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# **BUILDING PERFORMANCE EVALUATION IN HIGHER EDUCATION PROPERTIES: TOWARDS A PROCESS MODEL**

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## **Abstract**

The aim of this paper, as a continuation from an initial paper( Amaratunga & Baldry 1998) is to describe the research and the findings to date, including some of the outcomes of a pilot study. The paper also aims to provide a clear understanding of the perceived role of facilities management in higher education institutions and discusses the degree to which user based measurements are used and probes into relationships of satisfaction and dissatisfaction in higher education teaching facilities using content analytical methodologies. It also presents some of the results of statistical tests of association which details where there are relationships among functional performance and behavioural aspects of users whilst there are aspects of their facilities from which they derive some dissatisfaction. The paper concludes by identifying the need for further research before performance measurement in higher education properties may be promoted as an integral part of management practice.

**Key words: Facilities management, Building performance, Higher education properties, Balanced Scorecard**

## **1 BACKGROUND**

Property is important to all businesses and organisations. The cost of this asset alone, procuring, managing and operating, should make it a resource that is high on the agenda of business managers. This applies to all organisations including universities (Housley 1997). From a business point of view and from a public accountability one, the effective and efficient management and use of the property resource is imperative for all higher education (HE) institutions.

Property of HE institutions, particularly buildings, are facilitators of organisational 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.

Facilities management (FM) exists to support the core business (Simpson 1996). There is much agreement among researchers and practitioners as to the importance of FM to both manufacturing and service organisational competitiveness and effectiveness, but understanding of FM behaviour in HE establishments, teaching spaces 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 they affect teaching spaces and overall organisational performance.

The ongoing research from which this paper is drawn attempts to identify critical performance evaluation concepts of facilities and demonstrate how they can be successfully integrated into operations of HE environments so as to attain key organisational objectives. This paper summarises some of the findings of the pilot study which was focused at the exploratory level, to examine finding the practical issues of building performance in HE setting.

## **2 A CONCEPTUAL FRAMEWORK**

### **2.1 The role and the need for assessment of facilities management performance**

FM can be defined by reference to its nature, scope and role. A number of definitions of FM appear in literature. This project is restricted to making a contribution in the field of assessment of performance of buildings. Therefore, the definition of FM drafted to this project is: *“FM is the provision of a selected range of largely building-related support services to meet core business needs”*.

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action (Gregory et al 1995). Why should one want to assess the efficiency and effectiveness of action? General management theory supports the need for assessment of performance. The organisation must first be able to measure performance if it is to successfully influence performance (Schwah 1973). It has also long been recognised that performance measures are an integral part of the planning and controlling cycle (Bernard 1962) and managers must have been planning and controlling the deployment of resources since the first organisation was established. Writers have been concerned about the management of performance for a number of years. Gregory and Platts (1995) looked at performance measurement system design, whilst Leob and Buck (1996) suggested a framework for selection of performance measurement systems. More recently, popular writers have spread the word that management should have ways of measuring quality. Bringnall and Ballantine (1996) looked at performance measurement in serviced businesses and Sinclair and Zairi (1995) studied effective process management through performance measurement. Assessment of organisational performance is now officially commended to all (British Quality Foundation 1994).

The broad management need for performance measurement can be interpreted in a FM context. FM is a major cost for most organisations (Becker 1990). For the economic health of the organisation, the senior management on the core side will want to know that the FM is performing well (Simpson 1996). Measuring of performance was one of three essential issues for the effective implementation of a facilities strategy, as cited by Alexander (1996).

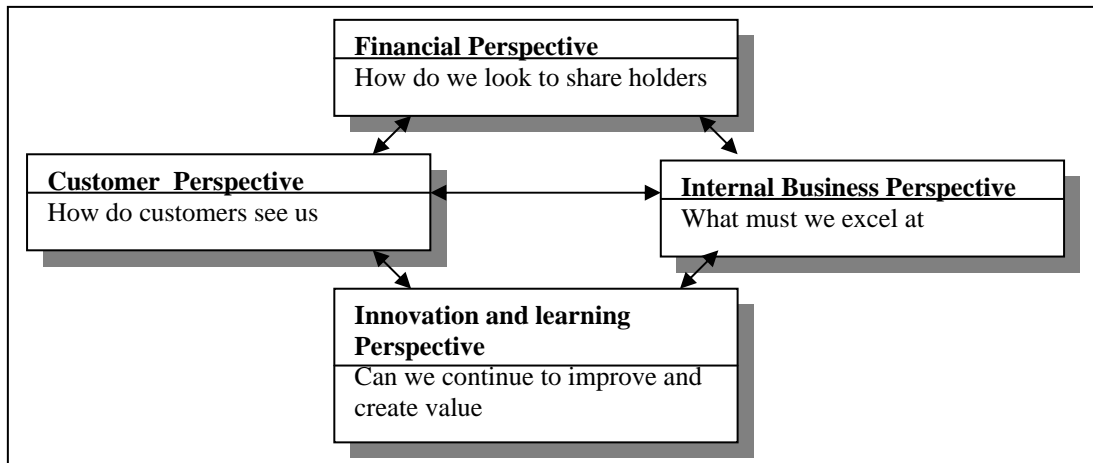
## **2.2 Facilities management and building performance**

With the emergence of FM, buildings were seen more as an enabler to core business activities (Nutt 1992). One of the major roles of FM in any organisation is to assess the ongoing quality of the facility and improve the physical building and environment, eliminate the constraints imposed by the building environment on the working practice/productivity, and manage the built environment to cope with the rapidly changing business environment (Owen 1995). How do organisations know if their facilities are supporting organisational goals and user requirements? The key is to introduce regular building appraisals (Barrett 1994). However, in most organisations, building appraisal methods are not very well developed. Organisations that are relatively good at managing the rest of their assets often have very little information concerning the performance of their buildings (Barrett 1994). Such information enables necessary control actions at all management levels to ameliorate the lack of effectiveness of the organisation if the facilities performance is not satisfactory. There is also an increasing awareness substantiated by the growing body of research (Lynch et al 1991 and Peters 1989) that there is a direct link between the quality of the workplace and the effect it has on the performance of its users. Oshaghemi (1997) stated that university employees, teachers in particular, show wide variations in the satisfaction they enjoy from organisational facilities which exist to enable them to carry out their tasks satisfactorily.

## **2.3 Financial and non-financial measures and the “balance”**

Ten years ago little mention of non-financial performance would have been made in organisational assessments (Neely 1999). Recently, however, some organisations have been more explicit about the link between financial and non-financial dimensions of performance. The notion of balance, perhaps most neatly encapsulated by Kaplan and Norton's Balanced Scorecard (Kaplan et al 1992), is widely accepted. Lingle and Schiemann (1996) have discovered that organisations which excel in their industry distinguish themselves by balancing financial and non-financial measurements, linking strategic measures to operational measures, updating their strategic scorecard regularly, and clearly communicating measures and progress to all employees.

The balanced scorecard integrates traditional financial measures with operational and softer customer and staff issues, which are vital to growth and long-term competitiveness. The balanced scorecard allows managers to look at the business from four important perspectives and provides the answer to four basic questions (Figure 1).



**Figure 1 – Different segments of the balanced scorecard (Kaplan et al 1992)**

### 2.3.1 Applicability of “balanced scorecard” to higher education environment

In order to truly provide ‘value for money’, HE institutions need a better understanding of how the interaction between people, buildings and the organisation influences the delivery of organisational goals. This requires a more sophisticated assessment of performance than the fairly crude quantitative indices or the purely aesthetic, qualitative judgements which tend to be the norm. Consistent with Kaplan and Norton’s ‘balanced scorecard’ which measures performance of core-business, the following framework was developed to measure FM provision in HE in accordance within the scope of research. It looks at the four perspectives described in Kaplan’s scorecard, within the FM provision (Figure 2).

<b>Customer</b>	➔	How do the building users see us?
<b>Financial</b>	➔	How is the FM function managed to the best value?
<b>Operational</b>	➔	How efficient and effective is the delivery of FM services?
<b>Innovation</b>	➔	How does the FM function continue to improve and assist the core business in creating value?

**Figure 2 – FM Balanced scorecard**

## 2.4 Building performance and higher educational buildings

Building performance measures would appear not be a common activity in HE buildings, particularly when compared to either public sector hospitals or private sector offices (Wood et al 1996). The recent expansion in student intake combined with financial cutbacks has revealed to many institutions the functional shortcomings of their buildings. The need to understand the part played by buildings, teaching spaces in particular, in delivering the goals of a complex modern HE establishment has never been greater. This has been recognised by the requirement of the university funding body, the Higher Education Funding Council for England, that HE establishments

should integrate buildings into their plans rather than “in many cases limit their consideration of estate matters to a list of projects they wish to pursue” (HEFCE 1992).

#### **2.4.1 Applicability of balanced scorecard**

A focus on operations rather than financial results has developed in recent years and several research studies (Cooper and Kaplan 1991) have found that many organisations' information systems include non-financial measures. They further commended that companies introduce many operational, non-financial measures and attempt to reconcile and integrate their financial and operational performance measurement systems. The applicability of such an environment in HE will be examined in order to establish a link between financial and non-financial measures as described in 3.3.1.

### **3.0 THE RESEARCH METHODOLOGY**

A study was made of the various research methodologies in order to select a suitable approach and the nature of the research and the involvement of both qualitative and quantitative data point to the use of case study methodology. 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. As the exploratory level of the research project, this pilot case described in this paper will focus on finding the practical issues of building performance measurement in HE setting. It will also help:

- ◆ to refine the data collection plans with respect to both context of the data and the procedures to be followed thereafter (Yin 1994);
- ◆ as an initial attempt towards making some contribution to the research in question;
- ◆ to test the interviewing method (Gibbs 1997);
- ◆ to set more workable questionnaires in the future work based on the feedback in the context of the current questionnaires.

The inquiry for the pilot case is less focused than the ultimate data collection plan. This information can be used in parallel with the ongoing review of literature, so that the final research design can be informed both by prevailing theories and by a fresh set of empirical observation.

### **4.0 PILOT CASE**

The case referred to in this study is a building situated within the University of Salford, UK known as the Centenary Building. It was purpose built, and is a four story building. It was the joint winner of the Royal Institute of British Architect's Education Award and the Stirling Prize for architecture.

Initially, the brief for the building was to house the schools of Electronic Engineering and Industrial Design. The university decided to exchange departments during the

construction period and the final user is the Faculty of Art and Design Technology. The Faculty of Art and Design Technology comprises of three departments: Department of Design and Creative Technology, Department of Design Practice and Department of Visual Culture, out of which the first 2 are located within the concerned building. At the time of the study, there were 34 in the faculty staff and nearly 620 students. The sample of students investigated covered undergraduates of Design Studies (year one and two), Spatial Design (year two) and the sample of staff members covered demonstrators, Lecturers and members of support staff. Also the initial study comprised of a sample of 60 students and 20 staff.

#### **4.1 Selection of Post-occupancy evaluation in the light of the case**

Post-occupancy evaluation (POE) can be defined as the process of undertaking a comprehensive evaluation of a building and implies a systematic, research based approach to considering the 'fit' between the building, the users and the organisation (Preiser et al 1988). Interest in POEs has increased significantly in recent years, although anecdotal evidence would suggest that it is a far more mainstream activity in the USA, Australia and some European countries than it is in the UK (Wood et al 1996).

POEs look at complex interactions in the real world hence are 'social' rather than 'pure' science (Wood et al 1996). Nevertheless, the range of methods employed in the case gave the opportunity to collect both qualitative and quantitative data. This pilot case concentrated on user perceptions and they were captured in ways that provided both qualitative and quantitative data. No attempt was made in this exercise to measure physical working conditions as a motivator, which has been cited as linked to either or both job satisfaction/happiness and environment. This is a complex issue, particularly in an area like HE.

#### **4.2 Choice of methods**

Because the matters under investigation were complex, several techniques in common use were employed in the POE. The data at the organisational level was collected by interviews with the senior administration. The individual level data was collected by gathering the views of employees, students and other users. Constituents other than senior management may be the best source to overcome the potential for bias (Flynn et al 1994). Questionnaires to users was the key research tool in this phase for inquiry purposes. In addition, observing physical traces (Gillian 1994, Finch 1992), observing environmental behaviour (Zeisel 1984, Waddington 1994), studying of relevant documentation (Foster 1994) were all used in the field. Documentary evidence was also sought to back up interview information regarding the dissemination of the organisation, cost information and FM and building performance measurement procedures.

## **5.0 RESULTS AND MAJOR ISSUES**

A framework was established to ensure POE measurements related to the building performance concept, ensuring their validity as performance measures. These relate to functional, financial, technical and behavioural performance. Data collection instruments were prepared to collect information on user perceptions of building facilities based on the above framework. The response rate was encouraging and the results will be used to suggest issues for further investigation.

Due to the scope of the pilot case, the quantitative analysis was carried out subject to some limitations. The measures used in the analysis were adopted from the factors pointed out in the literature. The elements in the study are consistent with findings on the measurement of POE (Preiser et al 1988, Barrett 1992, Wood 1996 and Aldridge et al 1998). In order to measure the level of satisfaction of users (staff and students), a measure which is suitable for assessing satisfaction of other categories of users in other types of buildings was used. Individual questionnaire items were used to construct the scales in the analysis.

Respondents were required to indicate:

- ◆ An estimate of how much time they spend in each type of teaching spaces;
- ◆ The quality of teaching spaces in terms of their functionality;
- ◆ The quality of teaching spaces in terms of their technical performance;
- ◆ Behavioural responses in each type of teaching space;
- ◆ Assessments of provided statements in terms of the level of expectations and what has already been provided.

### **5.1 Expectations of users**

Even though it is difficult to address the majority of findings in a presentation, every attempt was taken to address at least some of the major issues.

#### **5.1.1 Functional performance**

Functional elements deal with the fit between the building and its activities, and how well they directly support the activities within it, whilst being responsive to the specific needs of the organisation and its occupants, both qualitatively and quantitatively. To provide an indication of expectations of users on the functional performance of a teaching facility, the respondents were asked to rate the importance on a five point Likert scale (1=strongly disagree to 5=strongly agree). The responses reporting a value of 4 or 5 on the variables are labelled 'high practice', and those reporting a value of 1 or 2 are labelled 'low practice'. Respondents rating with a value of 3 are discarded in the analysis in taking any specific conclusion to eliminate any ambiguity concerning their status. Statistical analysis (using SPSS version 8.0) was conducted in order to find any appropriate relationships. From the responses received, the majority of users have thoughts on the functional performance of their facilities. Some of the findings are summarised in Table 1.



<i>Functional Performance of Teaching Spaces</i> .....	<b>Expectations – Staff</b>				<b>Expectations - Students</b>			
	<b>Mea n Score</b>	<b>S.D.</b>	<b>High Prac tice</b>	<b>Low Prac tice</b>	<b>Mea n Score</b>	<b>S.D.</b>	<b>High Prac tice</b>	<b>Low Prac tice</b>
Provision of various services including cleaning and maintenance, is managed well to retain a good level of services (S7F1)	4.14	.69	85.7%	0%	4.09	.91	77.2	7%
The management/administration should consider the 'Teaching Spaces' are functionally appropriate, where extraordinary flexibility for adaptation to changing needs should be part of the building program and design concept (S7F2)	4.14	.38	100%	0%	4.00	.98	70.1%	3.5%
It provides space and spaces for its occupants and the activities they carry out in the building (S7F4)	4.29	.49	100%	0%	3.98	.74	75.5%	5.3%
It allows and aids (and where necessary inhibit) exit and entry of people and the various goods and tools they use, to, from and among those spaces (S7F5)	4.14	.69	85.7%	0%				
It avoids putting occupants, visitors and passers-by at risk (S7F7)	4.71	.49	100%	0%	4.02	1.08	70.2%	5.3%

**Table 1 – Expectations on functional performance**

The staff appear to be generally satisfied with the functionality of their teaching spaces with mean scores in all greater than four. 100% of staff (with 4.29 mean score & .49 S.D.) and 75.5% of students (3.98 mean score & .74 S.D.) seems to be satisfied with the teaching space provision within the building. This is an encouraging sign as most writers on FM strongly emphasise the necessity of satisfaction of customers with their working space (Preiser et al 1988, Becker 1990, Barrett 1992). It was found that 100% of staff (4.14 mean score & .38 S.D.) agreed with the appropriateness of the building performance evaluation programme for its teaching spaces, while 70.1% of students (4.00 mean score & .98 S.D.) suggested the same. These results have prompted the writers to postulate the importance of FM as a major issue to improve quality of the facility in rapidly changing competitive environments.

### **5.1.2 Personal perceptions on the facility**

It is important to look into possible links between occupants' activities and satisfaction with the physical environment. Such behavioural aspects deal with the perceptions and psychological needs of the users and how they interact with the facility, as there is undoubtedly an association between the performance and behaviour of the users and the effectiveness of the building they occupy. Table 2 summarises mean scores and S.D.s of some of the personal perceptions of the facility.

<i>Behavioural aspects of Teaching Spaces .....</i>	<b>Expectations – Staff</b>				<b>Expectations - Students</b>			
	<b>Mea n Score</b>	<b>S.D.</b>	<b>High Prac tice</b>	<b>Low Prac tice</b>	<b>Mea n Score</b>	<b>S.D.</b>	<b>High Prac tice</b>	<b>Low Prac tice</b>
Increase opportunities for individual choice (S10B1)	3.86	.69	71.4%	0%	4.49	3.96	68.4%	8.8%
Encourage personal independence (S10B2)	3.71	.76	52.7%	0%	4.11	.84	77.2%	3.5%
Reinforce the individual level of competency (S10B3)	3.43	.98	42.9%	14.3%	3.82	.78	73.7%	7.0%
Improve comprehensive and orientation (S10B6)	3.67	.82	42.9%	0%	3.84	.94	63.2%	5.3%
Encourage social interaction (S10B7)	4.14	.69	85.7%	0%	4.11	.86	82.5%	7.0%
Stimulate participation (S10B8)	4.00	.82	71.5%	0%	3.98	.74	71.9%	0%
Provide individual privacy (S10B9)	4.00	1.00	57.2%	0%	3.89	.88	70.2%	7%
Reduce distractions and conflicts (S10B10)	4.00	1.15	71.5%	14.3%	3.95	.85	68.4%	3.5%
Provide a safe environment (S10B11)	4.14	1.07	57.1%	0%	4.02	.90	71.9%	5.3%
Plan for growth and change (S10B12)	4.29	.95	71.4%	0%	4.07	.73	77.2%	0%
User's interests and well being are protected (S10B15).	3.86	1.07	71.5%	14.3%	4.02	.90	71.9%	5.3%
Users feel that they are of prime importance in the provision of support services (S10B16)	4.00	1.00	57.2%	0%	4.61	5.50	66.7%	1.8%
It provides a suitable physiological environment for those occupiers and their activities (S10B17)	4.00	.82	71.5%	0%	3.89	.82	64.9%	1.8%

**Table 2 – Issues on behavioural performance**

The mean scores for each aspect ranges from 4.29 to 3.43 in the case of staff and it is 4.61 to 3.82 for students. Though there is a slightly higher S.D., the results shows the opportunities for individual choice, stimulation of participation, reduction in distractions and conflicts, growth and change, have scored high majority, whilst improvements of comprehensive orientation score low. Although provision of suitable physiological environment obtains a high value among staff (4.00 mean score & .82 S.D.), it has a low value among students (3.89 mean score & .82 S.D.). From the statistics provided in tables 1 & 2, therefore, it is evident that one needs to qualify the picture of satisfied users, which general measures of functional performance and behavioural responses tend to convey (Becker 1990, Zeisel 1984, Oshagbemi 1999)

## **5.2 Relationships among variables**

In finding some relationships/associations among behavioural issues and functional performance, the study uses correlation coefficients. The correlation coefficient is most useful from the quantitative point of view for discovering whether a pair of variables is possibly linearly related. Due to the small sample size involved in the analysis of staff responses, the Spearman coefficient of correlation (non-parametric test) was chosen as it measures the strength of the linear relationship between the variables. Pearson correlation is used to analyse the relationships among the responses of the students as it is found to be normal approximately. Accordingly, it is assumed that both groups are sufficient enough to make 'r' (correlation coefficient) reliable, a value of 'r' closer to zero will lead to a conclusion that the variables are not linearly related, whereas a value closer to one in magnitude shows that they are strongly linearly related. An intermediate value in the neighbourhood 0.5 would represent a fairly weak, but possibly useful, linear relationship among the variables.

The comparison brings out similarities and differences among the function of the facility and in the type of users for each dimension. In doing so, the study expects to explore critical dimensions of the FM process in performance measurement perspective. The correlation matrix (for both students and staff) in Table 3 covers correlation between the selected variables listed out.

Variables	Pearson's (Parametric) Correlation – Students			Spearman's (Non-parametric) Correlation – Staff		
	S7F1	S7F2	S7F4	S7F1	S7F2	S7F4
<b>S10B1</b>	r = -.027 p = .842	r = -.005 p = .973	r = .112 p = .407	r = .411 p = .360	r = .114 p = .808	r = .617 p = .140
<b>S10B2</b>	r = .548** p = .000	r = .477** p = .000	r = .375** p = .004	r = .086 p = .854	r = -.441 p = .322	r = .171 p = .714
<b>S10B3</b>	r = .448** p = .000	r = .372** p = .004	r = .394** p = .002	r = -.094 p = .841	r = -.214 p = .645	r = .331 p = .468
<b>S10B6</b>	r = .287* p = .030	r = .271* p = .042	r = .379** p = .004	r = .533 p = .276	r = .283 p = .587	r = .783 p = .066
<b>S10B7</b>	r = .307* p = .020	r = .254 p = .057	r = .394** p = .002	r = .322 p = .481	r = -.114 p = .808	r = .353 p = .438
<b>S10B8</b>	r = .555** p = .000	r = .440** p = .01	r = .516** p = .000	r = .580 p = .235	r = .000 p = 1.000	r = .418 p = .350
<b>S10B9</b>	r = .479** p = .000	r = .413** p = .001	r = .515** p = .000	r = .516 p = .235	r = .441 p = .322	r = .683 p = .091
<b>S10B10</b>	r = .419** p = .001	r = .511** p = .000	r = .533** p = .000	r = .710 p = .074	r = .428 p = .338	r = .663 p = .105
<b>S10B12</b>	r = .528** p = .000	r = .399** p = .002	r = .464** p = .000	r = .511 p = .241	r = .342 p = .453	r = .529 p = .222
<b>S10B15</b>	r = .391** p = .003	r = .304* p = .021	r = .375** p = .004	r = .626 p = .132	r = .535 p = .216	r = .828* p = .021
<b>S10B16</b>	r = .196 p = .145	r = .056 p = .678	r = .256 p = .055	r = .732 p = .062	r = .441 p = .322	r = .683 p = .091
<b>S10B17</b>	r = .516** p = .000	r = .423** p = .001	r = .526** p = .000	r = .000 p = 1.00	r = .000 p = 1.000	r = .418 p = .350

**Notes**

- ◆ \* = Correlation is significant at the 0.05 level ( $0.05 \geq p$  \*)
- ◆ \*\* = Correlation is significant at the 0.01 level ( $0.01 \geq p$  \*\*)
- ◆ The test of differences were all two-tailed probability tests.
- ◆ For variable interpretations – refer tables 1 & 2

**Table 3 – Associations among behavioural and functional perspectives – Students and Staff**

While it would probably be true to say that users appear to be generally satisfied with their teaching facility, the information on table 3 shows aspects of perceptions with which they are dissatisfied. From the table it can be seen very clearly that without any exception, the relationships among students were higher than the corresponding relationships among the staff. One conclusion from table 3, therefore, is that, in general, staff are less satisfied with their facilities from their behavioural point of view. A look at Table 3 will show that there is only one out of thirty six relationships of staff's perceptions where significant statistical differences exist, where as it is twenty nine among the students. It is interesting to know that students derive more satisfaction from their teaching facilities than staff, although it is probable that staff do not occupy the teaching spaces for as long as students.

## 6 SUMMARY AND CONCLUSIONS

This pilot case investigates the performance measurement of facilities affiliated to teaching in HE, highlighting some important issues on various aspects of building performance. Unavailability of empirical studies that can be used in developing more valid and reliable constructs in the research is expected to be overcome by analysing the pilot study evidence. The partial results of the survey show, in contrast, that two groups showed significant differences in the level of satisfaction which they derived from most of the aspects analysed. In offering possible explanations for the results of the study, it is important to note that the observed differences between the two groups, is because of the characteristics of the group as a whole. Particular areas that warrant further investigation are the relationship of 'costs' and of 'satisfaction' while there will undoubtedly be external pressure to quantify more relationships of, and influences on, performance evaluation in HE teaching spaces and the applicability of balanced scorecard principles to such an environment.

The range of 'soft' user-related measurements within the case was large moving from irregular surveying activity through to stable, regular activity and culminating in theoretical 'best practice'. The degree of commonality between the findings herein and current literature suggests that the findings could be applicable at a generic level, and thus warrant further research. The analysis of the survey has also clarified some practical issues associated with the evolution of performance measurement. Although many organisations have been seeking actively to collect data from users and were enthusiastic that their efforts in these areas were beneficial, it appears that the revolution in performance measurement in HE has a long way to go before it is promoted as an integral part of management practice.

## 7 REFERENCES

- Aldridge, S. & Rowlely, J. (1998). Measuring customer satisfaction in higher education. *Quality Assurance in Education*. 6(4). Pp.197-204.
- Alexander, K. (Ed).(1996). *Facilities management: theory and practice*. London: E & FN Spon.
- Amaratunga, D. & Baldry, D. (1998). Appraising the total performance of higher educational buildings : A participatory approach towards a knowledge-based system. *Proceedings of RICS COBRA Conference, Oxford*.
- Barrett, P.(1992). Development of a post-occupancy building appraisal model. In Barrett, P. (Ed). *Facilities management: research directions*. London : RICS books.
- Barrett, P.(1994) *Facilities management: towards best practice*. LINK CMR
- Becker, F. (1990). *The total workplace*. New York: Van nostrand reinhold.
- Bernard, C.I. (1962). *The functions of the executive*. Harvard university press. Cambridge, MA.
- British quality foundation. (1994). *Towards organisational excellence*. British quality foundation. London.

- Cooper, R. & Kaplan, R.S. (1991). The design of cost management systems: text, cases and readings. Prentice-hall, Englewood Cliffs, NJ.
- Flynn, B.B., Schroeder, R.D. & Sakakibara, S. (1994). A framework for quality management research and an associated measurement instrument. *Journal of operations management*. 11. Pp.339-366.
- Gibbs, A. (1997). Focus groups. *social research update*. [on-line serial], 19. Web: <http://www.soc.surrey.ac.uk/sru/SRU19.html>
- Housley, J. (1997). Managing the estate in higher education establishments. *Facilities*. 15(3/4). Pp.72-83.
- Kaplan, R.S. & Norton D.P. (1993). Putting the balanced score card to work. *Harvard Business Review*. Pp.134-142
- Kaplan, R.S. & Norton, D.P. (1996). *The balanced score card*. Massachusetts, Boston: Harvard Business School press.
- Kaplan, R.S. & Norton D.P. (1992). The balanced score card – measures that drive performance. *Harvard Business Review*. Jan-Feb.Pp.171-79.
- Kaplan, R.S. & Norton, D.P. (1996). Linking the balanced scorecard to strategy. *California Management review*. 39(1). Pp.53-79.
- Lingle, J.H. & Schiemann, W.A. (1996). From balanced scorecard to strategy gauge : is measurement worth it? *Management Review*. March. Pp.56-62.
- Loeh, J.M. & buck, A.S. (1996). Framework for selection of performance measurement systems : attributes of conformance. *The Journal of American Medic*. 275(7). Pp. 508.
- Lynch, R.L. & Cross, K.F. (1991). *Measure Up*. London: Mandarin.
- Neely, A., Gregory, M. & Platts, K. (1995). Performance measurement system design : A literature review and research agenda. *International journal of operations and production management*. 15(4). Pp. 80-116.
- Neely, A. (1999). The performance measurement revolution :why now and what next? *International Journal of Operations and Production Management*. 19(2). Pp. 205-228.
- Nutt, B.(1992). Facility management: The basis for applications research. In Barrett, P. (Ed). *Facilities management: research directions*. London: RICS books.
- Owen, D. (1995). Facilities management is not just a radio station. *Chartered Surveyor*. June. Pp.2-5.
- Peters, T. (1989). *Thriving on chaos*. London: Pan Books, Macmillan
- Preiser, W.F.E. (Ed). (1985). *Programming the built environment*. New York: Van Nostrand Reinhold company.
- Preiser, W.F.E., Robinowitz, H.Z. & White, E.T. (1988). *Post-occupancy evaluation*. New York: Van Nostrand Reinhold.
- Preiser, W.F.E. (1995). Post-occupancy evaluation: how to make buildings work better. *Facilities*. (11). Pp. 19-28
- Simpson, E.(1996).An assessment of facilities management performance: a look behind the scenes, a stroll around the block and a voyage into hyperspace. *Proceedings of the RICS COBRA Conference* , Bristol.
- Sinclair, D. & Zairi, M. (1995). Effective process management through performance measurement. *Business Process Re-engineering and Management Journal*. 19(1). Pp.75-88.
- Wood, S. & Worthing, D. (1996). Post-occupancy evaluation of higher education buildings: a case study. *Proceedings of the RICS Cutting edge conference*, Bristol.

Yin, R.K. (1994). *Case study research: design and methods*. Newbury park, London: Sage publications.

Zeisel, J. (1984). *Inquiry by Design: Tools for Environmental Behaviour Research*. Cambridge: Cambridge University Press.