

STRUCTURAL FRAMEWORK FOR ASSESSMENT OF FACTORS INFLUENCING THE SERVICEABILITY OF FACILITIES

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Abstract

Assessment and control require a gauge or a scale to relate processes to results in order to evaluate the strategies adopted and to enable effective variations to be made. Assessment is a requisite to effective and efficient management. A firm needs to be able to gauge the immediate and a future impact of its decisions and strategies. Assessment is needed to enable structural adjustments to a business whenever it is expedient. Both long term and short term assessment should encompass all aspects of activities in a firm. This means that the facilities needed to implement the strategies should be considered along with the traditional functions of management. The assessment framework considers many factors including selecting the right qualities to assess and also making the assessment right. A good classification and structuring of the source information is needed to give a total picture of facilities and hence enable an effective management brought about by total control of the situation.

This study examines and models factors that define suitability and viability of facilities and proposes an assessment framework. It is envisaged that the results of this study will enable a better understanding of facilities management and its related use as a tool towards the bigger goal of portfolio management.

KEY WORDS: Control, Assessment, Classification, Modelling, SADT.

1. INTRODUCTION

Facilities is a term that refers to a range of physical items and their use. They can be regarded as being all those aspects that may include physical tangibles that are needed to enable and sustain the realization of management objectives through the provision and maintenance of use environment. Facilities' management, FM, on the other hand is a process which ensures the achievement of overall management objectives through a coordinated approach that provides and sustains the use environment. Facilities represent a phase in the construction process.

Facilities' performance and serviceability studies have become increasingly important as evidenced by the impressive body of work that has been carried out. The work has however mainly concentrated on bench marking or analysis that address small portions of the facilities' systems for instance information technology needs of facilities [1]. Many studies have also been based on energy conservation and maintenance. This study develops a concept that uses a synthetic view that considers all constructibility factors. Uncertainties are targeted with a view to eliminating them or lessening them. Studies by Zeithml et al [2] have indicated the importance of communications in service quality delivery and control, a fact which is given a prominence in this study.

Many factors which influence the planning phase of construction continue on to later affect the operational phase or facilities so provided. If these factors are considered



together whenever any of the phases is being analyzed, it could make the construction process a very effective one. Unfortunately reality points to too many difficulties in doing this. Such diverse reasons as lack of complete operational information during planning stages, changing functional needs or changing facilities' ownership at operation stage may render any factors that were hitherto important during one phase to be irrelevant in another. A framework is needed to help facilities managers to constantly evaluate their situations to take in any changes and to ensure that the original goals are still the driving force in the operation of facilities for instance to ensure profitability.

Over emphasis of maintenance and replacement aspects of facilities has left many firms regarding facilities as overheads and strive to "optimize" the facilities by reducing the costs as much as possible sometimes at the expense of other functionality needs. Facilities can genuinely be avenues for value adding in a business, a situation which is possible only if all the factors affecting the facilities are all well understood. Project management at all phases would benefit a great deal if there was no fragmented management approach that separates planning stages from construction stage or planning stages from operational phase. All the factors at all these stages are related to each other and effectiveness demands that they be pooled together and considered at any of the stages. Management needs to come to grips with the needs for facilities in the firm and how to ensure that facilities support business objectives not only at the inception stage but through out its operational life.

2. PROBLEM IDENTIFICATION AND ANALYSIS

The requirement that facilities play a more active role in business has in the past been hampered by many factors. Some of these factors are tactical while others are purely operational. Management practices employed by many firms to manage facilities have resulted in the following:

- A proliferation of measures or controls that address small parts of construction phases and the facilities without there being an overall view.
- Over reliance on control measures for those items like physical tangibles which are easy to measure but do not represent the total picture. This results in incomplete information being used to assess the running of facilities. Operational service of facilities is not usually considered.
- Generation of lots of rigid data items that do not act as information and the maintenance of data for data's sake.
- Use of very long term planning period which doesn't help facilities to perform better since adapting of facilities for new uses is usually very difficult.
- Systems that provide or run facilities are black boxes without any "windows" for participatory communications.
- Users not generally having a forum or a system through which they can articulate their functional needs at the running stage of the facilities or at any other stage.

2.1 POSSIBLE CAUSES OF THESE PROBLEMS

The nature of the above short comings points to the lack of conceptual understanding of the role of facilities. This lack of understanding has been partially caused by the following:

- No link between facilities and the greater objectives of the firm resulting in the provision of facilities being considered as an afterthought.
- Facilities, especially financial aspects are considered "insignificant" as compared to other business considerations.
- Facilities have traditionally been managed only on the basis of cost reduction and are considered as overheads.
- Faulty policy towards facilities is employed by many firms. This leads to consideration of facilities as overheads and not as value adding. This may cause too much emphasis to be placed on those aspects of the facilities that do not add value to the business.

2.2 EFFECTS OF THE PROBLEM

The effects of the problem include non realization of potential for value adding by facilities, impossibility of a good selection and assessment of facilities at situation audit level and overemphasis of physical tangibles during operation stage and the neglect of users and their needs.

2.3 SOLUTIONS TO THE PROBLEM

The solution to the above problem is the establishment of an assessment frame work that will combine the factors for all the phases and use them to articulate the needs of the users and also to constantly monitor the operations of the facilities. The purpose of assessment include establishing the current status of facilities in the light of the overall objectives of the firm and devising remedies where such actions are called for. The environmental factors which are considered to have an influence of the solutions are grouped into three categories namely: the decision maker and his desire to retain or attain, The factors that the decision maker can control in achieving his needs and the factors that he has no control over [3]. The assessment framework is created via conceptual functional data models of the sequence of tasks needed to assess and manage facilities. As much information as possible should be obtained. These may include raw data. The data should of course be transformed into information before being used. No data should be used simply because it has been generated. The uncertainties that are associated with facilities and all other phases of construction should be listed and ways of dealing with them devised. This framework is established through modelling.

3. MODELLING

Modelling here refers to an act of developing description of a system. Structural Analysis and Design Technique, SADT modelling system which is employed here enables the description of activities within a system by use of text and graphics. It is "a complete, concise and consistent description of a system which is developed for a particular reason" [4]. The purpose of this modelling process is by definition simply to answer questions on the system. Failure to answers any of the questions may render the models useless. The SADT modelling method describes a system by dividing the system into sub systems each of which is related to every other one and to its own "forces". These forces are inputs, controls, the outputs and the mechanism expected to carry out the process or activity. Fig. 1. shows the relationship between the forces.

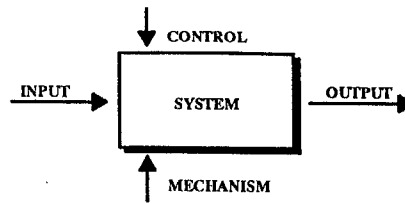


Fig. 1: The relationship between the factors used in SADT

This modelling process gives a qualitative description of a system and enables the understanding of the factors like social, economical and technical affecting the system. The modelling enables a quick display of a particular model structure or rapid structural analysis to be carried out. In this study other outcomes of interest include: to enable good communications within the system and to provide a prediction tool. The modelling will consider the assessment of facilities as assessment of all the phases of construction namely, the inception phase which includes mainly strategic planning and the factors that lead to the demand for the facilities, the acquisition phase which addresses the realization of the objectives and the needs necessary for it and the operational phase which looks at the sustenance of the objectives. The model variables are formulated to accomplish the following:

- Needs and objective setting.
- Situation audit, self assessment and the establishment of status of facilities.
- Comparison with existing standards and specifications in industry as well as practiced by competitors (Bench marking).
- Removal or lessening of uncertainties considerations.
- Improvement of communications and coordinations in the system.
- Serviceability and service quality.

The model variables are sorted into three main modules as shown in Table 1. These modules are further broken into sub modules until sufficient amount of detail has been achieved.

MODULES	PROCESS TO BE FOLLOWED
Establish dimensions and evaluation criteria	Establish the factors that should be considered at inception, acquisition and operation.
Evaluate the facilities	First, establish standards and specifications for good facilities and what the violation of each of the criteria spell, second, establish an evaluation criteria, third, view the facilities through the light of the established evaluation criteria.
Make the decisions	Establish functions of decision making.

Table 1: Main assessment modules

4. ASSESSMENT AND CONTROL

Control and by extension assessment is a natural part of management. This is due to the fact that it enables evaluation of the objectives and also points management to the

right direction in case of straying off course. It is also needed to verify the premises that the chosen strategy will yield the organization's objectives and checks whether plans and objectives are outdated or not. The control process should pinpoint existing problems or potential problems by comparing performances to predetermined objectives. It is simply a process that ensures that the activities are generating the desired results. Implementations of any objectives may run into some problem primarily due to human failing or other related problems hence the importance of control. Assessment is part of a strategic control system

4.1 PROCESS OF CONTROL

The control process involves three stages namely, establishment of a standard or goal, the measurement of performance against this standard and finally the identification of deviations and the taking of corrective action [5]. The standards may be qualitative or quantitative but should mirror exactly the objectives of the firm. Identification of deviations should establish the central reason for deviation, a reason which may not be readily apparent. Effective standards are observable, measurable, participatively set and should encourage compliance [6]. The process of control and assessment has many short coming and problems though the benefits clearly outweigh the disadvantages. Dessler [7] gives some of these problems as:

- Control can results in narrow view point which can make people concentrate in their own local area and neglect greater management objectives.
- Short run factors may be emphasized at the expense of long term good of the company
- Easily measurable factors can be over emphasized. These factors are usually the quantitative factors. This results in the neglect of the difficult to measure factors which are qualitative but may be the most important ones.
- Control can lead to conflicts between incompatible goals like high quality and low cost. Production which may want to produce as much as possible may see themselves as victims of quality control which constantly hamper their progress. The competition for scarce resources can also be a result of controls.

The assessment model addresses the above problems and is formulated to get to the root of the reasons for the problem and seeks to address them by providing the user with a forum for doing so.

4.2 ASSESSMENT DIMENSIONS

This study involves the search for those factors that are best able to address all aspects of facilities. These dimensions can then be used to address the facilities without regard to specific orientation or industry. To assist in the formulation of the frame work the function of facilities is conceptualised as being to provide service at quality and hence help in the realization of the overall objectives of the firm. For the purpose of the setting up of the assessment dimensions the purpose of facilities is summarized as being to:

- *Create and attract users.* This refers to provision of shelter for the users. The provision of shelter is a complex phenomenon that ensures that serviceability in its entirety is fulfilled. Factors considered here include: environmental pleasantness, good location, service differentiation, cost and welfare.
- *Motivate Users.* This refers to all aspects of operation of facilities and assembling of people. It involves the attraction of the users to the facilities. Service quality and serviceability are important here.

- *Sustain users.* This can be modelled as service quality or the provision and maintenance of business atmosphere.

The factors are modelled in categories which consider:

- The firm's overall strategy, strategy for facilities and the role of facilities in a firm.
- The type of facilities best able to serve the firm.
- Serviceability and service quality.

Strategy involves the establishment of what the role of facilities in the firm should be followed by the objectives that will ensure that the designed role is fulfilled. It is mainly a planning stage. At the objective setting stage both the needs for facilities by a firm and the needs of users in the facilities provided are addressed.

Objectives or goals are the specific desired results to be achieved by a firm usually in a specific time. They can be used as standards for measuring performances. Objectives should be set for only those actions which are important or those that are required for performance assessment. No one mix or combination of organizational objectives is applicable to all organizations. "The type of objectives that are established depends on the nature of the particular organization. Ideally, an organization's objectives should be compatible with its culture and should, match its strengths to opportunities, minimize threats to the organization and eliminate weaknesses in the organization" [8]. There is a need for a firm to sort out the objectives in order of importance and maintain a hierarchy of objectives. Items which provide potential areas for establishing objectives for most organizations include Customer service, financial resources, human resource, markets, organizational structure, physical facilities, products, productivity, profitability, research and innovation and social responsibility [9]. A typical brain storming list as the one shown in Table. 2 provides a good basis for objective setting. The SADT model provides a basis for selection of sub objectives by dividing the problem into sub problems.

PROVIDE A SHELTER	ASSEMBLE PEOPLE	PROVIDE A BUSINESS ATMOSPHERE.	PROVIDE INCOME
Provide security Exclude weather Exclude fire Exclude noise Exclude gasses Exclude bad 'atmosphere' Provide visibility. Provide physical comfort Provide heat/cooling Provide ventilation/light Provide safety	Provide traffic control. Provide security Provide access. Enable individuality Enable sociality Provide safety Enable communications Allow encounters Provide sequential flow Enhance associations.	Express prestige Enable communication. Enable organization Enable forward planning Enhance production Enable quality control Facilitate organization. Control human traffic. Provide privacy Enable environmental Control Enable effective control	Attract clients. Provide service quality Be serviceable. Have low maintenance costs Provide efficiency Express prestige Be a good investment

Table 2: Objective setting list

Once the objectives have been established, the needs necessary to realize the objectives are determined. These needs include considerations for use environment, users, technology and finance. The type of facilities best able to serve the firm is a consideration that is closely related with serviceability and service quality.

Suitability of facilities factors include not only plan, layout or geometry but also such issues as whether centralized or decentralized facilities are suitable or not. Serviceability and service quality are factors which enable the provided facilities to operate as required and continue to do so as long as is required. Operational factors include environmental, use characteristics, communication, coordination, and change management factors.

The factors which influence the maintenance of the use environment are more difficult to model owing to the rapid change in needs and information technology that occurs at most firms. Information technology is considered as one of the factors most likely to render facilities use environment unserviceable. The model does not consider very long term periods owing to this.

Facilities being just one of the means of achieving the objectives cannot be expected to play all the roles but only those roles that it is best placed to play. There are many aspects of service quality for instance that are more oriented toward the personnel input. These should be taken care of separately but with the same goals in mind.

5. RESULTS OF THE MODELLING: DESCRIPTION OF SOME OF THE MODULES

The modelling process resulted in several modules each targeting a specific aspect of the assessment. The resulting modules are as described below:

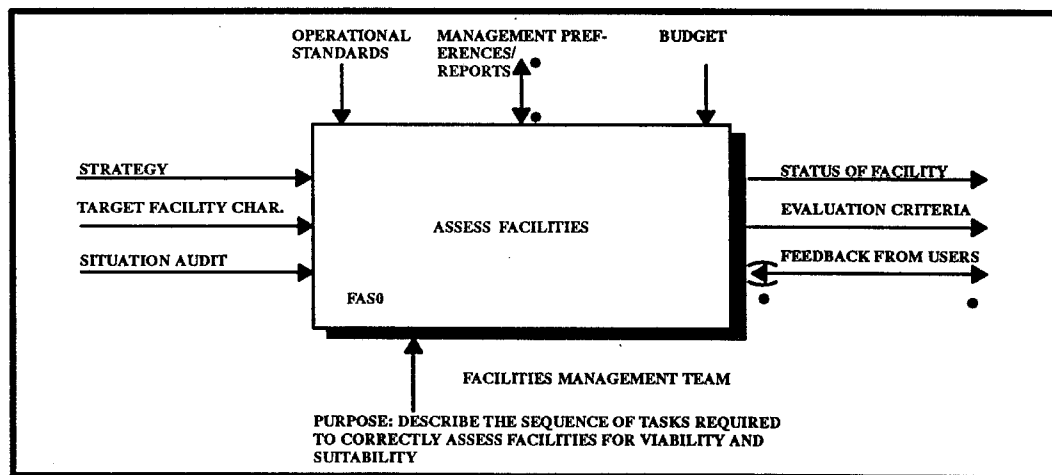


Fig. 2: Forces for level FAS0

Level FAS0: Establish the modelling factors (Fig. 2). This is the main module. It shows all the factors considered at the top most level. The factors are categorized into inputs, outputs, controls and mechanisms. The purpose of this module is to show all the the forces which influence the assessment process. The level FAS0 is divided into three modules namely, establish the dimensions of assessment and the evaluation criteria, FAS1, evaluate facilities, FAS2 and Make decisions, FAS3. The modules are shown in Fig. 3. The modules together specify how appropriate facilities should be and also the factors which indicate their status.

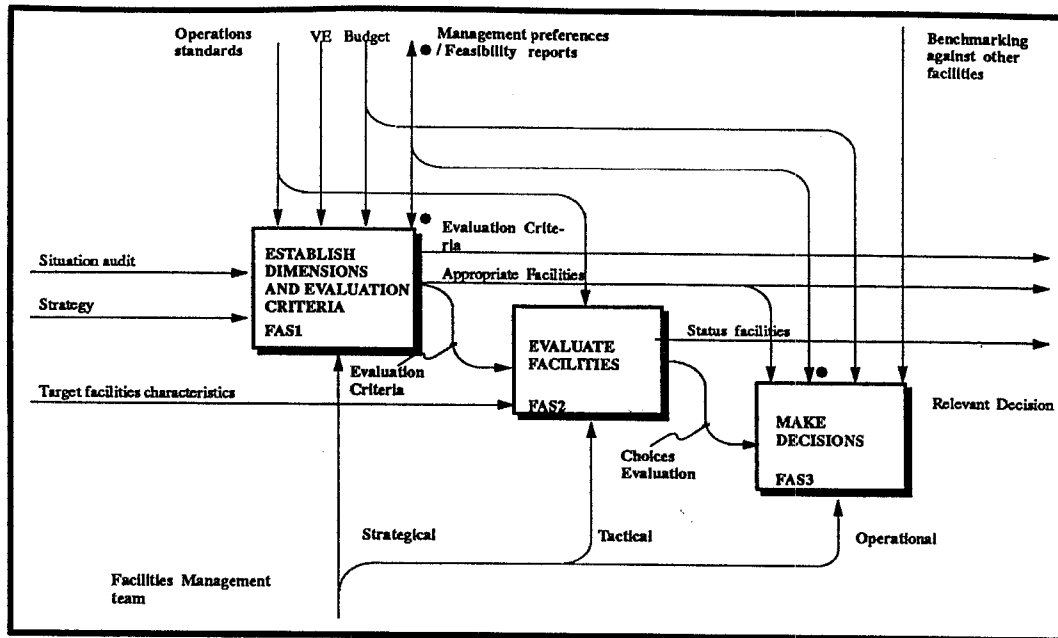


Fig. 3: Assess facilities.

Level FAS1: Establish the dimensions and evaluation criteria (Fig. 4). This module considers all dimensions of planning, acquisition, operation and establishes the appropriate levels for all the factors and dimensions. The control factors considered here include industry wide operational standards, value engineering, budget limitations and management preferences. Input factors include strategies and situation audit while the output include evaluation criteria and an indication of what type of facilities best represent the firms interests.

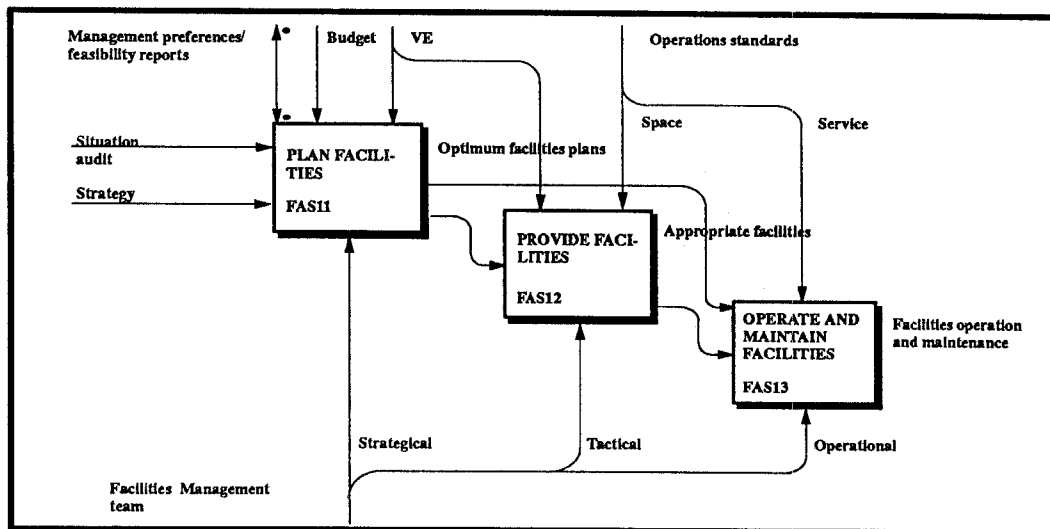


Fig. 4: Establish dimensions of assessment

This module is itself divided into three sub modules: Plan facilities, FAS11, provide facilities, FAS12 and operate and maintain facilities, FAS13. These three modules consider the factors considered at the higher level but in greater details.

Level FAS2: Evaluate facilities. This model deals with the establishment of a forum for evaluation. Once all the factors that indicate an ideal situation as regards a firm's

facilities have been established, a firm needs to take into account the fact that it is very difficult to achieve the levels proposed especially if the facilities are second hand or the firms circumstances have changed appreciably. This module takes into account such situations and proposes an evaluation procedure that seeks to solve the problems. It establishes the paradigms that are needed to achieve this. Fig 5. shows activity level FAS2 divided into five sub modules.

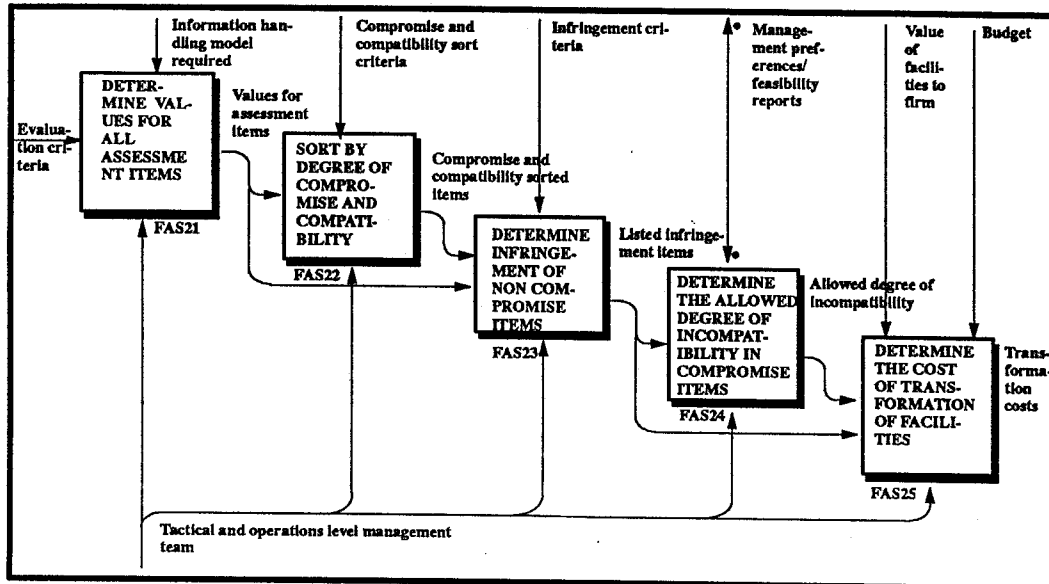


Fig. 5: Evaluate facilities

Input for this evaluation module include the use characteristics of target facilities and the evaluation criteria which comprise the desired characteristics. These characteristics together with control factors such as operational standards, value of facilities to firm, budget and allowed infringement to ideal conditions are considered. The main output of this activities is a status of facilities and transformation costs in time, environment, image and finances needed to transform facilities that are not fully compatible to the needs of the firm to a level acceptable to the firm. The factors here are also sorted into those that the firm can compromise and the degree of compromise allowed and what the compromise will mean in terms of facilitating the achievement of the firms objectives.

Level FAS3: Make decisions. The evaluations are closely monitored and controlled by the decision making process. The decision module provides the management with a list of possibilities and the outcomes of selecting any of the choices. It establishes the functions of decision making which should be used. The functions of managerial decision making used here include setting objectives, search for alternatives, comparison and evaluation of alternatives, the act of choice, implementation of the decision, follow up and control [10]. The decision making stage is closely linked with the planning modules and the evaluation modules. The standards and specification include space use standards and planning standards such as ASTM standard on rating the serviceability of facilities [11]. The evaluations in module FAS2 are fed into this module. The module uses the output and controls of level FAS1 to establish what the functions of decision making should be.

6. CONCLUSION

This study has looked at a conceptual functional data model of the sequences of facts needed to assess and manage facilities. It established the factors that influence serviceability of facilities and hence provided a framework that uses an overall view to devise a tool that can be used to view facilities regardless of the type of industry they are in. This view will enable management to accord facilities management its rightful place and ensure value adding. The resultant framework is a flexible system that allows each firm to use its own unique circumstances to arrive at the status of their facilities or simply to enable smooth management. No figures are expected to be generated by the management process but management are instead encouraged to develop their own specific functions of decision making to aid in facilities management. The frame work seeks to enhance participative communications and coordination among other considerations.

Importance of control has made the 90s a decade of "management by measurement". This tendency to measure everything and assign value to it and use that value as the sole basis for management has been criticized a great deal as not enabling managerial skills in the decision process. There are also situations where huge computer models have purported to "take over" management of facilities completely eliminating the human element which is an important consideration in any management. Despite all these problems and any other short comings that beset the control process when one is faced with a management problem which need assessment of any kind it is still better to take chances with too much information or rigidly formatted "data" rather than make the decision in complete ignorance or without any support system. For FM the important consideration might be to have an overall view and control of all the factors that affect the activities rather than zeroing on only the physical tangibles for instance or on maintenance only though without doubt these are important considerations. Bench marking only should not be used without the consideration of all the factors affecting the facilities. These factors and how they can be applied should be put into databases for use by each firm taking into account its own unique circumstances.

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