key operations and maintenance (O&M) functions; overall FM satisfaction levels; and various demographic data. Specifically, the researchers analyzed:

1. The respondents' overall demographic profile (location, education level, and role).
2. The respondents' estimated annual costs and satisfaction for their janitorial, utilities, and maintenance contracts.
3. Impacts of building age and interior area (square footage) and janitorial satisfaction and energy management satisfaction.

The snapshot nature of this current survey and its distribution at a conference required brevity. This precluded full implementation of benchmarking measures suggested by the literature review such as obtaining both quantitative and qualitative data related to satisfaction, as well as incorporating measure related to identifying methods for acting on the survey results. These topics will be addressed in the follow up comprehensive survey. The benchmarking process as used in this study is summarized in Figure 1.

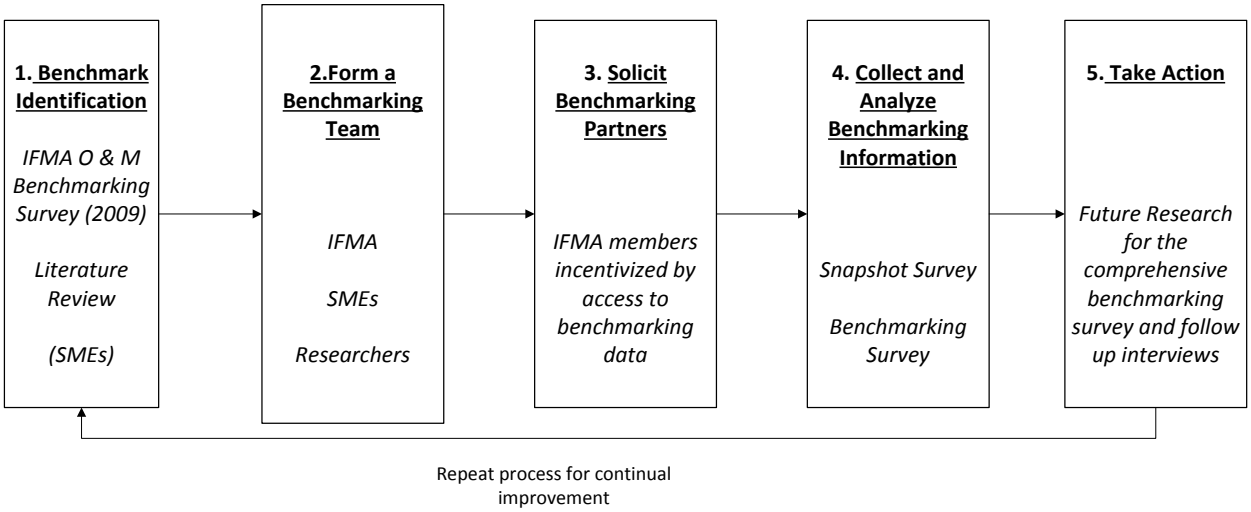

Figure 1: The Benchmarking Process followed for development of a formal benchmarking survey

Method

The researchers solicited feedback from a group of twelve subject matter experts (SMEs) on the survey's development over a period of three months prior to an October 2016 conference of facility managers. The benchmarking organization snapshot survey was passed out during a luncheon meeting at the conference. Ten surveys and pencils were stacked on each table, as well as the overflow chairs in the rear of the conference hall. In total, approximately 1,200 surveys were distributed. The surveys were printed on double sided (one sheet total) lime green heavier stock paper, as to draw the attention of the attendees. Completed surveys were left on the tables, and were collected by the research team after the luncheon.

The survey consisted of four primary sections. The first section (1) collected selected demographics and background information (of the respondent and the buildings they manage), including their role / job title, the number of buildings they manage, level of education, and number of years of professional experience. Next, the respondent was asked to answer questions about the largest and most active building they manage. The second section (2) asked the respondent to provide the estimated annual cost of janitorial services for their most active building as well as their overall satisfaction on a 1-5 scale (Very dissatisfied to Very satisfied). Similarly, the third section (3) asked about the respondent's estimated annual utility cost for their most active as well as satisfaction with their organization's energy management / conservation efforts. The final section (4) asked about the respondent's estimated annual maintenance cost and what type of maintenance are most their expenses are used for (preventive, reactive, or predictive).

The completed surveys were manually entered into MS Excel. A total of 285 surveys were completed, representing a response rate of about 24 percent. 81 percent of the respondents identified as a "Facility Manager", 15% identified as a "Services Provider", and the remaining 4 percent identified as "Other".

Results and Data Analysis

In the following section, the researchers present the key findings of the survey responses.

Demographics and Background Information

Respondents to the survey reported on facilities dispersed throughout the continental United States. 81 percent of the respondents identified as a "Facility Manager", 15 percent identified as a "Services Provider", and the remaining 4 percent identified as "Other". 37 percent of the respondents reported having obtained a Bachelor's degree and 33 reported having obtained a Master's degree. Approximately 24 percent reported having obtained an Associate's degree or some college education, and the remaining respondents reported being either high school graduates or having obtained a PhD. On average, the respondents reported that they manage about 54 buildings (*SD* = 135 buildings). Most of the respondents (93 percent) were located in the United States. Other countries of respondents include Canada, South Africa, Malaysia, Hong Kong, and Australia.

Figures 2 – 4 present data on the respondent's largest and most active building with regards to janitorial, utility, and maintenance costs, as well as satisfaction.

Janitorial Costs and Performance Satisfaction

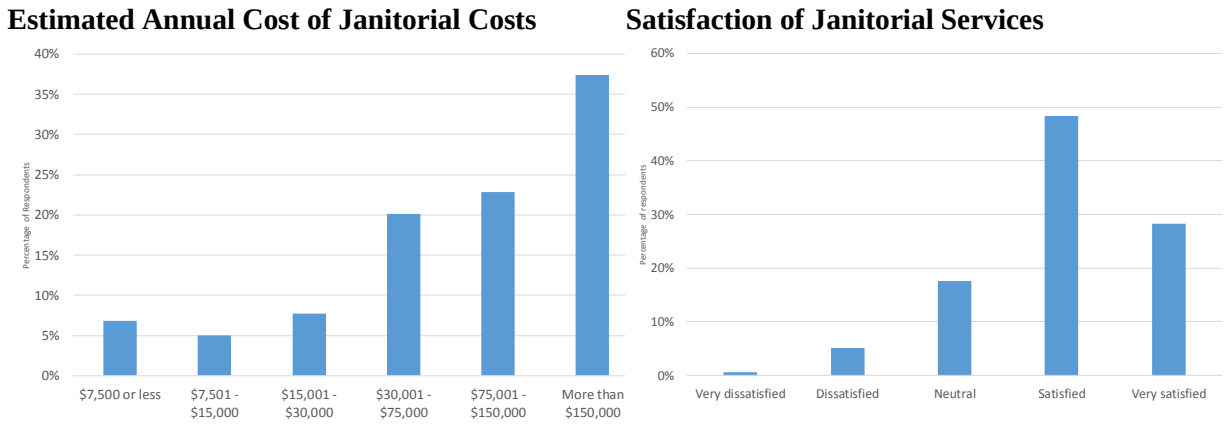

Figure 2. Annual Janitorial Cost and Satisfaction

Utility Costs and Energy Management Efforts Satisfaction

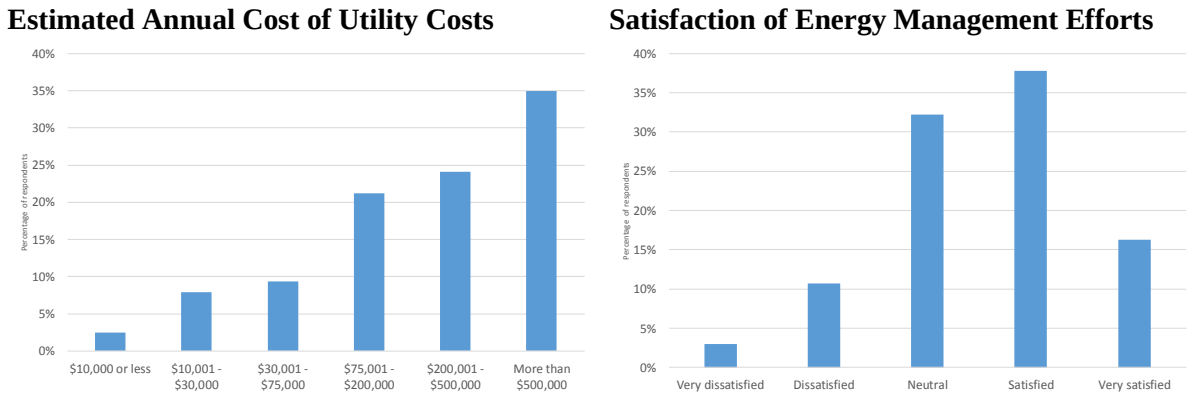

Figure 3. Annual Utilities Cost and Energy Management Satisfaction

Maintenance Costs and Typical Expense Allocation

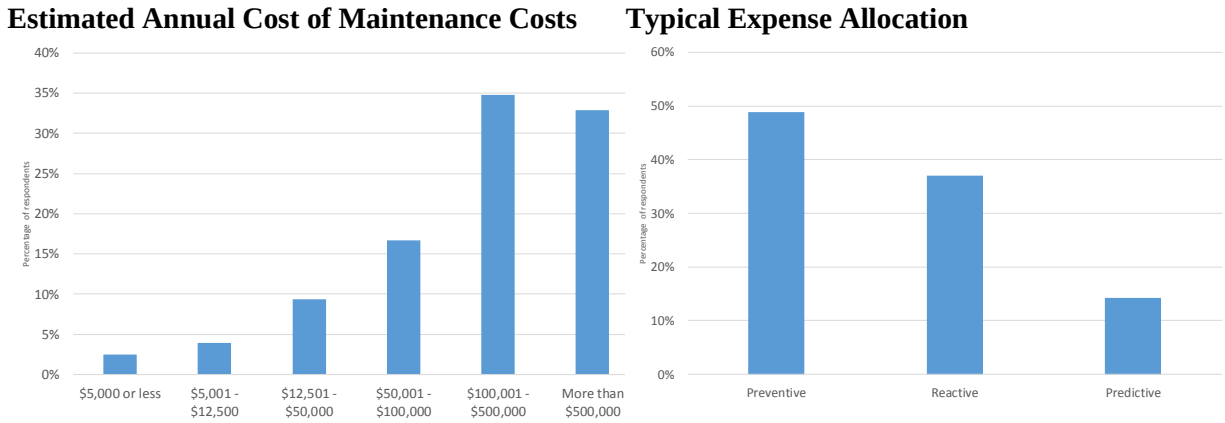

Figure 4. Annual Maintenance Cost and Expense Allocation

Next, the researchers analyzed correlations between the (1) building's age and interior area (square feet) and (2) satisfaction of janitorial performance and energy management efforts. A Pearson correlation coefficient was used to analyze the data. This calculation estimates the strength of the linear relationship between two variables. A Pearson's r =1.0 represents a perfect linear relationship and a value of 0 would represent no relationship. Table 1 presents the Pearson (r) correlations. A weak negative correlation was found between Building's interior area (SF) and energy management satisfaction, efforts [r (245) = -.12, p < .10].

Table 1
Pearson Correlations Between Building Age and Area and Satisfaction

Factor	Satisfaction Criteria	Pearson's r
Building's age (years)	Janitorial satisfaction	-.01
	Energy management satisfaction	-.03
Building's interior area (SF)	Janitorial satisfaction	.02
	Energy management satisfaction	-.12*

*$p < .10$.

Discussion

While the intent of this initial survey was to collect some basic background information on janitorial, utilities, and maintenance costs, as well as develop ranges for the follow up comprehensive survey, the responses reveal some interesting results. First, most respondents appear to be well-educated, particularly in work towards advanced graduate degrees. A previous study (Sullivan, Georgoulis, & Lines, 2010) found that about 49 percent the surveyed facility managers possess a bachelor's degree and 24 percent possess a Master's degree. The snapshot survey results for this paper indicate about 37 percent possess a bachelor's degree and 33 percent possess a Master's degree. These differences can likely be attributed to statistical differences in sample populations; nonetheless, many facility managers appear to have earned advanced degrees.

A second interesting finding is that while a building's age does not appear to affect the respondent's satisfaction of janitorial services performance or their organization's energy management efforts, those who manage larger buildings (interior area) appear to be slightly more dissatisfied with overall energy management efforts [$r(245) = -.12$, $p < .10$]. This difference in FM satisfaction is likely attributable to the extensive bureaucratic structure that comes with big organizations that operate larger facilities or may be related to the more extensive energy consumption requirements that come with operating larger facilities.

Conclusions and Future Research

Performance management is a growing field based upon the economic necessities governing the modern business world. Finding ways to increase and measure performance to produce cost-savings and continual improvement has become a mandatory function for business to survive in the current market. Facility management has recently begun to adopt and apply these techniques to the operations and maintenance functions of managing buildings. Though there exists abundant literature on the identification of best practices and benchmarking strategies, the literature discussing or relating these practices to facility management is rather scarce and in need of further research and discussion.

Little research exists on the action phase of the benchmarking process, as well as janitorial functions or best practices. Greater clarification is needed in the use of customer satisfaction and other subjective and qualitative measures in managing facility performance and the relationship between maintenance strategies and user satisfaction is also worthy of further exploration. This study advances the knowledge in the field by conducting a demographic survey of facility managers, and

exploring the satisfaction levels for janitorial and utilities. The researcher also found a statistically significant, yet weak, negative relationship between interior building size and satisfaction of their organization's energy management efforts.

A comprehensive follow up benchmarking study will incorporate many of the elements and best practices discussed in this paper from quantitative and qualitative customer satisfaction measures, to benchmarking how the companies take action during their benchmarking process. It will also delve further into various facility variables that can impact operations and maintenance performance. The researchers will also use the results to guide the cost range data for the upcoming comprehensive benchmarking study.

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