Abstract

Aim: Facility asset management includes effective and efficient management of built facilities, which can be achieved by controlling basic services and space management in order to enhance performance. The physical environment in a built facility has a major impact on successful and efficient operations of an organization. Selecting measures of efficiency typically takes into account the type of user, aim of the study, and to some extent, the public or private nature of the organization for which the indicators are being considered. Key Performance Indicators (KPIs) developed in past research studies have included mainly cost related measures, while current studies emphasize using cost related as well as non-cost related performance measures. This paper aims to gather, analyze, and develop a list of Key Performance Indicators and categorize them by relevance to the demands of the facility management industry.

Research Methods: An extensive literature search was performed and data from valid sources was collected, through which the need for KPI categorization was identified. The KPI categories were further validated by a survey of facility management professionals.

Conclusions: It is vital to measure facilities performance in order to establish an understanding of current conditions and situations, and to postulate future changes in facility asset management practices to achieve the desired objectives. Furthermore, KPIs must be measurable and quantifiable in order to use them effectively.

Limitations of the Research: The scope of this paper is limited to built facilities. The information is provided and analyzed from the user’s/client’s perspective only.
Practical Applications: This study provides a list of KPIs that could be used for a holistic performance evaluation of a built facility. Furthermore, they are categorized in such a way that facility management professionals could choose a set of KPIs most relevant to their situation.

Keywords: Facility Management, Key Performance Indicators, Performance Measurement, Categorization, Literature Review

1. Introduction

Facility management deals with the management of built assets and it incorporates controlling the services necessary for successful business operation of an organization. It should not aim at simply reducing the operating expenses of a built facility, but also at enhancing the facility’s efficiency, as well (Amaratunga et al., 2000b). The physical environment has a major influence on the successful operation and efficiency of an organization; by modifying it, an organization’s desired efficiency may be achieved (Amaratunga et al., 2000a). Thus, to gauge the effectiveness of facility management, it is necessary to reach an understanding of the facility’s current conditions and to postulate changes in facility management practices in order to achieve desired performance. Cable and Davis (2004) warn that poor facility management could result in inadequate facilities to support functioning, excess facilities not contributing to the organization’s mission, cost inefficiencies, inadequacy, and unavailability of facilities for future needs. Conversely, a strong facility management approach provides needed support to an organization’s mission, the realization of future facility requirements, greater cost efficiency, and the ability to anticipate results of current management decisions.

Due to impacts on strategic decision-making and organizational performance, a facility should be assessed periodically. Performance measurement extends opportunities to review past and present functioning, derive strategies for future endeavors, compare performance within and among facilities, assess the performance towards the organization’s goals, and provide directions to management for decision-making (Amaratunga et al., 2000a; Amaratunga et al., 2000b; Cable and Davis, 2004; Lebas, 1995; Douglas, 1996; Barret and Baldry, 2003; Kincaid, 1994).

Douglas (1996) emphasizes the importance of facility performance assessment in both inter-building (evaluating against other facilities) and intra-building (within itself) senses. Amaratunga et al. (2000b) argue that performance measurement is vital to an organization as it provides much-needed direction to management for decision-making.

Previous research studies propose a wider range of KPIs that could cover the performance of a facility in a comprehensive manner; however, these KPIs are too numerous and narrow in perspective, thus lacking, applicability across a range of projects and quantification (Shohet, 2006;
Neely et al., 1997). The literature suggests that there needs to be a list of KPIs that demonstrate wider applicability, holistic approach to the performance evaluation, conciseness, relevance and proper categorization, and are quantifiable and easily measurable (Shohet, 2006; Hinks and McNay, 1999; Slater et al., 1997; Augenbroe and Park, 2005; Cohen et al., 2001; Ho et al., 2000; Douglas, 1993/94; Douglas, 1996; Amaratunga and Baldry, 2003; Gumbus, 2005).

Among major facility performance measurement practices are benchmarking, the balanced scorecard approach, post occupancy evaluation, and measurement through metrics of Key Performance Indicators (KPIs). Cable and Davis (2004) assert that performance measurement through the establishment of KPIs helps senior management make strategic decisions. Developing performance metrics is a necessary step in the process of performance evaluation, as it includes relevant indicators that express facility performance in a holistic manner (Cable and Davis, 2004; Varcoe, 1996; Brackertz, 2006; Amaratunga et al., 2000a; Amaratunga et al., 2000b; Lebas, 1995). Consequently, it is tremendously important to identify a set of KPIs to establish effective performance evaluation metrics for the facility under consideration.

1.1 Research Objectives and Research Methods

This paper aims to identify the need for a succinct and properly categorized list of KPIs that can respond to the current needs of the facility management industry. Furthermore, it aims to provide a list of KPIs from which facility management professionals can select to perform the desired (general or specific) performance assessment. Following are the objectives of this study:

- Realize the need to provide a succinct and relevant list of KPIs; and
- Identify a set of criteria that could be used to narrow down the list of KPIs.

The research method used is similar to the concept of discovery through literature, as proposed by Swanson (1986), which emphasizes the creation of new knowledge by referring to bibliographic information available in the form of peer-reviewed papers, conference proceedings, and other valid forms of literature. This approach is gaining wider acceptance and being used in a large number of research studies (e.g., Kostoff et al., 2006; Srinivasan, 2004; Weeber et al., 2001). This paper refers to literature pertaining to facility performance assessment and KPIs to perform this task. Research efforts to establish a relatively comprehensive list of KPIs, peer-reviewed papers discussing the performance metrics and suggesting improvements, and published papers stating the urgency to categorize the KPIs are selected in order to derive findings.
2. Background

2.1 Facility Performance Measurement

The importance of facility performance measurement has been consistently emphasized in the facility management literature. Amaratunga et al. (2000b) and Brackertz (2006) indicate that performance relates not only to the functional quality of the building, but also to the contribution made by the building in achieving the organization’s goals. Hence, buildings do support organizations by helping them meet their long-term business and other goals. Cable and Davis (2004) assert that performance measurement addresses issues related to the buildings or facilities owned, their current condition, additional facilities required for achieving organizational goals, issues to be addressed, and the results of investment or no-investment decisions. Moreover, the purpose of performance measurement extends to understanding the impacts of management decision-making on success or failure of a facility’s portfolio, and to suggesting possible improvements. Barret and Baldry (2003) assert, “When the facility management unit lacks reliable and comparable data on building performance and costs, its ability to make its most basic decisions is impaired, as well as its ability to make a convincing case for its recommendations.” Douglas (1996) points out the importance of performance measurement in terms of user satisfaction, which includes both assessing the extent to which the facility is serving its users, and understanding the user’s satisfaction level. Kincaid (1994) and Lebas (1995) emphasize the importance of performance assessment in making comparisons within the organization, or with other organizations, to develop strategies for improvement. Furthermore, its focus must be not only on costs, but also on issues that shape the physical environment of the organization. Cohen et al. (2001) assert that rapid feedback about the condition of a building is essential for consistent and continuous improvement in building performance.

2.2 Performance Indicators

Ho et al. (2000) state that performance metrics can be used for genuine comparisons within and between organizations. Performance metrics provide an essential common platform of comparison, upon which improvement can be sought for any individual indicator. Deru and Torcellini (2005) and Spendolini (1992) explain that relevant, clear, compatible and authentic performance metrics facilitate the understanding of driving forces of a building’s performance, assist designers in creating efficient facilities, support owners in operating buildings in an efficient manner, and help management and decision makers to take necessary steps and to track performance. Hitchcock (2002) and O’Sullivan et al. (2004) state that performance metrics can define performance objectives clearly and quantifiably. Yuan et al. (2009) identified KPIs according to five major perspectives: the physical characteristics of the project, financing and marketing, innovation and learning, stakeholders, and project processes. They state that a genuine performance measurement is only possible after the major KPIs are identified, finalized, and monitored.
Ho et al. (2000) argue that the development of performance measurement metrics is the first step in a facilities benchmarking process. Performance metrics assist in establishing benchmarks that guide management in decision-making and indicate the success of current facility management practices. Furthermore, authentic, well-defined and compatible performance indicators could easily be transformed into strategies through analysis and decision-making. Douglas (1996) emphasizes the importance of indicators that portray space in terms of amount (area and volume), quality (appropriateness, visual and environmental qualities), and shape (plan and layout), claiming that space planning and management is a key element in building performance management.

Research efforts have identified performance indicators for facility condition assessments. Cable and Davis (2004) state that a set of KPIs must be identified and tracked over a period of time so that it can be compared against a baseline in order to examine improvements or deterioration. Amaratunga et al. (2000b) and Brackertz (2006) argue that, unlike past performance measurements, which focused primarily upon financial issues, current measurement practices must emphasize aspects like business, business goals, and job satisfaction. Popular metrics, like those relating to financial and space aspects, express the level of performance of the building, but do not indicate the contribution made to the organization’s strategic results (Brackertz, 2006).

The selection of performance measures as KPIs depends on the types of users of performance assessment (i.e., managers, supervisors, etc.), the public or private nature of the organization, assessment objectives (financial, functional, or physical), and prevailing trends in the industry (Lebas, 1995; Cable and Davis, 2004; Amaratunga et al., 2000b; Hinks, 2004; Eagon and Joeres, 1997; Cripps, 1998). Moreover, since different users require different measures for their purposes, their selection of performance indicators varies (Lebas, 1995). Baldwin et al. (2000) state that customers and providers select metrics that reflect their respective expectations and goals. Customer-related metrics tend to converge upon output, while provider-related metrics emphasize the processes implemented. The public vs. private nature of the organization and its facilities influences the preference of performance indicators to a certain degree. Cable and Davis (2004) assert that private sector organizations have a profit-oriented approach in selecting KPIs, while federal government organizations, like other public entities, emphasize excellent delivery of goods and services to the public.

Eagon and Joeres (1997) emphasize the growing significance of environmental performance measurement on a facility. They mention that the International Standards Organization (ISO-14031), British Standards (BS-7750), and the European Union’s Eco-Management and Auditing Schemes (EMAS) are among organizations that have developed or are developing guidelines for environmental performance evaluation of building facilities. Eagon and Joeres (1997) complain that most current performance metrics include indicators relating to processes, results, and customer satisfaction, but very few mark environmental performance. Epstein and Wisner (2001) mention two organizations (Bristol-Myers Squibb and Severn Trent) that successfully use a Balanced Scorecard approach to measure environmental or sustainability performance of buildings. They
propose adding an environmental and social perspective to the Balanced Scorecard method. Jasch (2000) asserts that measuring and monitoring the environmental performance of a facility is essential in learning about the level of compliance with environmental requirements, and it must include indicators to express the environmental goals achieved.

Critical Success Factors (CSFs) are also used to assess the performance of an organization. Boynton and Zmud (1984) state that CSFs relate to the most vital issues of an organization – operations and future success. Moreover, these factors reflect crucial areas for managerial or organizational success (Boynton and Zmud, 1984; Leidecker and Bruno, 1984). CSFs incorporate issues that, to some extent, govern the success and failure of an organization, and thus, are vital for the assessment of that organization (Chua et al., 1999; Grunert and Ellegaard, 1992; Leidecker and Bruno, 1984; Belassi and Tukel, 1996). Belassi and Tukel (1996) argue that, although efforts are undertaken to enlist CSFs, they emphasize only one specific aspect of an organization rather than the organization as a whole. There has been no attempt to group these factors together so that their interrelationships could be understood and analyzed. Furthermore, most lists of CSFs demonstrate a single emphasis and thus possess limited applicability. The emphasis should be on not only generating a list that incorporates all CSFs that contribute to the success of an organization, but also on grouping these CSFs (Belassi and Tukel, 1996).

3. Findings: Inferences from the Literature

3.1 Need to Categorize the List of Indicators

One need identified by Douglas (1996) is for a proper categorization of KPIs so that they represent broader applicability and potential use. Studies have developed and built lists of large numbers of indicators, but some of these indicators are not usable because they are not categorized clearly. For example, professionals interested in short-term financial appraisal have nothing to do with long-term functional or survey-based assessment, and vice versa. Thus, categorization must provide the opportunity for facility management professionals to select the list of performance metrics in which they are most interested (Douglas, 1996; Ho et al., 2000; Gumbus, 2005). Lavy et al. (2010) categorized the list of indicators into four categories and conducted a brief survey to obtain opinions from the facility management industry on this categorization (see Table 1). The survey demonstrated respondents’ approval of the categories of financial, physical, functional, and survey-based performance indicators. However, the study also revealed that some indicators from the survey-based category may fall into one of the other categories; hence, this category may be unneeded, or may need to be modified.

Amaratunga and Baldry (2003) categorized KPIs according to four basic principles: customer relations, FM internal processes, learning and growth, and financial implications. Augenbroe and
Park (2005) divided indicators into four categories, as well: energy, lighting, thermal comfort, and maintenance. Hinks and McNay (1999) classified a long list of 172 KPIs into eight categories: business benefits, equipment, space, environment, change, maintenance/services, consultancy, and general. Gumbus (2005) derived a list of performance measures organized into categories relating to four perspectives of the Balanced Scorecard approach. Ho et al. (2000) proposed a comprehensive and detailed set of KPIs categorized into eight major classes. As indicated previously, Lavy et al. (2010) derived a relatively large list of Key Performance Indicators (KPIs), categorized into four major categories of financial, functional, physical, and survey-based (see Table 1). Table 2 shows how various studies categorize KPIs, and how these categories fall into the proposed four categories, as mentioned earlier.

Table 1: Responses of facility management industry professionals on proposed categorization (Source: Lavy et al., 2010)

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Do you agree with the proposed categorization?</th>
<th>Do you agree that the proper categorization would help in facility management?</th>
<th>Additional comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Agree</td>
<td>Agree</td>
<td>Survey-based category includes indicators that could fall under other three categories. Anything that can be done to standardize KPIs related to FM would be appreciated.</td>
</tr>
<tr>
<td>B</td>
<td>Agree</td>
<td>Agree</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>Agree</td>
<td>No response</td>
<td>Survey-based indicators are a big factor in performance standards.</td>
</tr>
<tr>
<td>D</td>
<td>Agree</td>
<td>Agree</td>
<td>Many of these indicators listed are used by a federal facility. Survey based indicators seems to address the physical and functional indicators in a qualitative manner. Categorization helps facility management professionals in selecting set of indicators of their choice.</td>
</tr>
<tr>
<td>E</td>
<td>Agree</td>
<td>Agree</td>
<td>Any effort to accumulate and translate data would support facility management practice.</td>
</tr>
<tr>
<td>F</td>
<td>Agree</td>
<td>Agree</td>
<td>-</td>
</tr>
<tr>
<td>G</td>
<td>Agree</td>
<td>Agree</td>
<td>Kilowatt-hour usage must be tracked and measures to reduce this consumption needs to be surveyed.</td>
</tr>
</tbody>
</table>
Table 2: Literature categorization of KPIs (Source: Lavy et al., 2010)

<table>
<thead>
<tr>
<th>Sources</th>
<th>Categories</th>
<th>Financial</th>
<th>Functional</th>
<th>Physical</th>
<th>Survey-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaratunga and Baldry, 2003</td>
<td>Financial</td>
<td></td>
<td>FM internal processes</td>
<td></td>
<td>Customer’s relations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning and Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gumbus, 2005</td>
<td>Financial</td>
<td></td>
<td>Operational</td>
<td></td>
<td>Customer’s relations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning and Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hinks and McNay, 1999</td>
<td>Business</td>
<td></td>
<td>Space</td>
<td>Maintenance and service</td>
<td>Environment General</td>
</tr>
<tr>
<td></td>
<td>benefits</td>
<td></td>
<td>Equipment</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Change Consultancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ho et al., 2000</td>
<td></td>
<td></td>
<td>Cleaning</td>
<td>Size and use of facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Energy consumption</td>
<td>Maintenance Maintenance Refurbishment</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Ground and environment</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Safety and security</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Augenbroe and Park, 2005</td>
<td></td>
<td></td>
<td>Energy</td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lighting</td>
<td>Thermal comfort</td>
<td></td>
</tr>
<tr>
<td>Massheder and Finch, 1998</td>
<td>Business</td>
<td></td>
<td>Acquisition</td>
<td>Portfolio Building</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disposal</td>
<td>performance</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Need to Narrow Down the List of Indicators

Establishing a long list of indicators must not be the only goal of facility performance assessment. Such a comprehensive list must be filtered through a certain set of genuine criteria to develop a concise list of those indicators that effectively express one or more aspects of performance assessment (Ho et al., 2000; Slater et al., 1997). Ho et al. (2000), Slater et al. (1997), Hinks and McNay (1999), Cohen et al. (2001) and Gumbus (2005) advocate minimizing performance indicators in order to obtain a more precise but relevant set of KPIs.

Hinks and McNay (1999), referring to research studies performed by Varcoe (1998) and Slater et al. (1997), suggest that there must not be more than four to six performance indicators tied with, at the most, five to six well-defined business or facility objectives. Slater et al. (1997) claim that the
number of KPIs must be kept at a minimum of seven and a maximum of twelve for a comprehensive evaluation of a facility’s performance. Literature suggests the following criteria to consider when narrowing the list of KPIs:

3.2.1 Indicators Ensuring Holistic Assessment

Unlike past assessments of facility performance that emphasized financial aspects, current assessment must concentrate on aspects like business, organizational goals, job satisfaction, work environment, environmental issues, and other non-financial qualitative aspects, in a detailed manner (Amaratunga et al., 2000b; Brackertz, 2006; Douglas, 1996; Cotts and Lee, 1992; Cable and Davis, 2004; Cripps, 1998; Eagon and Joeres, 1997; Jasch, 2000; Epstein and Wisner, 2001). There must be a holistic approach to performance measurement and assessment in order to cover facilities comprehensively. Consequently, the set of KPIs must be broad, and it should cover the evaluation of overall performance of facilities or organizations, rather than one single aspect (Hinks and McNay, 1999; Douglas, 1993/94; Douglas, 1996; Gumbus, 2005; Cable and Davis, 2004).

3.2.2 Quantifiable and Measurable Indicators

Research studies have been unsuccessful in providing a set of quantifiable KPIs required for strategic decision-making for an organization (Shohet, 2006). Furthermore, Shohet notes that most research efforts in the past, focused on maintenance management, have not offered quantifiable indicators for decision-making. Shohet also points out a lack of “quantitative tools and well-based methodologies” in this field of research. Augenbroe and Park (2005) add that not only quantification, but also a precise definition, is vital for key performance indicator development. Moreover, they argue that there is resistance from the research community to quantitatively evaluating the design performance of a building, as design performance has conventionally been assumed to be qualitative. Essentially, performance metrics should be quantifiable in order to provide a common platform for comparing a building’s performance. According to Balanced Scorecard Collaborative Vice President Geoffrey Fenwick, very few companies have come up with complete, measurable, and quantifiable performance indicators (Gumbus, 2005). Cable and Davis (2004) mention important characteristics of KPIs, and assert that KPIs must be quantifiable in order to perform aggregation, calculation, and valid comparison. The performance indicators to measure facilities and/or organizations must be not only easily measurable, but also quantifiable in order to make valid comparisons and decisions (Shohet, 2006; Augenbroe and Park, 2005; Ho et al., 2000; Gumbus, 2005; Tsang et al., 1999; Cable and Davis, 2004; Tsang, 1998; Chan et al., 2001).

3.2.3 Indicators Showing Wider Applicability

Most research studies so far have focused either on specific aspects or on specific project requirements, and thus, they demonstrate limited applicability to a wider range of projects (Shohet, 2003). Hinks and McNay (1999) performed extensive research to establish a list of KPIs, pointing
out the difficulties in executing valid performance measurement, due to a lack of indicators that exhibit wider applicability. Furthermore, they assert that performance measures should be derived in order to be replicated or transformed easily to suit the requirements of a range of projects. Performance metrics must be generalized so they can be applied across the facility management industry (Shohet, 2003; Hinks and McNay, 1999; Neely et al., 1997).

4. Conclusions

Facility performance assessment is vital for reviewing past strategies, improving current measures, and for future decision-making. The literature suggests that performance measurement should include not only cost related, but also, non-cost related indicators covering aspects relating to user perception and organizational goals. Furthermore, it is emphasized that performance assessment should be carried out periodically and facilities should be evaluated within the organization and against other organizations. The inclusion or exclusion of certain performance measures depends on the user’s needs, public or private nature of organization, performance evaluation objectives, and prevailing trends in the industry. About two decades ago, the trend in performance measurement was moving toward the management of maintenance activities, while current trends concentrate on sustainable energy and economic savings. These can be seen in endeavors to develop performance indicators toward these measures. Qualitative data are at times difficult to calibrate; hence, there is a tendency to convert this data into quantifiable data, which creates new complexities. Current trends at local, regional and global levels tend to impact performance metrics significantly, as they represent the demands of the industry.

Efforts have been made in the past to derive a relatively comprehensive list of KPIs (as discussed in the literature review section); however, the literature suggests that these lists of KPIs need to be categorized in such a way that professionals in the facility management industry may select KPIs according to the aspects being evaluated. The lack of proper categorization often results in less use of performance metrics, because the categories selected have no meaning to the industry. Furthermore, there is a need to minimize the number of KPIs, so that effort is not wasted on redundant, overlapping, or unwanted information. In spite of these significant efforts, researchers are still trying to establish a comprehensive list of KPIs. Some reasons for this may be the lack of applicability (to a broad range of facilities,) lack of a holistic approach, and failure of proper categorization. Facility performance metrics must have broad applicability so that with slight modifications, metrics could be used in a broad range of buildings. Clearly, KPIs that demonstrate wider applicability and are quantifiable and measurable should be included. Performance indicators that express more information or cover a wider aspect of performance evaluation should also be incorporated.
This study suggests that broader applicability, a holistic research approach, and better categorization of performance indicators would benefit the field of performance measurement, and would provide a more pragmatic perspective to research studies. This paper identified the need to establish a succinct but relevant list of KPIs that demonstrates wider applicability and includes quantifiable and measurable core indicators.

References


