A revised approach to performance measurement for health-care estates

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Daryl May, Facilities Management Graduate Centre, Sheffield Hallam University

Professor Ilfryn Price, Facilities Management Graduate Centre, Sheffield Hallam University

Daryl May, Senior Research Fellow, Facilities Management Graduate Centre, Sheffield Hallam University, Stoddart 7242, City Campus, Sheffield. S1 1WB. d.may@shu.ac.uk

ABSTRACT

The purpose of the research was to show how lean asset thinking can be applied to UK health care facilities using different measures to compare the estates contribution to the business of health care providers. The challenge to conventional wisdom matches that posed by 'Lean Production' to 'Mass Manufacturing'. Data envelope analysis examined the income generated and patient occupied area as outputs from the gross area of a NHS Trust's estate. The approach yielded strategic comparisons that conventional facilities management (FM) measures of cost per m^2 hide. The annual cost of an excess estate is conservatively estimated at £600,000,000 (in England alone). Further research to understand the causes of the excess is needed. Meanwhile the research illustrates the power of an alternative way of assessing facilities performance. The authors are not aware of the lean asset perspective previously being applied to healthcare facilities. The research shows the underlying fallacy of relying on cost per m^2 as the primary measure of asset performance. The results and discussion will be particularly useful to senior estates and facilities managers wishing to use new measures to define strategic estates targets.

Keywords.

Lean assets, performance measures, strategic FM, business criticality, healthcare

Introduction

Facilities Management (FM) and related property professions / specialisms suffer from a concern with inputs to a business – the building and its services – rather than the outputs that the building contributes to.[1-5] The problem largely disappears in industries such as retail or hospitality and healthcare in the USA where the physical facility is an obvious component of a firm's servicescape[6] but elsewhere it is acute. Attempts to classify FM as an input[7] perpetuate a facilities pushed rather than a business pulled view. An analogy can be drawn with Womack et al's distinction between mass and lean manufacturers.[8] The former, having invested in large presses to stamp automotive body parts sought to optimise efficiency by maximising production runs between changes of dies. A build up of finished goods inventory (unsold cars) was seen as an asset and

valued accordingly. Apparent production line efficiency was maintained by a large stock of work-in-progress inventory (components). The Japanese, especially Toyota, driven by a need to do more from less physical space ultimately developed what became known as lean production with the 'clock-time' of the production line pulled by orders from the customer. A drive to greater flexibility in the stamping processes (expressed as a goal of single minute exchange of dies) became part of the lean philosophy.

Western executives were sceptical. As one Detroit vice president put it to Peter Senge after a visit to Japan in 1985 *they didn't show us the real plant* however the concept proved exportable to North America and Europe.[9] In a revealing comparison of a Toyota plant in the USA and a General Motors plant Womack et al. found the former producing the same volume of cars, at higher quality and lower overall cost, from 38% less physical space.[8] FM needs to deliver equivalent savings. By way of example modern agile offices, open plan designs which work, can be shown to enhance perceived productivity, and in some case business outputs from typically 25 % less floor area.[10-12] Such cases do require a different managerial paradigm and a different business language about workspace: a challenge comparable to the switch to lean manufacturing hence the suggestion of the Lean Asset[a].[10] Part of the necessary challenge is to develop alternative measures of facilities performance.

This paper offers a brief summary of lean asset thinking applied to office environments but is primarily concerned with health facilities in the UK's National Health Service (NHS). The National Health Service, set up in 1948 provides heath care services free at the point of delivery throughout the UK. Under the Department of Health, a central government department, services are delivered by local NHS Trusts who run hospitals and other local health facilities. There is now evidence suggesting that patients are aware of health facilities and do place importance on these services - for example the physical environment, cleanliness, quality of food, ease of car parking etc. The early research findings from patients exercising choice, suggests that patients will use factors such as ease of car parking, cleaning standards and food service when making their choice of hospital to attend.[4,13-14]

Health care buildings, especially those concerned with in-patient treatments, are also physically and technologically complex compared to those in most other sectors where the facility is critical to the customers choice. It should be no surprise that it is especially in healthcare that an executive level role has developed for Facilities Directors.[7] In no other business is there the same combination of technological risk and customer criticality.

The Facilities Management Graduate Centre (FMGC) at Sheffield Hallam University has been conducting research into FM in the NHS for since 1994.[10] The centre co-ordinates a research programme on behalf of a group of NHS Trusts and Private Sector FM Healthcare Providers who collectively work. In 2006 they asked for a re-examination of the issues of value measurement and the route to achieve it. The question hides a dilemma. Value for money means something different to different stakeholder groups. For patients / taxpayers there is clear evidence of the impact of facilities on perceived value for money. For many, but not all clinical services, facilities services impact on perception and increasingly patient choice. For the estates professions, and unfortunately for much governmental policy guidance on value for

money, it still translates into low cost. Measures of cost per unit area/staff member/patient episode etc. still dominate performance guidelines. Meanwhile in the current climate, and expressed in admittedly crude commercial terms, for UK NHS Trusts value for money increasingly translates into income.

It is exceedingly doubtful whether a focus on cost per square metre in particular translates into best value for either NHS Trusts or patients, or indeed best use of built assets. In extreme cases low cost per square metre can be obtained by having a large estate in barely useable condition – the equivalent of an excessive inventory - when there is a growing body of evidence as to the influence of quality facilities on patients and staff. In simple terms the dilemma, which is common to many areas of FM, can be expressed by the alternatives in Figure 1. Resolution depends on discovering better ways to assess 'value-for-money'. Without them the question about routes to achieving the same is not relevant.

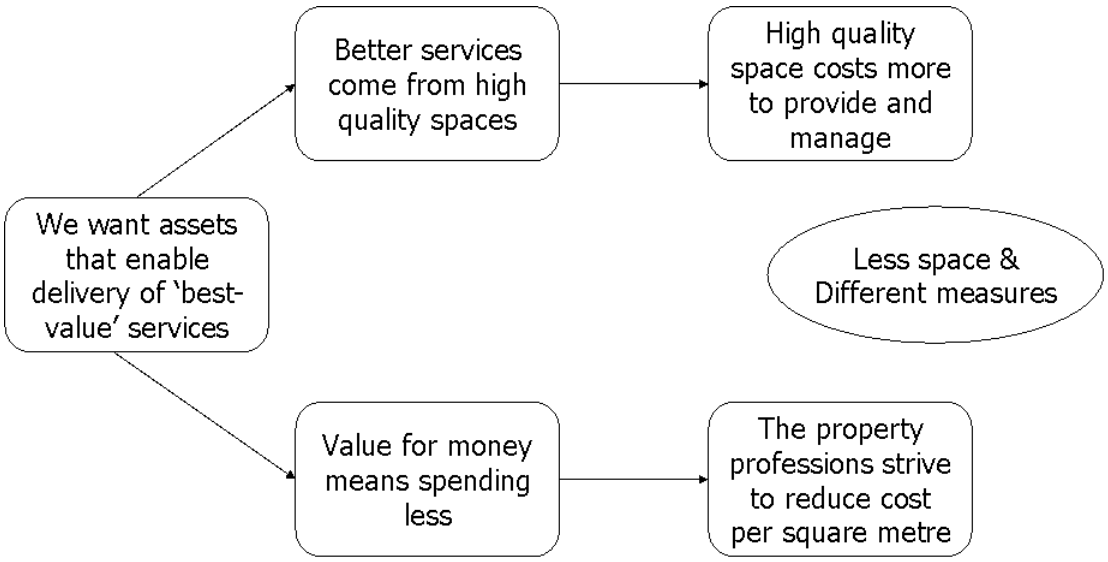

Figure 1 The lean asset dilemma.[10]

Consider Table 1 (reprinted from Price[10]). It shows the 'back office' or civic accommodation portfolios of two UK City Councils. Council B has office space which on average costs 13.51% more per m^2. However, being a well managed council[b], B supports its front line service delivery by proportionally fewer back office staff, which it accommodates more effectively in higher quality, more efficiently occupied offices. The net result is that as a proportion of total turnover Council B spends less on its back office accommodation and supports a turnover per m^2 that is nearly 50% higher. When user satisfaction and occupation efficiency are benchmarked the Council B portfolio is one of the upper quartile performers.[3] Council A falls in the lower quartile. When the true costs of space are compared, using notional rental values or other indicators of the cost of wholly owned buildings the biggest driver of overall costs is invariably the total area. A study commissioned by the Royal Institute of Chartered Surveyors (RCIS) estimated a total cost of £18 bn due to the typical UK office occupying ca 25% more space than the best performers.[12]

	Council A	Council B	Difference
Gross Turnover	£2,200,000,000	£1,100,000,000	-50.00%
Accommodation NIA m2	92,000	30,800	**-66.52%**
FM Budget	£25,000,000	£9,500,000	-62.00%
Cost per m2	**£271.74**	**£308.44**	13.51%
Turnover per m2	**£23,913.04**	**£35,714.29**	**49.35%**

Table 1 Comparative performance of two Civic Accommodation portfolios.[10]

In UK universities an even more directly commercial measure is available by looking at the relative performance of each estate in terms of the income generation supported. In Figure 3 'A' is the best performer in terms of research income and 'D' the best performer in terms of teaching income. 'B' and 'C' perform well on different combinations of the two income streams while the unlabelled institutions are shown in their best relative positions[c]. Again the majority of institutions in the sample are 20 to 30% less efficient.

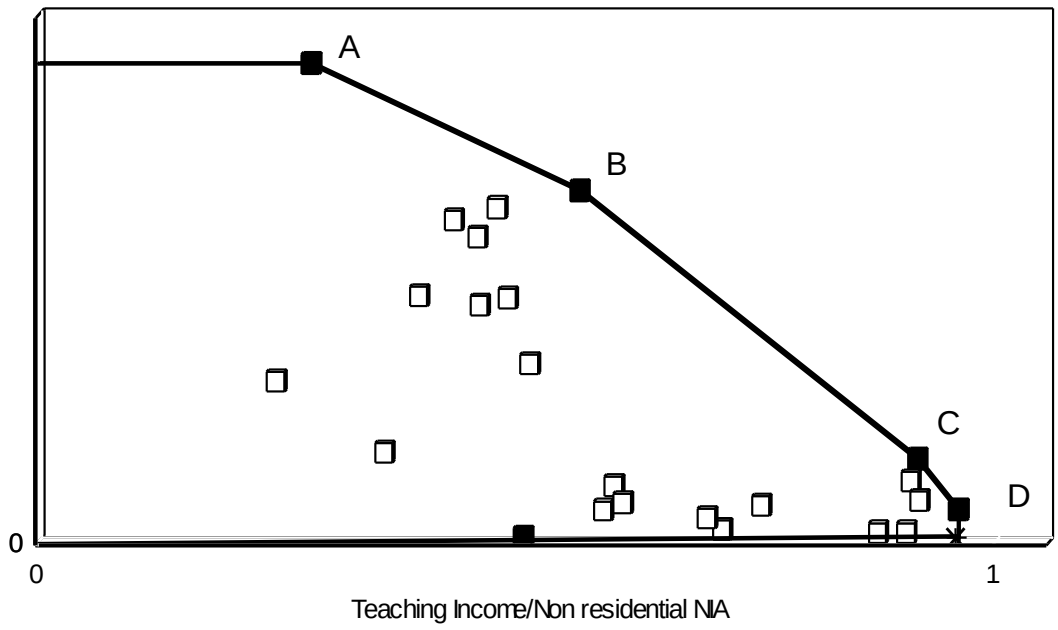

Figure 2 Comparative income generation by a sample of UK Universities.[3]

Other factors of course contribute to the differences but the analysis highlights which institutions are maximising the income generated in the estate and which are not. It provides an immediate snapshot of value for money in a way that conventional cost measures do not. If a particular institution is only generating about 50% of the

normalised income from its estate of a competitor it is, at best, in a situation that needs urgent examination, and at worst at risk[d].

As the above examples illustrate a search for 'value-for-money' should start by looking for indicators of how effectively a facility supports the goals of the organisation that uses it: the outputs realised from the space. We are not aware of prior research into healthcare facilities that has adopted such an output based stance. The investigation has accordingly focussed on the feasibility of finding such indicators using readily available data. In practice in the UK this means the annual *Estates Return Information Collection* (ERIC) data returns that all NHS Trusts have to complete for the Department of Health. The ERIC data enables the analysis of estates and facilities information from NHS Trusts and Primary Care Trusts[e] (PCTs) in England. It is a compulsory requirement that Trusts submit a return.

Methodology

We were supplied[f] with the following data from the ERIC returns for all trusts in the UK:

Trust type	Total number of staff employed - WTE
PCT Income	Gross internal site floor area (m2)
Trust Income	Patient occupied floor area (m2)
Total capital investment - £	Non-patient occupied floor area (m2)
Estate services costs - £	Available beds (No)
Total FM (Hotel Services) costs - £	Income from staff (£)
Investment to reduce Backlog Maintenance-£	Income from visitors (£)
Income from Leases	Income - Non patient trading activity (£)
Cost of Leases	Income from commercial businesses (£)

The data derive from the 2006 returns (based on the 2005/2006 financial year). There are clearly issues of data consistency, especially in relation to PCTs[g] however the average figure for 'hard FM' (estates costs plus capital) per m^2 at £172 is double that for soft FM at £79. Given the fact that some soft FM costs are related to area the figures are compatible with those for other types of building. In business terms the space is however an input. It is there to earn an income and/or support the delivery of patient health. The questions should be:

1. How effectively is the space used to deliver care services?
2. How patient focussed is the asset?

As a surrogate for question 1, within the available data, we examined Trusts' total income[h]. There is scope for argument about how effectively income mirrors health care

delivery. We have however had to assume that income is, for similar groups of NHS Trusts, broadly proportional to the number of patients treated. We have therefore compared the ratio of income per unit area of the estate. As surrogate for question 2, (efficiency of the asset design) we have used the proportion of the total gross internal area (GIA) that is devoted to direct health provision: i.e. that which is classified as patient occupied as a surrogate for the efficient use of the overall resource. For a first analysis therefore we chose two output measures the total income and the 'patient occupied floor area' both in relation to the input measure; the GIA of the estate.

We used the same analytical method as was used to generate Figure 2; an approach called data envelopment analysis or DEA. In brief it compares the efficiency of units in a sample on two or more performance measures, weighting the results to present each unit in the best possible relative position. Units whose efficiency cannot be bettered by others in the sample are assigned an efficiency of 100%. The relative efficiency of other units can then be computed. Pinder and Price describe the method in more detail and provide references to original textbooks.[3] DEA can be used to contrast more than two ratios at a time. Unfortunately since the resulting 'envelope' is multi-dimensional we have restricted the analysis to two dimensions separately. There are inevitably potential errors in either ratio. We discuss them later in the paper.

The project was constrained by the time and available funding. The results presented here therefore describe an initial screening of the major NHS Trust categories. The sample is anonymised in order to protect participating organisations. The ERIC data used contains all the NHS Trusts and PCTs in England. There was 570 NHS organisations within the ERIC data set.

Results

Primary Care Trusts

The reported income for PCTs averages £2,497 per m^2 a figure which hides a range from £178 to £106,921 per $m^{2.}$ Two obvious explanations are errors reporting the estate and confusion of commissioning income and income in respect of directly delivered services. For these reasons no sensible comparisons were able to be analysed and presented.

NHS Acute Trusts

NHS Acute Trusts provide secondary care services within a hospital setting. Teaching hospitals were excluded from the analysis because of the possibility that their spatial configurations and income streams would differ. For the remaining NHS Trusts the reported income per m^2 ranges from £3,430 to £1,276 per m^2 with a mean average of £1,888. The range seems more realistic. Unfortunately a small number (seven) did not show patient occupied area figures so had to be excluded from the analysis. The distribution of the remainder (Figure 3) does not suggest any obvious special cases.

However the profile of relative efficiencies (Figure 4) suggests that only 4 other NHS Acute Trusts are within 10% of the best performing units (the red envelope in Figure 3)

with the largest number being only 61 to 70% as efficient. Such a figure is low compared to other groups of public sector assets that have been analysed in this way.

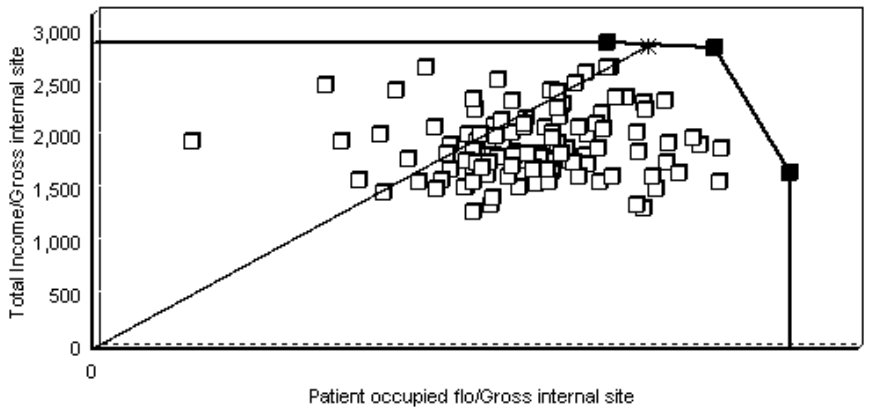

Figure 3 Income generation and Patient occupied area for NHS Acute Trusts in England

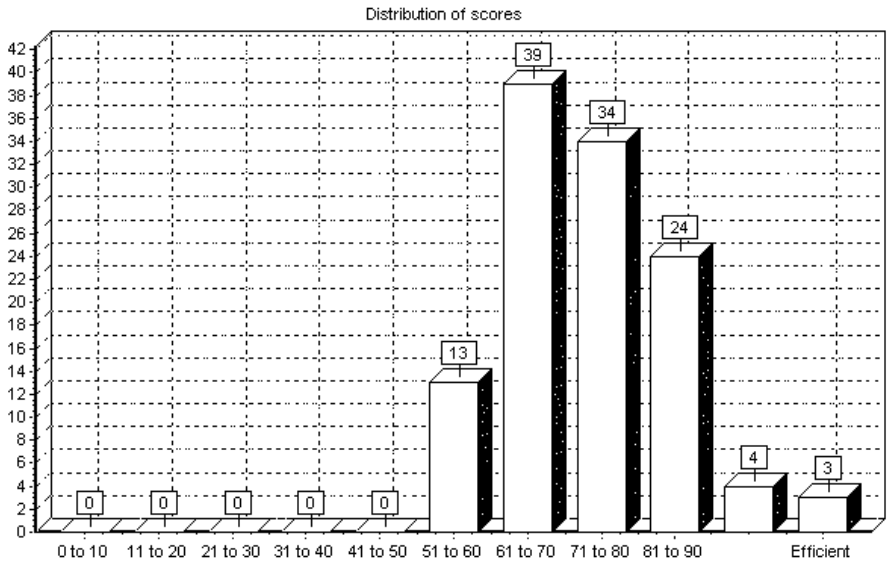

Figure 4 Histogram of the trusts in Figure 3 showing their efficiency relative to the three 'envelope' units.

Erring on the side of caution we recalculated the relative efficiencies excluding the three NHS Trusts that were 100% efficient in the first analysis. The revised frontier plot and histogram are shown in Figures 5 and 6. Four NHS Trusts now achieve 100 % efficiency; that is on some weighted combination of the two ratios their performance cannot be bettered by the remaining NHS Trusts left in the sample. The modal inefficiency changes to the 70 to 80 % range and the overall pattern is more consistent with other sectors. The result merits further scrutiny. It suggests that 92 of the 115 NHS Trusts for which the analysis could be completed are at least 10 % less efficient than the best in terms of the overall portion of their estate devoted to patient care and/or in respect of the income earned from that estate. A majority, 63, are more than 20% less efficient. To the extent that income reflects the throughput of patients - an assumption

that is admittedly a generalisation - the results suggest that either NHS Trusts are using their space less effectively or are handicapped by having too much non-productive space. To put the figure into perspective the total combined estate in the sample is 11,708,831 m^2 operated at an average hard FM cost of £176 (estates costs plus capital) per m^2. Using the same method of calculation as Bootle and Kalyan employed on behalf of RICS that space is costing £412,023,689 per annum.[12] The figure is an estimate but does as explained err on the side of caution. In contrast the ERIC data indicate a total spend on soft FM in the same year of only £1,072,266,163. Better value might be obtained by focussing on the apparently wasted space rather than efforts to make small cuts to cleaning or maintenance budgets.

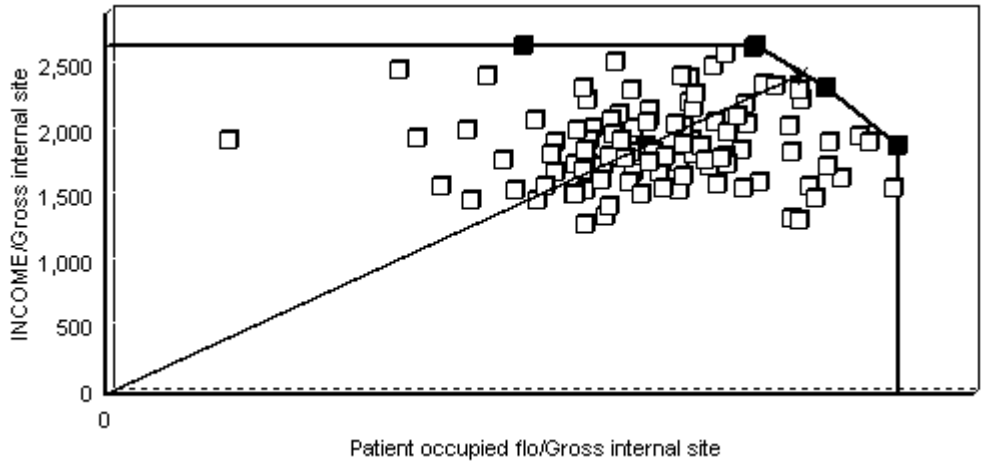

Figure 5 Recalculation of the plot from Figure 3 excluding the three best performing NHS Trusts

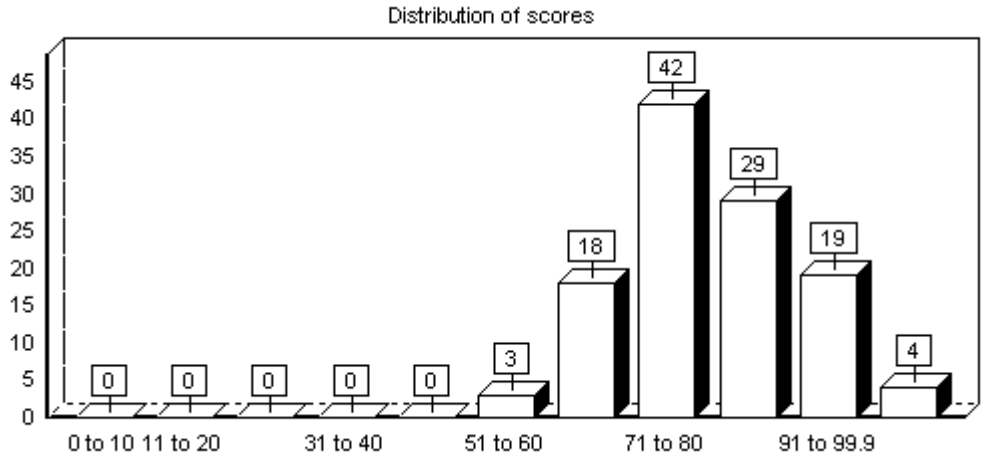

Figure 6 Histogram of the data presented in Figure 5

Mental Health Trusts

Mental Health Trusts provide health and social care services for people with mental health problems in a community or hospital setting. The income figures for NHS Mental Health Trusts are comparable to the Acute sector with income ranging from £3,120 to

£1160 per m^2 with a mean average of £1,803. The same analytical procedure was followed and the data for 57 Mental Health Trusts were included in the analysis.

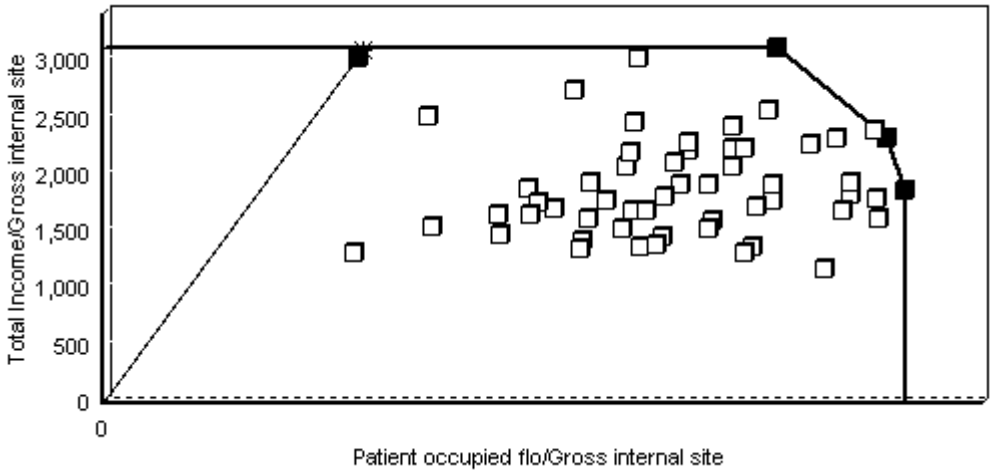

Figure 7: Comparative efficiency of Mental Health Trusts in England

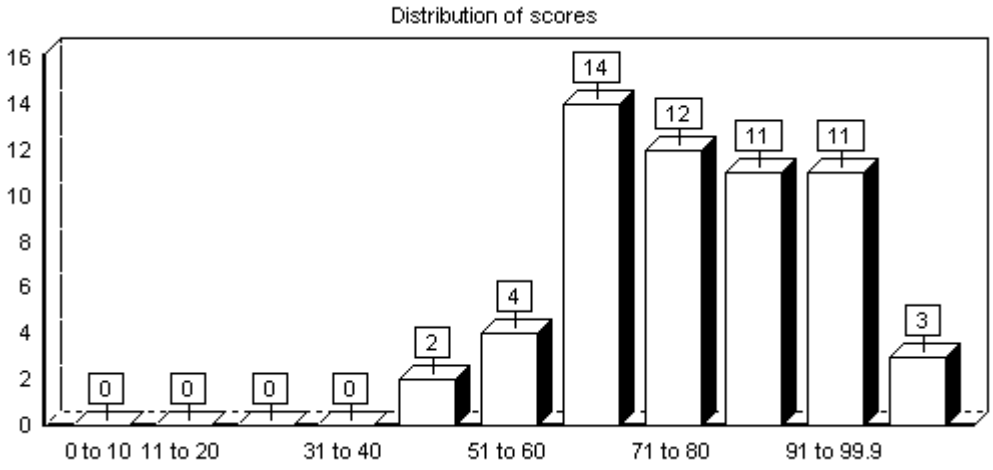

Figure 8: Histogram of data presented in Figure 7

Again the picture is similar. The tail of less efficient performers is perhaps longer and deserves more detailed examination. No immediate pattern was apparent from examining the identity, type and location of the more efficient performers. The average cost of space (hard FM) in these trusts is similar at £174 per m^2 however given the smaller estate the cost of a 20% inefficiency is only ca £122,000,000 per annum.

NHS Specialist and Teaching Trusts

Specialist and Teaching NHS Trusts are Acute hospital Trusts that may provide specialist care (for example cancer) or combine teaching and research activities with one or more local universities. There were 41 NHS Specialist and Teaching Trusts

included within the analysis. Figure 9 shows the results for both London based and non-London based NHS Specialist and Teaching Trusts. The three 'envelope' units are all non-London specialist centres. A London Teaching NHS Trust with an efficiency of over 99% is also effectively an envelope unit. At the opposite extreme another London Teaching NHS Trust is apparently very inefficient (to the left of the diagram). No NHS Teaching Trust outside London achieves an 80% relative efficiency and the majority are less than 70% as efficient. Their general relative efficiency does raise a question about how the space and income for such services is apportioned between NHS Trusts and universities.

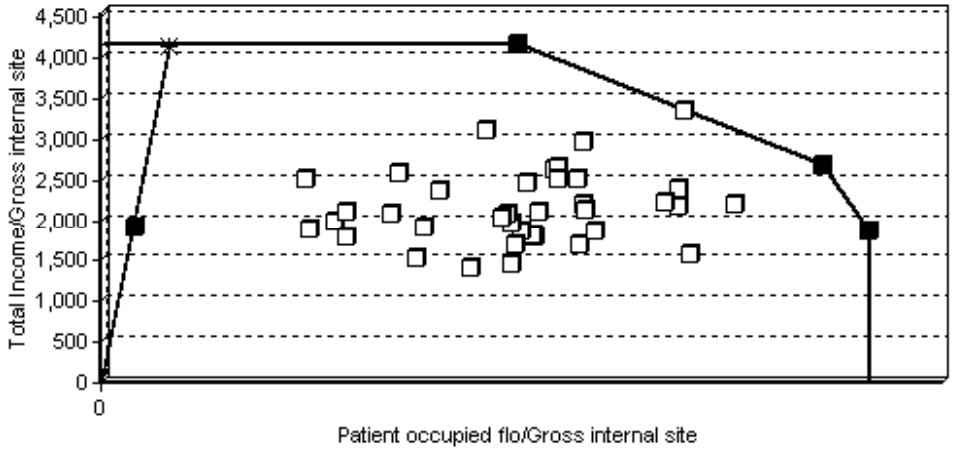

Figure 9 Comparative efficiency of specialist and teaching trusts

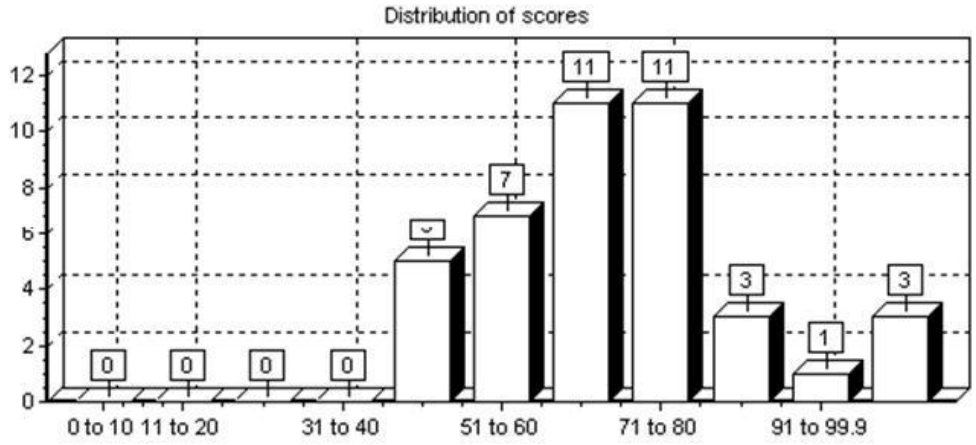

Figure 10: Histogram of data presented in Figure 9

Discussion

An admittedly preliminary analysis shows a considerable variation in the apparent efficiency of, and income generation from, the estates of different NHS Trusts. The prospective cost of this inefficiency is large. If overall there is 20% more space being used than needed - a conservative estimate given the distributions presented - then the

extra expenditure may be over £500,000,000 per annum. The figure is calculated from the mean cost of estates services in the sample.

Similar inefficiencies have been calculated for commercial offices and appear in work completed using DEA on universities and civic accommodation[12]. What explanations might there be and what proportion of the inefficiency might be recoverable. These are questions that deserve more detailed research given the sums involved? The following list explores possible options.

1. The **apparent inefficiency is inevitable** in that if you analyse any group of facilities in a search for relative efficiencies you will find differences. In one sense this is true but that is not a reason for understanding the possible causes and seeking to minimise them. To not do so is to ignore the issue.

2. The **data are bad / inconsistent** and compares different variables. Again the argument can always be made. The existing data on PCT income in particular and perhaps on PCT estates appears very confused. The analysis of the NHS Specialist and Teaching NHS Trusts suggests special cases meriting further research. There are two other sources of potential bias in the data which cannot be eliminated. The GIA figures captured in the ERIC returns include residencies and built car parks. Both would tend to distort the ratios especially the patient occupied space. Outdoor parking, on the other hand can produce an income without appearing as space. In spite of this the comparisons appear to give a consistent picture and the analysis has erred on the side of caution in excluding the apparently very good performers. The total income figure includes income from staff or visitors (for example car parking charges, restaurants) and therefore could distort a patient income figure indicating output. However the extra is on average only 0.4% of all Trust income and is individually nowhere more than 2%. It seems unlikely that data inaccuracies are the major explanation.

3. Site **specific constraints on designs** make some inefficiency inevitable and not all designs can achieve the same efficiency. Case studies and comparisons of plans would be needed to test the potential influence of design.

4. The **data have been analysed at Trust level only**. The data presented above have only been analysed at the aggregate Trust level and not at the level of specific hospitals or sites. To analyse the data at this level we would need the income allocation per site. These data are currently not part of the mandatory ERIC returns.

5. Older buildings were less efficiently designed. Again site specific analysis would be needed. The data we had did not allow such a comparison.

6. As **functionality changes with time** efficiency decays because local accommodation solutions have to be patched in. Again this could not be tested and it is a subject meriting further research. Indeed it might be a more generic issue in facilities management. In the specific NHS context the possibility merits research to anticipate potential changes in demand on PFI sites.

7. Changes to space cannot match **changes to clinical practice**. This issue, while real is a sub set of 5) and 6*)*.

8. The inefficiency is an inevitable **price of political decisions** to keep traditional local hospitals/sites running in the face of changing clinical practice and demand. Yet again more research is needed. However the variations in relative efficiency occur in all types of NHS Trusts and the first overview of the Acute Trusts does not suggest particular categories are more or less efficient. Further comparison by Trust type is required.

9. Different **non clinical needs** introduce variations. Possible sources have been described above. Others could occur where, for example, NHS Trusts have invested in shared facilities but the GIA figure is listed against one Trust or site. Again this is a possible cause whose influence would need more specific research if its magnitude were to be determined. The obvious cases of NHS Specialised and Teaching NHS Trusts have been excluded. Training suites, cafeterias, laboratories, meeting spaces etc might also increase the space but bring in less income than patient occupied space however a comparison of output measures should focus attention on such space. In contrast a traditional cost per m^2 measure would tend to be improved by any excessive, but cheap space.

10. There are **local power games with space** such as a tendency to hoard or a demand for executive offices. Comparisons with other sectors would suggest a potentially strong influence. Again the output measures bring such inefficiency into sharper focus.

11. The inefficiency is a result of **over reliance on measures of cost per m^2.** Cost per square metre benchmarking makes portfolios with a relatively large proportion of poor quality, poorly serviced and maintained space appear relatively efficient while concealing underlying inefficiencies in the total use of the built resource. To the extent that this is true it represents the wastage induced by the dilemma illustrated in Figure 2.

Above all perhaps the guidelines by which new facilities are designed and spatial norms are calculated need to be scrutinised. It is not yet clear whether the excess space is designed in or accumulates with use. If the former there is the added risk that extra capital and embodied energy is being wasted.

This study has proved capable of placing a discussion of estates strategies on NHS Trust executive board agendas in a way that traditional building condition data did not achieve. Further work is now required to research the consumption of space by different service areas and develop means to further describe the estate in service and business language.

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[a] Lean Asset™ and the Lean Asset™ are registered trademarks of Sheffield Hallam University

[b] Judged by the Audit Commission, by Beacon Status for Asset Management and by a national poll of Council managers

[c] In formal terms the diagram is calculated using a technique called data envelopment analysis which weights at least two output / input ratios to show each individual unit under comparison in the best possible light. The 'envelope' units (A,B,C & D in the example) are treated as 100% efficient. The relative efficiency of other units ca n then be calculated.

d The data in the diagram are six years old. One of the underperformers has subsequently been taken over, others have taken urgent action to rationalise their portfolios and dispose of parts of the estate.

[e] Primary Care Trusts (PCTs) are groups of general practitioners, opticians, dentists and pharmacists. They provide primary services and commission hospital (secondary) services.

f By Michael Bellas, Senior Estate Analysis Manager, Estates & Facilities Division Department of Health

g Under current UK policy PCTs are responsible for commissioning health care, that is they contract for delivery from other forms of NHS Trust. They also provide certain health facilities.

h For completeness other income streams are included. They represent on average only 0.4% or the total figure.