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MATZDORF, F. <http://orcid.org/0000-0003-4479-1249>

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Benchmarking the Business Performance of Departmental Space in Universities

Fides Matzdorf
Centre for Facilities Management Development, Sheffield Business School, Sheffield, UK
f.matzdorf@shu.ac.uk
Tel +44 (0)114 225 3892

ABSTRACT

Purpose and Theory:

In UK higher education institutions, facilities management performance tends to be measured in space utilisation and space cost. A new approach uses the 'return on investment' (ROI) concept of income generation to highlight space performance at faculty/department/building level.

Design and approach:

Using space data from several English universities and data envelopment analysis (DEA), six types of academic units (departments, institutes or similar) are compared in regard of their respective research and teaching income. This technique allows mapping out the total 'envelope' with the best performers at the edge, showing what improvement/change would be needed for the others in the group to match their performance.

Findings:

This is a viable method of benchmarking and gives participating institutions better and more strategic and business-oriented feedback on the performance of their space envelope than mere cost comparisons. It can potentially inform strategic decisions about university estates. However, there are barriers to applying this approach: problems posed by issues of classification and diverse organisational structures can be overcome, but lack of collaboration of facilities/estates and finance directorates; lack of centralised, accurate and detailed data pose more serious challenges.

KEYWORDS

Facilities management, benchmarking, higher education, Data Envelopment Analysis, output, income generation.

1. INTRODUCTION

Public sector facilities management (FM) faces a common dilemma, resulting from an over-reliance on the wrong performance metrics for organisations' built assets. Using cost per unit of area as a dominant measure can encourage retention of too much low-quality estate (Price, 2007). This paper illustrates an alternative approach for higher education (HE) facilities in England. The project was designed to address the question of the feasibility of benchmarking the relationship between the *performance* of university departments and the *space* they occupy.

1.1. Current 'philosophy' of public sector/HE benchmarking

Value for money carries different meanings for different stakeholder groups. For the estates professions, and unfortunately for much governmental policy guidance, value for money translates into 'low cost'. Measures of cost per unit area/staff member/patient episode etc. still dominate performance guidelines in public sector organisations. The main focus is on measuring inputs, not outputs (Price and Clark, 2009), and in the worst cases, measurement systems encourage manipulating the measurement rather than improving outcomes (Pidd, 2005).

1.2. Current methods/measurements and their limitations

In UK higher education (HE) institutions, facilities management performance tends to be measured in space utilisation and space cost. Sapri and Pitt (2005) state that "it is important to have systems to measure the effect of the FM functions on an organisation's core business together with systems to measure FM's own performance". Within the public sector, there is a fair amount of information on the latter, but the former is often left out.

This obsession with a narrow focus on cost benchmarking has already been critiqued elsewhere (e.g. Price and Akhlaghi, 1999; Sapri and Pitt, 2005; Price and Clark, 2009). Despite widespread criticism, public sector FM appears to be slow in moving away from this paradigm (Price and Clark, 2009). For a business, an over-emphasis on cost can be misleading. Businesses ultimately measure return on investment (ROI). Estates strategies that are aligned to a business strategy should benefit from measures that illustrate the contribution the space makes to the business (Tranfield and Akhlaghi, 1995; Price et al., 2003). As the public sector is more and more orienting itself on a business model, this should be taken into account. In crudest managerialist terms, universities have facilities to earn income from either knowledge generation (research) or knowledge transfer (education) – the managerial question is how well the space supports some combination of those activities.

1.3. A new approach

"A generic solution is to develop measures, or indicators, based on outputs per unit area […] that are specific to the sector being examined" (Price and Clark, 2009). A new approach has been tested with a wider range of public sector organisations, using the return on investment (ROI) concept of income generation to highlight space performance at faculty, department and/or building level (Price and Clark, 2009; Pinder and Price, 2005).

HE estates directors need to be able to understand how effectively individual departments utilise space compared to equivalents at other institutions. Ideally, performance indicators should not be purely finance-based, but should take into account societal contributions such as research and educational outputs per unit of space – however, such an approach is impractical, since it would be almost impossible to gather all the relevant data. As a surrogate this project examined *income* per unit of space, using a statistical approach, Data Envelopment Analysis (described in the next section).

2. APPROACH / METHOD / METHODOLOGY

2.1. Data Envelopment Analysis (DEA)

Whilst DEA is increasingly used as a benchmarking methodology, it is by no means intuitive to understand, which explains why it is not as widely used as might be expected. A relatively simple mathematical explanation is: "DEA is a novel approach to relative efficiency measurement where there are multiple incommensurate inputs and outputs. If a suitable set of measures can be defined, DEA provides an efficiency measure not relying on the application of a common weighting of the inputs and outputs. Additionally the method identifies peer units and targets for inefficient units." (Emrouznejad, 1995)

The DEA approach can be used to compare ratios of outputs to inputs, such as *staff satisfaction*, *occupation efficiency*, *design efficiency*, or *profit*. It can also examine other inputs. The research presented is ground-breaking in that it has focused on how *physical space*, as input, contributes to the occupying organisation's *business outputs*.

DEA is a linear programming-based technique, which essentially uses a 'ratio of ratios' to generate a benchmarking 'map'. For the purpose of benchmarking *income generation*, we compared *'teaching income over space'* to *'research income over space'*. The top performers sit on the edge of the map (giving a new meaning to the term 'cutting edge'), and by drawing a line that joins these top performers, an 'envelope' is generated. All other units sit within this envelope.

Note that in all the cases described in Section 3, only two data points have formed the convex hulls in each case, but it is perfectly possible that more than two data points may form the convex hull, for instance if in Figure 2, AH7, AS7 or AH8 had had more teaching or research income, or a lower GIA.

Drawing a line from the 'zero point' through any unit within the envelope to the nearest point on the edge of the envelope shows how far away the unit concerned (institution, department, faculty etc.) is from being 'one of the best' and how far it would have to go, i.e. how much it would have to improve its performance in order to get there. This improvement could happen in various ways: the unit concerned could increase its income, or decrease the space it occupies/uses, or a combination of both. The necessary change can be calculated numerically on the basis of the data supplied.

Not starting at zero would be artificially imposing a minimum ratio of either research or teaching that all departments would be judged against – this would make comparison very difficult if not impossible, since most units in the sample might then have different starting points.

The approach can also cope with more than two ratios – however, the resulting envelope has more than two dimensions and cannot be shown graphically. In order to illustrate the approach graphically, it was restricted to two dimensions.

The discussion of the mathematical foundation of DEA is beyond the scope of this paper, but can be found from numerous other sources such as DEA Zone (Emrouznejad 1995). Beasley (2009) provides a comprehensive introduction to DEA, suitable also for non-mathematicians and non-statisticians.

2.2. Why use DEA?

Data Envelopment Analysis is a well established standard technique developed in the 1970s (Charnes et al. 1978), which has been extensively developed and used in economics. DEA has now become a popular tool for benchmarking, because it gives far more flexibility in comparing multiple ratios – one of the reasons why this technique has been chosen for this study.

DEA has been used widely for benchmarking public sector services: "Examples of such units to which DEA has been applied are: banks, police stations, hospitals, tax offices, prisons, defence bases (army, navy, air force), schools and university departments. Note here that one advantage of DEA is that it can be applied to non-profit making organisations." (Beasley, 2009)

Whilst DEA has been used in a range of higher education benchmarking studies (e.g. Johnes and Johnes, 1993 and 1995; Madden & Savage, 1997; Tomkins and Green, 1988; McMillan and Datta, 1998; Tomkins and Green, 1988; Ahn et al., 1988; Beasley, 1995), none of these studies have focused on or included the institutions' facilities or their facilities service provision.

2.3. Method of data collection

Since this benchmarking exercise focused on departmentally ‘owned’ and used space, it was important to *exclude* genuinely multi-user, centrally timetabled teaching space, but to *include* space dedicated to one department or shared exclusively between two (even though formally it might be centrally timetabled).

The data required for the exercise could be compiled in a small spreadsheet. Ideally, members should enter data for all departments in the institution, but if this was not possible/available, or the institution wanted to start with a few selected units, the minimum for obtaining any sensible output was:

- the business school or equivalent;
- the art and design department (if there was one);
- one lab-based science department;
- one non-lab-based department with a high research reputation, and hence income;
- one engineering department (if there was one);
- one ‘flagship’ teaching department.

The data required for each unit are the potential outputs supported by the space for each department and would ideally include (**minimum** data requirements in **bold**):

- name of department to be benchmarked
- space (ideally broken down further):
  - dedicated teaching
  - office/meeting space
  - labs/workshops
  - sports halls/studios
  - computer labs
  - other
- **total gross internal area (GIA)**
- **departmental staff numbers (as full-time equivalent, FTE)**
- departmental undergraduate student numbers (FTE)
- departmental postgraduate student numbers (FTE)
- **departmental research income** (from grants and funding from HEFCE, the Higher Education Funding Council for England)
- **departmental teaching income** (from student fees and funding from HEFCE)
- **departmental 'other' income,** ideally broken down further into
  - 'discretionary income'
  - research project income
  - special projects income
  - short and self-financing income

More detailed data, such as FTE student numbers, broken down into undergraduate and postgraduate, further breakdown of space and income, would help to develop a more detailed profile for each institution.

Each participating institution was given a spreadsheet form, which was sent to its senior contact, usually the estates or facilities director, and invited to submit the data they wished to enter.

As organisational structures vary widely within the UK HE sector, the method of accessing and collecting the relevant data had to be determined internally by each participant.

3. RESULTS

3.1. Project participants and coding

Of course, difficulties arise when trying to assign institutional units to certain categories. Comparing 'like with like' requires classification of departments. These categories have to be based on the type of space as well as the type of 'core business' of the departments concerned. In order to keep good-size samples and to avoid confusion, the number of categories was kept to a minimum. Of course, a different business focus or institutional orientation invariably leads to different combinations of subjects and hence different mixes of disciplines and spatial uses.

For example, in this project a problem arose with the classification of a School of Building and Architecture: it could not be clearly ascertained whether it should be classified as ‘engineering’ or ‘humanities’ – in the relevant graphs this will show up as a question mark.

As the research progresses, categories are expected to evolve further. For a start, the following classification was used:

B Business or Management School
E Engineering
H Humanities & Social Science
M Medical / Health
P Education
S Science & Technology

The codes used consist of the code letter assigned to the institution plus the classification code for the unit (faculty, school or department). The results of the current paper are based on a pilot sample of 5 institutions, anonymised as A, B, C, D, and E, with altogether 43 participating departments.

Where an institution has more than one unit from the same faculty, e.g. several science departments, these are numbered as S1, S2, S3 etc. There is an exception in the codes: AH1 is a Business School and should strictly speaking be named AB, but the project participant considered it part of their Humanities section.

3.2. Data

The data were collated in a spreadsheet and cleaned up. They were then exported into a specialist software application (Frontier Analyst®) to generate the graphs illustrating the ‘envelope’.

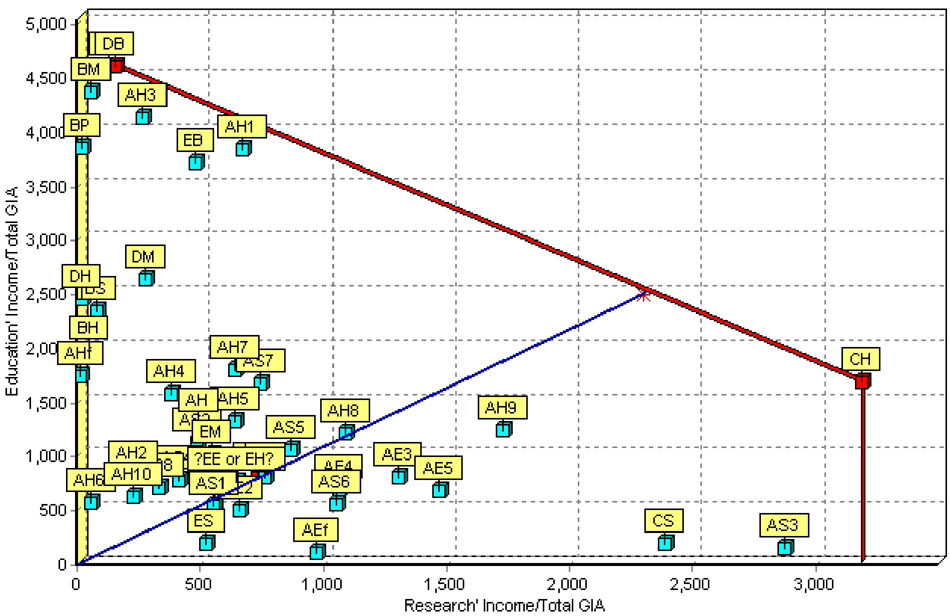

Figure 1: Research and Teaching income per unit area of departmental space

Patterns emerge that make sense: In the top left-hand corner there is a cluster of units doing particularly well on educational income (DB, BM, AH3, BP, EB and AH1). This includes a number of business/management schools, but also an Economics Department, a Faculty of Social Care and a Faculty/School of Education. As business schools tend to be flagships for their institutions, any business school *not* in that corner would pose immediate questions.

A smaller cluster of three in the bottom right-hand corner (CH, CS, AS3) shows departments doing well on the research and consultancy side. If AH9 is included in this cluster, three out of the four departments look as if they are 5*-rated (at the time of the project the highest rating in the UK's research assessment exercise, attracting the highest level of funding).

The top performers on the teaching side are:

DB	Business School
BB	Business School
BM	Medical School
AH3	Economics Department
AH1	Business School
BP	School of Education
EB	Management School

The top performers on the research side are:

CH	Department of Arts History & Media – 5 rating
AS3	Specialised research (Ergonomics & Safety) – known to get a lot of consultancy income
CS	School of Science – 5A rating
AH9	Social Science Department – 5* rating

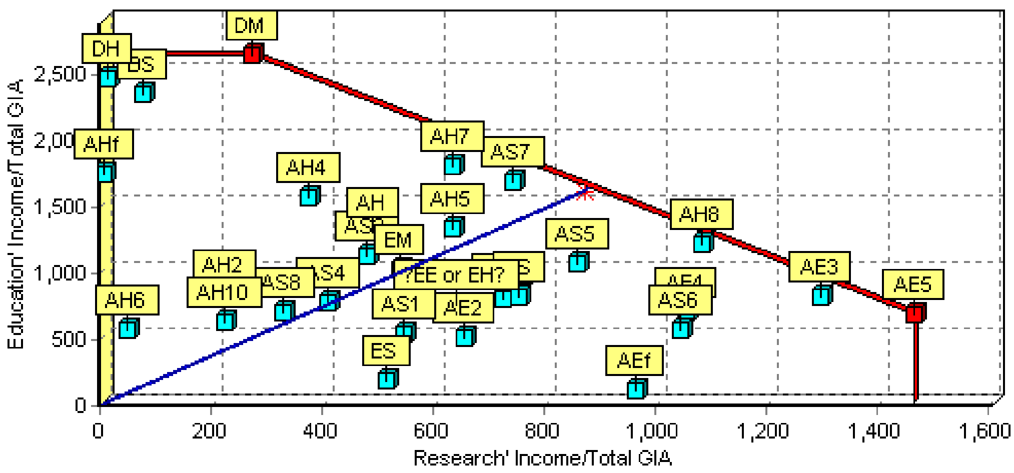

Figure 2: Research and Teaching income per unit area of departmental space, with the 'stars' taken out

Taking out the 'stars' (the best performers that formed the edge of the envelope in Figure 1) allows a closer look at the 'best of the rest'. Those departments that showed as second-best in Figure 1 now form the new envelope, which makes it possible to differentiate better between the other organisations.

Institution D, which showed up well in the overall institutional analysis, again seems to appear highly efficient. Did they and C pick out 'star' departments/schools for this project? Only A and E have put in some 'middle-of-the-road', 'mixed-economy' departments. Again, it would be vital to get further data for a more complete picture.

The top performers within this envelope are:

Teaching
DM Health, Sport & Science
DH Creative & Cultural Industries
BS Science & Technology

Mixed
AH7 Politics Department
AS7 Mathematics
AH8 Sport

Research
AE3 Civil Engineering
AE5 Mechanical Engineering

Different pictures emerge when the data are split by discipline (as in the next 4 graphs). Given the diversity of structures and groupings of subject areas in HE institutions, categorisation can only be approximate, but nevertheless it is a basis for comparison. Further refinement of the data collection methods will be needed in the future. For example, it has been very difficult to categorise a School of Environment and a School of Architecture, since both included science, engineering, and social sciences elements. One possibility would be to enter the same unit several times, under different headings, but there is a risk of skewing the comparison. As research in this area is ongoing, categories will be further refined as the database grows.

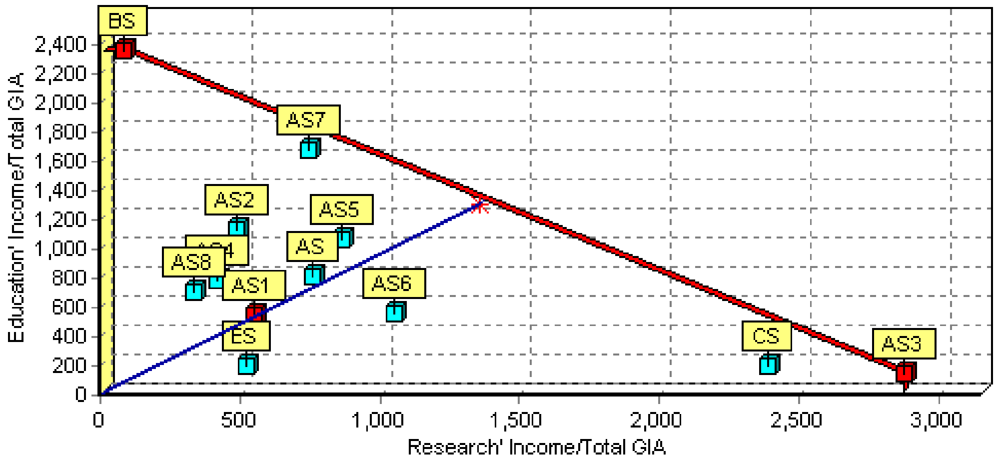

Figure 3: Science units

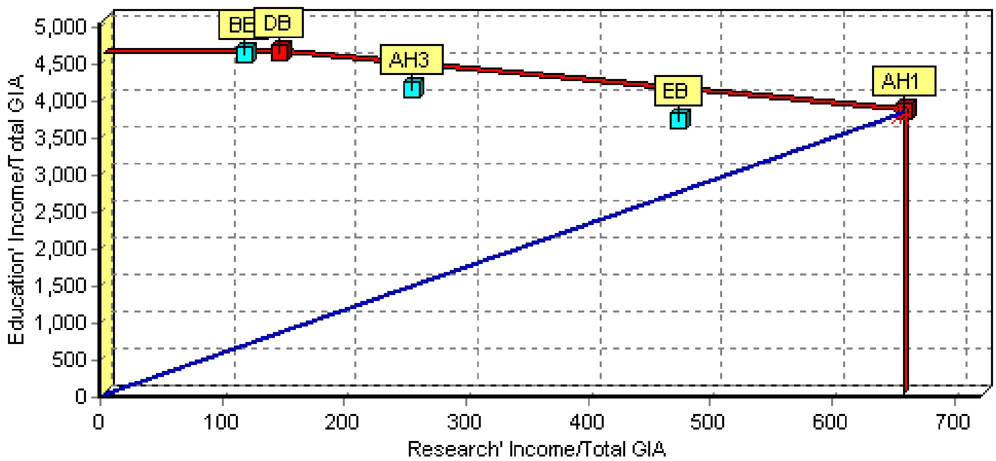

Figure 4: Business schools and one economics faculty

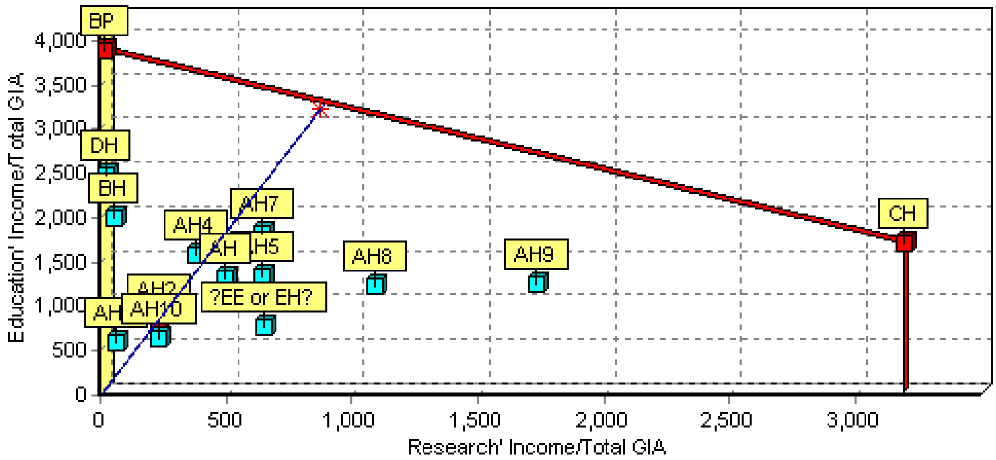

Figure 5: Humanities / design / environment units

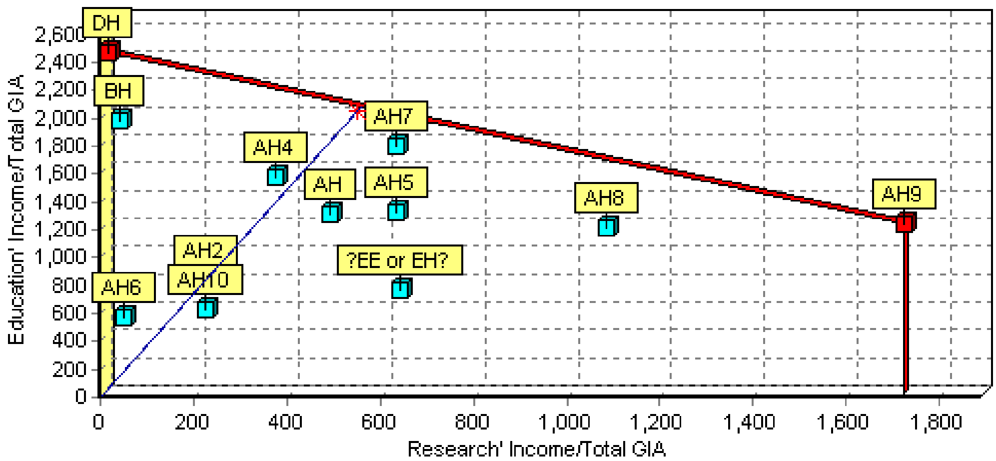

Figure 6: All humanities / design / environment etc except B's School of Education and C's History of Art

Although engineering departments were one of the main categories, there is no graph for them yet, since only one institution so far submitted data in this category.

Whilst University A appears to have a range of particularly efficient departments, we may also ask if they have more accurate data – this would be quite likely, since they have been involved in this project for longer than any of the other institutions. This in itself is an achievement that should not be underestimated.

4. ISSUES ARISING

4.1. Capital projects

Most institutions have some capital projects underway and they may show up as an increase of space without added income; but this problem can be overcome by entering ‘old’ and ‘new’ space separately, i.e. doing a ‘before and after’ comparison. This, in turn, could be used for longer-term benchmarking within an institution.

4.2. Diverse structures

Hardly any two institutions have the same structure, neither in organisational nor financial terms. Universities can be structured into colleges, schools, faculties, departments, or any combination of these. Income and/or space allocation can be based on any of these units, or a combination thereof. As mentioned earlier, this can cause significant problems for assigning units to categories.

4.3. Locus of information

Again, this depends on structure. For example, whilst the estates/facilities directorate has high-level information on space, space information at departmental level is not necessarily held by the estates division, but can be managed at school/faculty level. The same applies to financial data, student and staff numbers.

4.4. Cross-departmental collaboration

In most cases project participation meant that the estates/facilities directorate had to liaise with other departments in their institution (e.g. central finance division or individual faculties) to obtain the necessary information. This raised a number of issues, e.g. where relevant data are held within an institution, or internal politics vs. cross-departmental collaboration. Since almost invariably the information required is not held in one place, but ‘owned’ by different departments, this benchmarking exercise becomes an exercise in collaboration and crossing of departmental boundaries. In some institutions these working relationships had already been well established, but not in all.

5. CONCLUSIONS AND FURTHER WORK

The graphs show how well an institution’s units are converting space into income, compared to other institutions. They also show up departments that have space problems in relation to their income.

However, as is the case with all numeric benchmarking methods, one has to remember that *figures do not give answers but pose questions*. Whilst the numeric results give a first overview, flagging up problems or identifying apparent 'top performers', they do not reveal the full picture (nor are they meant to). So they should be followed up by further research (e.g. site visits, interviews, links to other data, especially space quality data/ratings such as building condition and functional suitability) to give more in-depth insights into the causes of 'good' or 'bad' performance.

So whilst the DEA approach cannot alone provide evidence to confirm or refute the hypothesis that in the long run low-quality facilities are less likely to attract high income, it is a highly important step in this direction.

As pointed out earlier, more detailed and accurate data are needed. Apart from being a tool that can be an excellent basis for ‘space discussions’ and space working groups, the DEA approach can also be used to start up or continue a dialogue between departments within a university.

Whilst Yorke et al. (2005) argue that “the more important outcome for institutional policy-makers and managers is the demonstration that standard institutional datasets can be mined for insights that have potential operational value”, the research described here goes further to demonstrate that these data can actually have *strategic* importance for high-level decisions about university estates.

The author knows (personal communication) that estates directors found the information useful to underpin their ‘strategy conversations’ with vice-chancellors and faculty deans. In other words, taking this business-focused approach enables facilities managers to demonstrate the real value that FM can contribute not just to buildings, but to the business overall.

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