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Amaratunga, Dilanthi and Baldry, David

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# **Post-Occupancy Evaluation of Higher Education Teaching Spaces - A Methodological Approach**

**Dilanthi Amaratunga,  
The Research Centre for Built and Human Environment, The University of  
Salford, Salford.**

**David Baldry,  
The Research Centre for Built and Human Environment, The University of  
Salford, Salford**

## **Abstract**

In the general facilities management literature, it is assumed that there is a causal link between facilities management practices and performance. The role of facilities management in facilitating organisational performance, and thereby in providing competitive advantage, is widely acknowledged. However, the mechanisms of how this happens in higher educational establishments are quite unclear, prompting performance evaluation researchers to question whether performance evaluation in fact does add value, and enhance organisational performance.

Assessment of performance of buildings of institutions delivering higher educational services has become matter of particular interest to governments seeking to increase the effectiveness of educational provision and maximise value for money.

This paper presents initial findings of the characteristics of important aspects of a performance evaluation approach related to higher education teaching spaces, and discusses the proposed methodology to be applied.

**Key words** : Facilities Management, Performance Evaluation, Higher Education

## **1 Introduction**

Buildings are for people. They are also facilitators of organisational performance. Buildings, facilities, people and organisations are interrelated to the extent that a failing in one link of the chain will affect overall building performance (Barrett 1992). In times of high operating costs, increasing competition and rising user expectations, organisations must seek to maximise the return on their investment in both facilities and people, which are arguably the greatest assets of any organisation (Barrett 1992)

There is much agreement among researchers and practitioners as to the importance of facilities management (FM) to both manufacturing and service organisational competitiveness and effectiveness. This area has attracted broad interest and has

resulted in a vast literature. The understanding of FM behaving in higher educational (HE) establishment, teaching spaces (TS) in particular, however, remains relatively undeveloped. To date little data is available to assess how extensively the use of these techniques has diffused in HE organisations, what factors have influenced their diffusion, and how it affects TS and overall organisational performance.

Critical, yet often overlooked by the FM literature, is the fundamental character of the professional community, its market place environment, corporate support for building performance, and the processes by which the change and adoption occur within the organisation and within the profession itself. Their contribution also remains limited by the fact that they postulate the same criteria to be applied to all FM processes and organisations, doing research as well as development work, without providing any evidence to support.

The ongoing research from which this paper is drawn attempts to identify critical performance evaluation concepts and demonstrate how they can be successfully integrated into operations of HE environment so as to attain key organisational objectives. Further, it will set out a methodology for defining and measuring the level of fit between the organisation and its facilities.

## **2 Justification for the Research : Theoretical Background**

### **2.1 General Facilities Management Principles**

FM is based on the premise that the efficiency of any organisation is linked to the physical environment in which it operates and that the environment can be improved to increase efficiency (Grimshaw et al 1993). Becker (1987) suggests: "FM is responsible for co-ordinating all efforts related to planning, designing, and managing buildings and their systems, equipment and furniture to enhance the organisation's ability to compete successfully in a rapidly changing world". The aim of FM should be not just to optimise running costs of buildings, but to raise efficiency of the management of space and related assets for people and processes, in order that the mission and goals of the organisation may be achieved at the best combination of efficiency and cost (Spedding et al 1994)

The review of literature suggests that the key components that impact on FM implementation are a synergetic blend of "hard" and "soft" issues. This concept therefore comprises both production oriented and user relations oriented elements (Varcoe 1992). This perspective is exemplified by the work of Becker (1990), Williams (1996) and Douglas (1996).

Further, literature reveals that FM encompasses a vast spectrum of perspectives about people, organisations and change processes to realise the value of any organisation. These practices are generally consistent with the ideas and techniques originally articulated by Nutt (1992), Then et al(1992) and Mole et al(1992). By grouping similar requirements postulated in the literature, Barrett(1992) classified all these into three separate categories. Thompson(1990) also provided a meaningful taxonomy for classifying FM attributes.

## **2.2 Building Performance**

Buildings create environments and provide temperature, humidity, lighting and ventilation necessary for people to live and work productively (Barrett 1992). At one time, buildings were considered merely as an expensive overhead (Douglas 1996). With the emergence of FM, buildings were seen more as an enabler to core business. There is also an increasing awareness, substantiated by a growing body of research (Lynch et al 1991, Peters 1989), that there is a direct link between quality of work place and the effect it has on the performance of its most critical resource, its employees. This can be extrapolated to include a broader consistency of building users.

Performance, in business terms, means the manner or quality of functioning (B.W.Associates 1994). It thus relates to a building's ability to contribute to fulfilling the functions of its intended use (Williams 1993). Facilities represent a substantial percentage of most organisations' assets and their operating costs, thus it is hardly surprising that building performance (BP) appraisal is becoming a formal and regular part of the FM process. Becker (1995) argues FM is an organisational change agent and BP is an important aspect of that change.

## **2.3 Special Issues of BP in HE**

A university as any other organisation, is trying to improve its efficiency in the face of rising operating costs and increasing user expectations. The proposed research attempts to build from the broad principles of building performance evaluation (BPE) by developing a methodology for assessment of a facility's ability to satisfy the objectives of teaching within of universities.

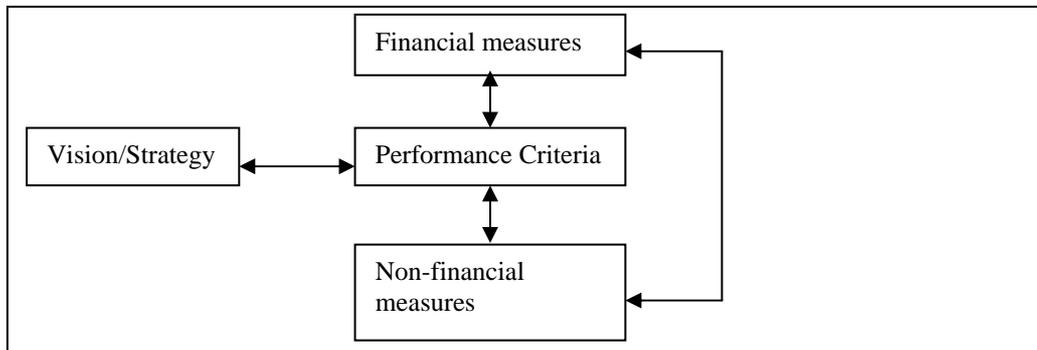
## **2.4 Outcomes of BPE**

BPE is known to produce highly positive results for increasing significant reduction in costs, errors and times, increased user satisfaction and better overall organisational efficiency and effectiveness (Preiser et al 1988). Sheridan et al (1996) also point out some of the likely benefits of a systematic approach to performance and quality improvement: cost reductions, communication improvements, means of user problem solving, reduced employees frustration and enhanced satisfaction.

## **2.5 Achieving the Balance**

The basis of achieving the balance between short and long term objectives and financial and non-financial measures is the concept of a 'balanced score card', first described by Kaplan & Norton (1992), although around the same time, a number of other authors, for instances Maskell(1991) and Eccels & Pyburn (1992) were expressing similar ideas.

Kaplan and Norton suggested that what is needed is “a balanced perception of both financial and operational measures”. In this proposed research, it is hoped to achieve a “score card” that can channel the energies, abilities and specific knowledge held by people throughout the organisation towards achieving the organisational goals, in terms of teaching spaces of universities. The proposed score card will fill the void that exists in most of the organisations – the lack of a systematic process to implement and obtain feedback about BP. The comprehensive nature of the proposed score card is demonstrated by the interlinking perspectives shown in figure 1.

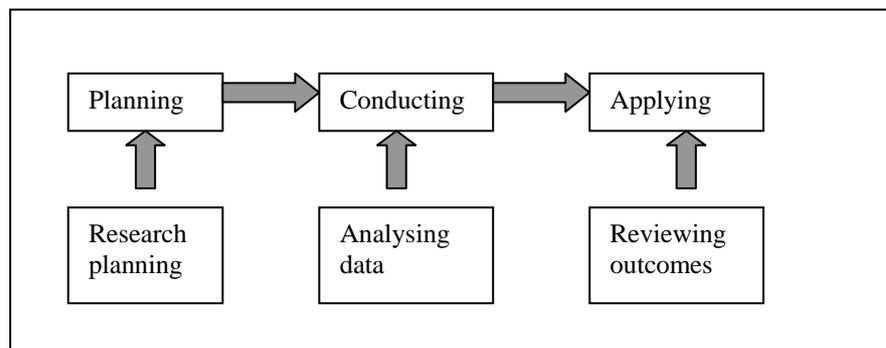


**Figure 1** - The performance perspectives linked by the score card

## 2.6 BP Measurement

The approach needs to involve an examination of attitudes and satisfaction derived from quality of building facilities, and to address the core interests and the expectations of the users. Different authors have suggested different parameters of performance evaluation, but the concept of POE will be applied in this research, which is the comparison of client’s goals and performance criteria against actual BP, measured both subjectively and objectively (Preiser et al 1988). The concept of BP is the major philosophical and theoretical background for POE.

Based on the collective and cumulative experience in the literature review carried out (Preiser et al 1988), a POE process model was developed which outlines the route that POE goes through. (Figure 2)



**Figure 2** - POE Process Model

## **2.7 Elements of BPE**

The elements of BP are those aspects of facilities that are measured, evaluated and used to improve buildings (Preiser et al 1988). There are other elements in BP, economical or financial, technical, behavioural and functional which will be dealt with, since they carry a substantial weight in terms of facilities performance implications.

## **3.0 The Problem Area and the Value of Research**

### **3.1 Theoretical Problem**

While FM had typically been utilised as an improvement strategy for manufacturing and service organisations, few articles describe how the organisations integrate BPE techniques into their processes. Very little empirical research focuses specifically on FM practices in terms of BP and as a result, the theory development and measurement issues are particularly weak in BP practices literature, and in the context of HE establishments in particular. To date, there appears to have been no systematic attempt to empirically investigate the relationship among the FM practices, organisational elements and the BP in the HE context, nor have measures of organisational FM been proposed for any of the quality practices mentioned in the general FM literature. To understand the general cause and effects, however, it is necessary to develop reliable and valid instruments for measuring FM practices as well as FM performance.

As has been emphasised by Belcher (1997), to derive any PE model suited to HE, it should be made to reflect the basic characteristics of those which constitute the specific nature of this environment. In this respect, the definition of an adapted analytical framework should enable a clear identification of these particularities and their incidence on the way in which the subject of PE in HE should be looked at.

### **3.2 Practical Problem**

The management attention given to the subject appears to have been so poor, despite the identification of its potential value for long-term survival. To deal with BPE in HE, the administration/management should have an adequate model so that it can predict the effect of its outcomes. In most (or all) HE establishments, there are no such models when it comes to improving the quality of the work carried out. Thus much more work needs to be done contextualising the implementation and the issue of maintaining momentum to explore the ambiguities within the concept as applied on the ground. Instruments to measure the success and the pertinent variables to represent all encompassing dimensions that made the performance model are really necessary at this stage. It is well documented in the literature that due to the unavailability of theory to explain the differences between successful and unsuccessful efforts of BP, performance initiatives in HE often do not succeed (Belcher 1997). Showing the strength of the correlation between performance improvement alternatives, technological development, total expenditure and actual

performance could guide the administration the ability to select the best approach accordingly.

## **4.0 Research Design**

### **4.1 Research Objectives**

Four research objectives are to be addressed in investigating the contribution of PE in HE. Firstly, it is expected to provide an operational definition of FM and PE in HE. The second objective is to analyse the level of application of quality practices in HE setting and its impact focusing on the general FM taxonomy proposed by Barrett(1992), Spedding et al (1994) & Becker (1990). The third objective is to identify and analyse the contextual importance of key PE factors that interface with the optimum utilisation of FM practices and to look for ways of enhancing their applicability through improving their uses. The fourth objective is to identify and measure the facilities performance. Identifying and measuring the critical factors of facilities performance can help to build theories and models that relate these factors among them and to FM and the environment of a HE organisation.

### **4.2 Research Questions**

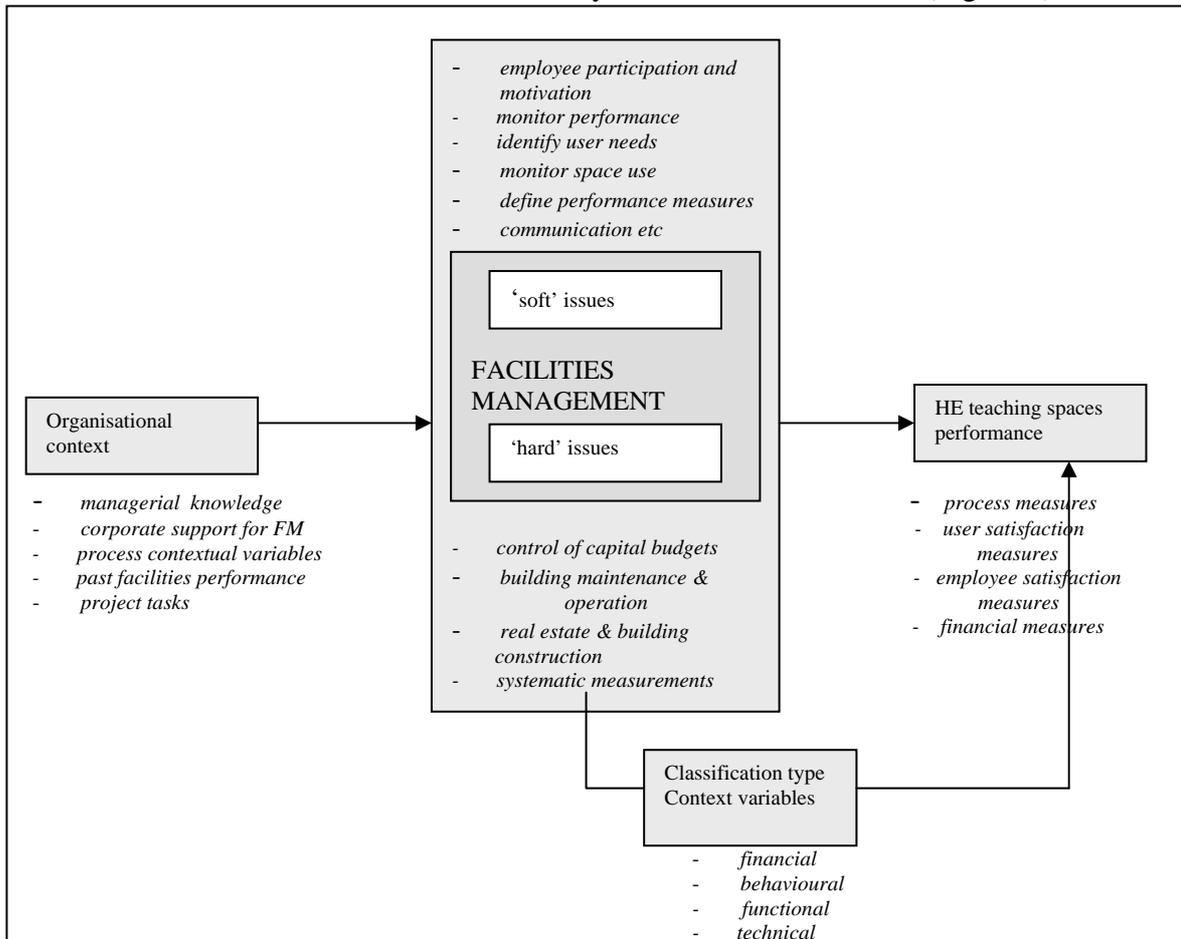
Due to the lack of sound models and empirical evidence to develop hypotheses at this stage of the research, the exploratory phase of the research will be guided by certain goals or research questions. At the end of the exploratory stage, based on the outcomes to the above questions, a full set of hypotheses and a complete framework showing all the relationships will be generated for further testing at the explanatory phase. Increasing use of the BPE concept in recent FM literature has described many different aspects, of which several are contradictory. Although the majority agree that it is a multidimensional construct, its real aspects are not clearly defined. Telling a research scientist that BP means ‘the manner or quality of functioning’ can be misleading.

Instead, the meaning of BP should encompass the values, systems and processes used to select what has been done, the way in which these things should be done effectively, and the means to measure the impact and reward results. Therefore, the research will address the following questions:

- What does BP means in the context of FM?
- What aspects of BP practices are relevant to the HE context?
- What are the processes that hinder the use of BPE practices in HE?
- What impact does BPE have on HE organisational performance?
- How does the application of BPE practices affect performance and what benefits are achieved through PE implementation?
- What BP context variables act as influencing factors for BPE practices and organisational performance, how do they affect quality implementation and how significant are the relationships among them?

### 4.3 Framework for Analysis

During the study of facilities performance in HE, the value of exploring the relationships between four types of variables will be discussed. The following framework tries to link the context variables of HE which comprise the external environment that supports the effective use of FM, core FM practices and HE performance. While the proposed factors are literature based, empirical research over time will determine the relevance and validity of this set of variables. (Figure 3)



**Figure 3 - Framework for analysis**

### 5.0 Methodology and Phases of Research

In particular, the research design will involve analysis of both qualitative and quantitative data, which will be collected through case studies. According to Yin (1994) this approach is ideally suited for areas where knowledge building is in its formative stages with few prior studies to build on. The decision for this approach of research strategy at the first instance is two fold. Firstly, due to the tenuous nature of the application of FM, BP and linkage between that and HE teaching spaces performance makes the case approach an ideal methodology for conducting scientific inquiry in this area to clarify the constructs. Secondly, this approach provides the ability to focus on the details of individual and group experiences related to FM implementation in order to preserve the contextual richness of the study.

### **5.1 Phase I - Literature Review**

First, an extensive literature review in areas concerning FM was conducted. Literature on FM in general (Lawrence 1995, Becker 1990, Spedding et al 199, Alexander 1996, Barrett 1995), literature on BP ( Hously 1997, London et al 1995, Douglas 1994, Robathan 1996 etc.) and relevant literature on POE (Preiser et al 1988, Brown et al 1997, Collins et al 1996, Green et al 1998, Riley et al 1995 etc. ) were used to identify important BPE constructs in the HE environment.

### **5.2 Phase II - Pilot Study**

At an exploratory level, the pilot study will focus on finding the practical issues of BP in HE setting. The pilot case study will help to refine the data collection plans with respect to both context of the data and the procedures to be followed (Yin 1994). The pilot project acts as an initial attempt towards giving some contribution to the research in question, by providing a more detailed and recent view of the drivers and barriers to performance evaluation initiatives within FM environments and to get some ideas for further discussions around the process involved in the successful implementation in HE, as proposed by Preiser et al (1988).

The prime purpose of this exercise is to test the interviewing method for future work, as well as to increase the understanding of what exactly has been done in practice on PE issues in HE organisations. Also, this will ultimately help to uncover the type of information that will be required to carry out a more comprehensive survey at the next stage.

The second phase of the pilot study uses a survey research approach, refining questionnaires covering a more inclusive set of implementation and day to day practised PE items and their perceived benefits. This design of the questionnaire will rely largely on the early work in the area, operationalising the constructs suggested mainly by Zeisel (1984). At this stage, the respondents will be asked to provide insights into hows, whys and whats of the PE programme. The comments, to be given by the employees or users in the context of the questionnaire will be valuable to set a workable questionnaire, in the future work.

At the end of this stage, a set of hypotheses will be constructed to cover all necessary relationships between the sets of variables. By this stage, it is expected to fulfil:

- The refinement of the constructs available in the general FM literature to suit PE in HE
- Identification of new constructs and their dimensions
- a clear idea of the definition
- statements of clear directions and possible strategies of relationships.

### **5.3 Phase III - Explanatory Study**

Following the pilot case study, a review of the inadequacies of the initial design especially in terms of the context and context validity of the established BPE

instruments, the case study research design will follow that proposed by Yin (1994). Case studies are tailor made for exploring new processes or behaviours. In this sense, case studies have an important function in generating hypotheses and building theory (Hartley 1994). The data at the organisational level can be collected by interviews with the senior administration. The individual level data need to be collected by interviewing employees and other users; In addition, tracer studies and behavioural observations will be carried out to observe the patterns of behaviour. Through this exercise, it is expected to identify organisational context and PE factors that affect HE teaching spaces performance. All the case study evidence will result in modifying and developing several representative measurement items for each critical factors and the explanation of the meaning of each. Although the individual cases help to provide a depth knowledge of the relationships studied in this research, inter-group differences and more externally valid results demand a cross-case analysis.

The type of analysis in this phase will be exemplified by the following main themes:

- Does FM practices correlate with HE organisational performance?
- Do organisations with a formal performance evaluation programme achieve more advantages than those without a formal one?
- What performance factors have an effect on PE implementation and how strong are these relationships?
- Are 'soft' issues of performance more applicable to HE than 'hard' issues? E.g.: can we correlate high uses of 'soft' issues of PE with high involvement of cost control?
- How can the balance be achieved between 'hard' and 'soft' issues?

The data collected through case studies will be subjected to principal component factor analysis (Kim & Muller 1978), using (SPSS), to refine the constructs that will appear in the final model. Path analysis will be used to test the model, determine the path coefficients and the significance of the relationships between the variables. The methodology for the path analysis will be based on earlier studies on different path analysis techniques: Adam (1994), Flynn et al (1995) – using regression analysis, and Raymond et al (1998) - using partial least squares technique (PLS). Most empirical applications of this methodology have employed multiple regression analysis. In this method, tests of the significance of path coefficients and the overall significance of individual relationships can be examined by conducting *t*-tests and by examining coefficients of determinants ( $R^2$ ) respectively.

Through analysis of path coefficients and elimination of weak paths, it is possible to refine the final model, showing the relationship among variables. This final model then can be used to test the whole set of research hypotheses developed at the end of the pilot study.

## **6.0 Conclusions & Forward View**

### **6.1 Conclusions**

By focusing on particular desired PE outcomes, and working back to discover the relative importance of PE variables in HE as determinants, it is expected that an insight into the subject can be provided. Moreover, by undertaking path analysis showing correlation between variables, and integrating all the significant relationships into one model, it will be possible to build a comprehensive framework which will help to understand the PE in HE and its impact and value. Another contribution will be to include HE related performance evaluation variables into existing frameworks of FM, which will ultimately provide an adapted model which researchers can make use of in their attempt to build generalised theories of FM. Furthermore, providing an all-encompassing definition for PE in HE and operational measures of FM in terms of certain critical factors will primarily help to expand the theoretical and empirical literature base in this currently less developed area.

The practical implications occurring from the results of this study are quite clear. By finding the correlation between the mentioned four sets of variables, HE administrators can be equipped with an effective tool to determine the value and the level of acceptance of each factor contributing to the teaching spaces and to the overall organisational performance. Also this type of model will be particularly useful as it indicates the relationships between each constituent part, and will be helpful to determine which types of relationship will be more conducive to success. The administration needs to know the status of the organisational controllables so that they can manipulate them to make organisation-wide improvements in facilities performance. The proposed model in turn will offer a reference to assess the benefits of PE. By clarifying the nature of the relationship among variables of facilities performance, it will also be helpful to derive future decisions on investment FM activities.

### **6.2 Forward View**

The potential problem with the initial stages of the research is the limited availability of empirical studies that can be used directly in developing more valid and reliable constructs for case studies. This however is expected to be overcome by analysing pilot study evidence carefully before deciding the final case study framework. As a result, the success of this phase will largely depend on the findings from the pilot study phase, which is currently in progress. While this kind of inter dependency adds more strength to research findings, it sometimes fails to make a worthwhile contribution to the understanding of the social phenomena if the approach is incomplete. To confront such an unanticipated situation, devising a contingency plan at the research design stage would be of great value. This will result in a more in-depth study to cover within and between case understanding. This more macro level approach to case studies will help to determine the differences between PE evaluation activities and reasons for FM failures amongst different types of teaching spaces, working at various stages in the technology life cycle. This case study approach can also be expanded to develop a framework towards construction of a knowledge

based system, which can be of future use, to incorporate valuable data of PE derived from case studies.

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