smg space management group

UK Higher Education Space Management Project

Managing space: a review of English further education and HE overseas

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Managing space: a review of English further education and HE overseas

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Executive summary

Scope of the study

This study considers approaches to space management outside the UK HE sector, to see how they might contribute to UK HE space management guidance. It investigates the method used by the Learning and Skills Council (LSC) to assess space needs in the further education (FE) sector in England, and researches examples of higher education (HE) space planning and management in other parts of the world. The study was commissioned by the UK HE Space Management Group (SMG).

The LSC approach

Our assessment of the LSC's approach made allowance for the differences in space needs between the HE and FE sectors, for example the space requirements for research activity in higher education institutions. The purpose of the exercise was to see if the principles behind the approach could make an effective contribution to space management in HE and, if so, whether any adaptations would be useful.

The LSC approach is driven by the number of guided learning hours. Guided learning hours are broadly the equivalent of teaching contact hours in HE. The LSC uses guided learning hours as the main driver because sector-wide research found that the size of colleges' estates correlated closely with the number of guided learning hours delivered.

Its approach has two main components:

a. Advice on how individual colleges can build up a profile of their space needs based on the number of guided learning hours, target rates of space utilisation and areas per workplace (for example in a lecture theatre or a laboratory), depending on the type of guided learning activity. The profile will vary according to each college's teaching and learning methods and the scope of its curriculum.

b. Formulae which can be used to calculate the predicted size of a college's estate. The formulae are based on the performance of the top quartile of colleges in terms of their space efficiency in delivering guided learning hours.

International review

Our international review focused on examples of space management guidance and methods in Australasia, North America, Hong Kong and Germany. We found that a range of methods is employed, including the publication of high level ratios of different types of space, space standards and target utilisation rates. A number of the methods had similarities with the LSC approach.

Comparison and conclusions in relation to UK HE guidance

Many of the space management concepts and methods used by the LSC and researched in the international review are familiar to UK HEIs, although they may be expressed in different terms. However, the majority of HEIs do not routinely build up space needs profiles based on the volume of activity to be delivered for comparison with space available. Such a method would be a useful addition to current UK HE space management guidance by providing a means for assessing the capacity of the existing estate, and whether there are surpluses or shortfalls of particular types of space.

However, the availability of data to support such an approach is an important consideration, particularly in terms of the number of contact hours. Two case studies carried out suggest that availability of sufficiently detailed information is likely to vary widely between institutions.

The SMG model for benchmarking the size of HEIs' estates, available at www.smg.ac.uk/the_model, is already based on a similar methodology to that used by the LSC to derive guidance areas. Research was undertaken during the study to test the feasibility of replicating the LSC approach more closely,

but it was concluded that the multi-variable SMG model is at present a more powerful explanatory tool.

Recommendations

Three recommendations are made in the light of this study.

1. We recommend that a space management tool is provided for the UK HE sector which would enable HEIs to develop a space needs profile. Given the diversity of practice within the sector, it is proposed that this should be in the form of a framework giving the structure of the method, with default settings which can be followed or overridden by HEIs depending on their own individual circumstances. Further details of such a method, in the form of a space need indicator framework, are set out in the SMG report 'Review of space norms' (www.smg.ac.uk/resources).

2. We recommend that the SMG model is retained in its present form as a tool for benchmarking the size of HEIs' estates, pending any significant change in the effect of key drivers of estate size.

3. The LSC guidance on the total amount of space to be provided by colleges is based on the performance of the most efficient quartile, in terms of the relationship between numbers of guided learning hours and total college floorspace. By comparison, the SMG model is based on the average space performance predicted across the sector for a given profile of drivers. It is recommended that additional information is provided to HEIs in updates of the SMG model in the form of space predictions based not only on the average performance, but also on the performance of the top quartile for a given profile of strategic drivers. This would provide an additional benchmark related to the performance of the most space efficient institutions in the sector.

Introduction

This publication is the outcome of a study conducted by Kilner Planning and London Economics. The brief for this study was twofold. The Learning and Skills Council (LSC) has developed an approach to help further education colleges in England to assess space needs. One objective of this higher education (HE) space management study was to look at the extent to which the approach could be applied or adapted to HE. The brief was also to research examples of international HE space management methods and guidance, and to investigate whether other approaches could add value to UK HE space management guidance and practice.

The study is part of phase two of the Space Management Project (SMP). The project is under the direction of the UK HE Space Management Group (SMG), supported by the four UK funding bodies for higher education: the Higher Education Funding Council for England (HEFCE), Scottish Funding Council (SFC), Higher Education Funding Council for Wales (HEFCW) and the Department for Employment and Learning (in Northern Ireland) (DEL).

Scope of the report

The report has three main sections. The first focuses on the LSC method. The second investigates international practice. The final part draws together the conclusions of the research and discusses the scope for additions to the UK space management toolkit.

Overview of the UK HE space management project

All published reports, and previous research mentioned in this document, are available on the web at www.smg.ac.uk.

Phase one	Review of practice	*July 2005*
	Drivers of the size of the HE estate	*July 2005*
	The cost of space	*July 2005*
Phase two	Promoting space efficiency in building design	*March 2006*
	Impact on space of future changes in higher education	*March 2006*
	Managing space: a review of English further education and HE overseas	*September 2006*
	Space utilisation: practice, performance and guidelines	*September 2006*
	Review of space norms	*September 2006*
	Space management case studies	*September 2006*
	Space management project: summary	*September 2006*

The Learning and Skills Council approach

From the outset of the research into the LSC approach, it was recognised that there are important differences between the higher and further education sectors. A key difference is the research activity in HE. The focus of the study was on assessing whether the principles behind the LSC approach could make a contribution to effective space management in HE.

This part of the report begins with an introduction to the LSC approach, the background to its development and the way that it is used in the English FE sector. It describes its main components and compares it with HE guidance and practice.

During the study, case study work was carried out into the application of its main principles in two HEIs. The findings of the case studies are discussed, together with the outcome of some sector-wide modelling of space calculations using statistical methods similar to those employed by the LSC.

Introduction to the LSC approach

The LSC approach provides guidance to colleges on how to assess how much and what type of space they need. The central driver underpinning the approach is the volume and type of guided learning activity that needs to be accommodated on site. This is measured in terms of the total number of guided learning hours to be delivered over the academic year. Guided learning hours are defined by the LSC as:

'All the times when a member of staff is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. It also includes time spent by staff in assessing a learner's achievements, for example in the assessment of competence for National Vocational Qualifications. It does not include time spent by staff in the day to day marking of assignments or homework where the learner is not present. It does not include hours where supervision or assistance is of a general nature and is not specific to the study of the learner.'

Guided learning hours are broadly the equivalent of teaching contact hours in higher education. Colleges collect this information to make an annual return to the LSC as part of the individualised learner record for each student.

The approach to space needs has two main components. The first is advice on how individual colleges can build up a predicted profile of their space needs using guided learning hours, which can then be compared with what they have now. It enables them to identify in what areas, for example in different types of teaching space, there are shortages or surpluses. This could be described as the 'bottom up' part of the approach.

The second, or 'top down', component is the publication of formulae in the form of guidance areas on the overall amount of space to be provided by colleges. The guidance areas are based on the performance of the top quartile of colleges measured in terms of their space efficiency in delivering guided learning hours. This component allows colleges to see whether they have more or less space than the guidance areas would predict for the volume of teaching activity which they provide.

The LSC issues the approach to colleges as guidance. It is not mandatory. It is presented as a toolkit of the different components, which colleges can then use to help them plan and manage their estates.

The tools allow an individual college to compare:

- its actual area with the guidance area for the college, calculated using LSC formulae
- the utilisation of workplaces in the college with a target level of utilisation
- the average area used to provide workplaces for different activities compared with LSC guidance on workplace areas

- allocation of proportions of floorspace for various kinds of activity compared with LSC guidance on floorspace allocations
- the cost of overprovision of floorspace with the benefits of reduced but more effectively employed floorspace.

The guidance can inform the preparation of property strategies. It is also used by the LSC as a basis for decisions on capital funding. The LSC promotes efficient use of space and requires an increase in effectiveness of use as a condition of project consent. The approach is applied in a financial context where the level of funding available to the sector assumes efficiency gains, and encourages colleges to use their premises more cost effectively.

Supplement A 'Guidance on College Property Strategies' to LSC Circular 02/20 notes:

> '(The) guidance can be used to assist managers in assessing how the college estate can be more efficiently managed to contribute to the improvement of facilities and finances. …The governors and management of each college are expected to keep their college's estate under constant review with the aim of improving its effectiveness, its efficiency and its economy. …Each further education college is free to retain the amount and quality of student and staff facilities it can afford to maintain in the long term.'

Background

The LSC and its predecessor, the Further Education Funding Council (FEFC), have periodically issued guidance on assessing space needs since incorporation in 1993. The current method is described in LSC Circular 02/20 and its supplements.

Prior to 1997, the FEFC advised colleges to use methods which were based on student numbers (space full-time equivalents, FTEs) as a driver of space need and on levels of workplace utilisation. On this basis, it generally followed that the more students a college had, the larger its predicted space needs would be.

The LSC moved away from space FTE student numbers as the key driver of space needs because of the increasingly wide variation in what full-time attendance actually meant. Different teaching methods meant that further education institutions (FEIs) with the same FTE student numbers could have very different space needs.

Instead, the LSC focused on the use of guided learning hours. It took the decision to base the assessment of space need on guided learning hours in the light of statistical analysis carried out across the FE sector as a whole. The LSC had decided to investigate a range of variables which might explain the size of FEIs' estates, including student numbers, income and the number of guided learning hours. It developed a regression model for assessing the effect of different variables and used sector-wide data. This form of analysis is very similar to the research into the key drivers of the size of the HE estate carried out in phase one of the Space Management Project. This is described in the SMG report 'Drivers of the size of the HE estate' and is used in the SMG model (www.smg.ac.uk/the_model) for benchmarking the size of HEIs' estates.

The LSC modelling showed that the total number of guided learning hours delivered by a college was closely linked to the size of its estate: the more guided learning hours delivered, the larger the estate was found to be. The correlation was closer than with student numbers. Other factors, such as income, were also found to be good explanatory variables, but not as powerful as guided learning hours.

There have been major changes in the FE estate in England since incorporation. Total floorspace (gross internal area) fell from 9.1 million m^2 in 1993 to 7.6 million m^2 in 2003. Over the same period, learner numbers increased from around three million to four million. The LSC found that over the 10 years, most colleges cut the average on-site daytime guided learning hours for full-time students. In fact, the fall in the total number of hours taught, as reflected in guided learning hours, offset the increase in student

numbers. This meant that despite the overall growth in student numbers, the need for floorspace fell.

The LSC has a working party which keeps the approach to assessing space needs under review. It looks at trends in the number of guided learning hours and the need for facilities resulting from changes in the style and pattern of teaching and learning and the impact of information technology. A study now under way is revisiting some of the space standards and categories which are used, although it is understood from the LSC that that the basic principles of the approach are unlikely to change.

The main components

The next two sections of the report describe the main steps entailed in following this approach. They are:

- building up the space profile
- sector-wide guidance for colleges.

Building up the space profile

The LSC advice focuses on calculating the amount of space needed to accommodate the guided learning hours to be delivered on-site during the daytime. The focus is on the core daytime period on the grounds that this is when most of the teaching takes place. Therefore if space needs predictions can accommodate peak demand, they should also be able to address evening, weekend and out of term time activities.

The standard assumption in the guidance is that on-site accommodation is available for 40 hours a week over a standard 36 week learning year. Thus, there are 1,440 hours available for learning during the year. The actual numbers of hours available could vary depending on the practice of individual colleges.

If all that time and all the space in an institution were used at 100 per cent efficiency, the minimum number of workplaces needed to accommodate the hours of guided learning activity would be the total number of guided learning hours divided by 1,440 (using the standard assumption given above). This gives a calculation of the absolute minimum number of workplaces that would be needed to support the planned activities. The higher the number of hours that space is assumed to be available in terms of either hours in the week or weeks in the year, the lower will be the minimum number of workplaces.

However, the approach recognises that 100 per cent efficiency is not achievable. The actual number of workplaces needed will be greater than the minimum, to reflect the fact that not all workplaces will be in use all the time. The number to be provided can be calculated by applying a target utilisation rate. For example, if an institution calculated that the minimum number of workplaces it needed was 1,000, and that it would aim for a target utilisation rate of 40 per cent, the number of workplaces to be provided would rise to 2,500 (1000/0.4). The higher the target utilisation rate, the lower the number of workplaces that will be needed, and consequently the smaller the floor area that will be predicted: for example, at a higher target utilisation rate of 50 per cent, the number of required workplaces will reduce to 2,000.

Once the target number of workplaces has been calculated, the floor area to be provided is a function of the number of workplaces multiplied by an area per workplace. The area per workplace will vary depending on the type of activity carried out. For example, less space is needed per workplace in classrooms compared with workshops or studios.

This method will generate a predicted floor area to accommodate a given number of guided learning hours. If the number of hours is forecast to change in the future, the method can also be used to project the corresponding change in floorspace needs.

This is the approach used to derive the teaching space component of the total floorspace. In addition to this, an allowance needs to be made for other types of space. The LSC approach makes provision for these in terms of the proportions that each type of space might comprise to build up a total area for an

institution, although it recognises that this is broad brush and that there is a lot of variation in the sector.

The predictions can then be compared with actual space available to assess:

- whether there is an overall surplus or shortfall in space
- whether there are mismatches between types of space needed and space available
- how target utilisation compares with actual utilisation
- how the planned area per workplace compares with the actual area.

All the calculations relate to the non-residential gross internal area (GIA) of a college, but they exclude:

- farm, equestrian and horticultural buildings
- third party leases for non-educational purposes
- parts of the floorspace provided for community use, for example where buildings are provided to a larger scale than would be needed for college use and have been funded by an external body.

The individual steps to build up the profile are as follows:

1. Calculate the minimum number of workplaces

Take the total on-site daytime hours of learning to be delivered and divide by the total daytime hours available during the teaching/learning year.

For example, if the institution has 2,000,000 on-site daytime learning hours and there is a 40 hour daytime teaching week and a 36 week teaching year, the minimum number of workplaces would be 2,000,000 divided by 1,440 (40 x 36), that is 1,389 workplaces.

2. Calculate the number of workplaces needed at the target utilisation rate

Take the minimum number of workplaces and multiply by the reciprocal of the target utilisation rate.

For example, if the target utilisation rate is 50 per cent, the number of workplaces needed would be 1,389 multiplied by 2 (or 1,389/0.5). This would generate a total workplace need of 2,778.

3. Calculate the breakdown of the total number of workplaces needed by space type

Break down the total number of on-site daytime learning hours into types of space needed using the space categories given in Table 1.

4. Calculate the areas needed to accommodate these different activities

Multiply the total number of workplaces broken down by space type by the areas per workplace given in Table 1. The space categories and workplace areas in the table are based on advice set out in Department of Education and Science (DES) Design Note 37. It is likely that these will be revised in the light of recent research into current practice in the further education sector.

5. Calculate the total teaching space need

Add together all the subtotals generated in Step 4.

6. Assess total institutional space

All the steps so far have focused on building up a profile of teaching space needs. The LSC approach notes that the proportions of different types of space in colleges are likely to be in the order of those given in Table 2, although again these proportions are under review.

Once the figure for total teaching space needs has been calculated, the predicted areas for the other types of use can be generated, as well as the projected total for the institution as a whole.

7. Comparison of projected space needs with actual space

By doing these calculations, a college can develop an aggregate picture of how much space it theoretically needs and compare the result with the actual space it has now. It can be used as a guide for identifying areas of over or under provision and for considering how space management measures might be used to maximise the effective use of space.

Table 1: Breakdown of space categories

Room type	m^2 per workplace
General teaching rooms	
1. Lecture theatres (or close seating arrangements)	1.0
2. Teaching in informal groups	1.8
3. Teaching with demonstration facilities	2.5
Specialised teaching rooms	
4. Commerce and business (computer rooms)	2.7
5. Science and technology (laboratories)	3.0
6. Art and design studios (other than large scale work)	3.2
7. Crafts, large scale art and design, home economics, carpentry, plumbing (workshops with benches)	4.5
8. Catering and hairdressing	6.5
9. Welding, motor vehicle work, installation trades	7.5
Learning	
10. Resource based learning centres	2.5

Table 2: Proportions of different types of space

Type of space	Likely proportion of total GIA floorspace (%)
Teaching	43-50
Learning	10-17
Administration, catering and communal areas	15
Balance	25

Sector-wide guidance areas for colleges

Once the LSC identified guided learning hours as the most powerful explanatory variable of the size of college estates, it developed guidance areas for the total amount of space that colleges should provide, based on assessment of the space performance of institutions across the sector. This was done in the following way:

- the LSC estimated the relationship linking the gross internal area of colleges that it funded to the driver of guided learning hours
- it identified the top quartile of space efficient institutions on the basis of this relationship
- it then re-estimated the model using the top quartile of institutions only
- it generated a predicted area for each institution based on the re-estimated data from the top quartile
- it computed the sector-wide excess space by comparing actual space provision with the prediction from the model.

On the basis of the modelling exercise, it was concluded that if all institutions could replicate the performance of the most efficient quartile, 30 per cent of the space in the LSC sector would be surplus.

The output from this modelling exercise was used to generate guidance areas for colleges based on the performance of the most efficient quartile. These are presented as formulae. There are two separate formulae because the LSC found significant differences in the space provision in sixth form colleges without vocational provision and all other colleges.

The guidance area formulae are:

Sixth form colleges:

Guidance area = 1,500 m^2 plus 10 m^2 per minimum number of workplaces

Acceptable upper limit = 1,500 m^2 plus 13 m^2 per minimum number of workplaces

All other colleges:

Guidance area = 1,500 m^2 plus 11.5 m^2 per minimum number of workplaces

Acceptable upper limit = 1,500 m^2 plus 14.5 m^2 per minimum number of workplaces

The 1,500 m^2 in the formulae is the constant from the regression carried out during the modelling exercise. The minimum number of workplaces is calculated by each college by following the method described above in the section on 'building up a space profile'.

The LSC encourages colleges to move towards these guidance areas per minimum number of workplaces.

The use of guidance areas enables the LSC and individual colleges to calculate whether there is an overall surplus or shortfall of space. The guidance areas specified in the formulae are kept under review and could change to reflect trends in learning and teaching practice.

Comparison with HE guidance and practice

There are clear differences between the space needs of the FE and HE sectors. The main one is the fact that there is research activity in higher education. There is also much greater diversity in institutional mission and size in the HE sector. In addition, the LSC applies its approach to LSC-funded space only. There is a much greater proportion of space in the HE sector which is provided from other

Example of how a college can use the guidance areas

This example is taken from Annex F of LSC Circular 02/20 and its supplements.

College A is a general further education college that has 2,500,000 total guided learning hours a year.

There are 2,000,000 on-site guided learning hours which equate to 1,389 as the minimum number of workplaces. The college has 2,000 full time students attending for an average of 750 hours a year. The gross internal area of the college is 26,500 m^2.

The college calculates its actual area per minimum number of workplaces as being:

26,500 m^2 – 1,500 m^2 = 25,000 m^2

Area per minimum number of workplaces is 25,000 m^2/1,389 = 17.99 m^2

The LSC formulae for guidance areas for colleges indicate that the area of the college should lie in the range of 1,500 m^2 + 1,389 x 11.5 m^2 = 17,474 m^2, or 1,500 m^2 + 1,389 x 14.5 m^2 = 21,641 m^2.

Compared with the LSC guidance areas, the college in this example has between 22 per cent and 51 per cent oversupply of space. (The circular notes that whether or not this is tolerable depends on the financial position of the college.)

sources and where the external funders may set their own specifications for the amount and type of space to be provided. There is also a lack of access to sector-wide equivalents of guided learning hours.

However, many of the components of the LSC approach are familiar to HEIs and are already used by them to a greater or lesser extent.

Existing HE guidance

The importance of the link between hours of activity and numbers of workplaces available is highlighted in the University of Newcastle upon Tyne's 'Space Management Guidelines for the HE Sector' (2002). One of the principles of space management good practice in the Newcastle Report is:

> 'Significant efficiencies will only result if the total teaching room capacity is related to the total need for taught student hours. Efficiency will not result where there is substantial spare capacity.'

Some of the closest similarities in terms of guidance on building up a space needs profile are set out in the Education and Learning Wales (ELWa) publication 'Space Management: A Good Practice Guide' (2002) as the following extract illustrates.

'The first element in assessing space need is to assess the number of course groups within the department in question, together with the range of functions demanded by those groups and the time in hours demanded weekly or annually for each type of function.

The second element is to identify the size (or range of sizes) for those functions and outline specifications. The combination of the two will then yield the overall functional space demand in time for the department.

Dividing the notional academic day length by the target frequency of use then provides the actual number of hours to be allowed per function. Dividing the demanded hours for each function by the actual number of hours available in the timetable will indicate the number of rooms that function required. An illustrative example is provided below.

Element	General teaching	IT suite	Total hours per week
Graphic design	20 hours	20 hours	40
Business studies	30 hours	20 hour	50
Total demand for 22 wk year	50 x 22 = 1,100	40 x 22 = 880	90 x 22 = 1,980
Academic year (40hrs/wk 22 wks)	880	880	880
Target frequency of use	70%	80%	N/A
Actual number of hours available	616	704	
Rooms required (demand/available)	1.79	1.25	
Practical number of rooms required	2	2	

Understanding the number of people in a course group then enables the size of each room to be calculated through the use of, for example, standard capacity functions for each room type.

As an illustration of the above, certain design guidelines for general teaching note a requirement of 2.1 m^2 per person. Given a target course group size of 20 this would equate using the above tabular example to two general teaching rooms each of approximately 42 m^2. Similar formulae can be followed for other types of room function. Calculations for circulation, plant rooms, toilets and other building functions can then be added to the summation of academic requirements to provide a total figure.'

The advice recommended that additions for balance areas and other ancillary functions would be added to the figure calculated to get a total space prediction. If an HEI followed this method of assessing space needs, it would be quite similar to the LSC method of building up a space needs profile. It is also a method which allows for institutional diversity in teaching and learning practices.

Data availability

A key issue in HE is the availability of the data required to build up a profile of space needs across an institution.

The core data needed are the following:

- total guided learning or contact hours per annum
- actual and timetabled space utilisation rates
- hours allocated to different types of space
- actual gross and net internal floor areas broken down by type of space
- actual numbers of workplaces (in most cases this will be the same as the number of seats available although in some types of space, such as performance studios, a judgement will need to be made about capacity)
- areas per workplace in different types of space
- breakdown of other types of space.

A summary of the likely availability of the data is set out in Table 3.

Although not all the estates data may be held in sufficient detail initially, it is likely that many HEIs could fill in the gaps relatively quickly, based on an inspection of the room stock. However, of all the data needed, it is the total of guided learning or contact hours which is likely to prove the most difficult to access and take most time to compile for many HEIs.

Table 3: Summary of likely data availability

Data	Availability
Guided learning/contact hours	The data are not collected at sector level by HESA or the Funding Councils and may not be centrally held within individual HEIs. They are likely to be most readily available to HEIs with full central timetabling systems linked to student records. In other cases, the data may be dispersed and available from individual departments or course leaders.
Actual utilisation rates	Many HEIs have some utilisation data based on the observed use of rooms, but on average this relates to 51 per cent of the core teaching area based on EMS data.
Scheduled utilisation rates	These will be available from timetables. There is likely to be more information on projected frequency rates as planned group sizes may not always be recorded.
Actual gross and net internal floor areas broken down by type of space	The majority of HEIs have the information on total areas of space – how it is broken down by types of teaching space depends on the level of detail held in estates information systems.
Actual numbers of workplaces	Common sources are likely to be data collected as part of space utilisation surveys and health and safety assessments of maximum capacities, particularly of specialist rooms.
Areas per workplace in different types of space	These can be compiled by dividing room areas by the capacities calculated above.
Breakdown of space types	This is likely to be available as part of the annual return for EMS

HEI space profile case studies

The case studies relate to two institutions. One of them is a multi-campus university. It is predominantly a teaching institution. The exercise focused on one campus spread over several sites, which houses faculties providing courses in professional studies, music and healthcare. Courses are modular in structure and students have a very wide choice of pathways available to them.

The case study took place at time when the university was already reviewing its teaching space needs as part of a zoning exercise across all faculties and to inform the space needs for new, replacement accommodation for healthcare. Almost all the teaching space is included in the central timetable, and the university has areas for all its teaching rooms and capacities for almost all of them. Two semesters run for a total of 30 weeks, and the daytime teaching is carried out over a 35 hour timetabled week. Although a lot of evening teaching takes place, this was excluded from the analysis in line with the LSC approach to concentrating on the core daytime hours.

Data were collected on teaching group sizes, and the numbers of daytime teaching hours per week and across the academic year, for a range of teaching activities. Estimates had to be made for hours of activity in some types of specialist teaching spaces. The minimum number of workplaces was calculated assuming a total of 1,050 hours available on the basis of the core teaching week and the length of the two semesters. A target space utilisation rate of 40 per cent was used to calculate the number of workplaces needed, and the workplace areas from Design Note 37 were used to generate predicted areas. The total predicted teaching area was found to be close to the actual amount of space available on the campus.

The second case study took place in a university with a more devolved system of management. Initially, the data needed to support the approach were only available in relation to a limited amount of centrally timetabled general purpose teaching space. However, after a period of consultation with faculties, it was possible to arrive at an overview of the hours of teaching by courses in different types of space. This could then be used to drive the space need predictions. Information was also collected on the areas per workplace in a range of types of space.

Reviewing the scope for HE guidance areas

The SMG model for benchmarking the size of an institution's estate provides guidelines on what the average size of an estate would be for individual institutions given their own profiles of drivers, such as income, student numbers and location. This approach already has strong similarities with the method used by the LSC to derive guidance areas, but the SMG model is based on the average performance across the sector rather than on the most space efficient quartile. Nor does it use guided learning hours. It is based on a wide range of drivers including income, numbers of students and location.

An exercise was carried out which sought to replicate the LSC methodology and use of drivers as far as possible for the HE sector. The way in which this was done and the modifications which were made during the exercise are described in the steps below.

1. In the absence of sector-wide data on guided learning or contact hours, FTE numbers by HEFCE price group by institution were used instead. This driver was selected as a broad proxy for guided learning hours. The reason for doing so is that price groups are based largely on the principle of similar resources for similar activities, and activities include methods of teaching as well as other factors such as use of equipment. Only on-site taught student FTE numbers were used.
2. Estate management statistics returns provide data on non-residential internal areas of HEIs on a gross and a net internal area basis. In order to replicate the LSC approach, research space was excluded from the totals.
3. The next step was to estimate the relationship between taught student FTEs by price group and the amount of non-residential, non-research area. It was found

that the equation explained about 83 per cent of the variation in sizes of non-residential non-research estate.

4. The research then identified the quartile of HEIs where the existing amount of non-research space was lowest relative to the amount predicted by the model based on taught student FTEs by price band. The original relationship calculated in Step 3 was then re-estimated using data only from this quartile, and space predictions were generated for each HEI.

5. The potential amount of excess non-residential non-research space in the sector was calculated by comparing the actual space with the predicted space based on Step 4. The finding was that for the 148 HEIs in the sample the total net internal non-residential, non-research space amounted to 10,645,277 m^2 and the total predicted area was 7,816,295 m^2, or 26.6 per cent less than the actual space.

The conclusions drawn from this exercise are dependant on the extent to which taught student FTE numbers by price group can be regarded as a reasonable proxy for guided learning or contact hours. There is uncertainty on this point in the absence of any more detailed information.

However, the SMG model, which is based on a range of drivers, explains more of the variation in the size of HE estates than the use of taught student FTE numbers by price group. It also relates to the whole of the net internal non-residential estate including research space. It does not in its present form provide a benchmark based on the performance of the top quartile of space efficient HEIs. However, that could be done as well as, or in place of, the current benchmark based on average predicted performance for a given profile of drivers.

International review

Our review of international HE space management guidance focused on Australasia, North America, Hong Kong and Germany. A range of terms are used in different countries, and not all of them are directly comparable to UK practice. For example, some countries use gross floor areas and others use net assignable areas as core measures.

Australasia

In Australasia, the Tertiary Education Facilities Managers Association (TEFMA) provides space planning guidelines for HEIs. The current version includes:

- high level ratios for general planning purposes
- standards and benchmarks
- space utilisation
- space planning guidelines by school/department/discipline.

High level ratios

High level ratios are an amount of space for different types of use driven by student load usually measured in terms of equivalent full time student units[1], and the actual figures and percentages given are based on data provided by institutions in the sector. They are intended to be a macro planning tool, and provide benchmarks on:

- total university gross floor area (GFA) per equivalent full time student unit (EFTSU), with 15 m^2 being considered average performance
- proportions of different types of space within institutions and average m^2 per EFTSU as shown in Table 4.

[1] Equivalent full time student units are defined in the TEFMA guidance as a value representing the student load for a unit or part of a unit of study, expressed as a proportion of the workload for a standard annual programme for students over a full year of study

Table 4: Breakdown of different space types

Group/category	% of total campus space	UFA/total campus EFTSU (m^2)
Academic	43-57	4.5-6
Administrative	9-12	1-1.2
Commercial	2.8-4.2	0.3-0.4
General teaching	12	1.2
Library	10	1
Student services	4-8	0.4-0.8
Other	8	0.8

Table 5: Space breakdown by academic category

Category	Area per student unit m^2/EFTSU
Natural and physical sciences	10
Information technology	2
Engineering and related technologies	10
Architecture and building	6
Agriculture, environmental and related studies	5
Health	14
Education	3
Management and commerce	1
Society and culture	3.5
Creative arts	6
Food, hospitality and personal services	6.5

The ratios also cover:

- library and cafeteria per space per EFTSU
- academic space broken down by discipline expressed in m^2/EFTSU in both broad categories and with subdivision of these into further sub-categories. The broad categories are shown in Table 5.

Standards and benchmarks

TEFMA gives allocation guidelines for particular types of space, most different office occupants, and by function. For example, a Dean is allocated 18-20 m^2 of usable floor area (UFA) with an additional 16 m^2 UFA in a laboratory if required. Usable floor area is defined as floor area measured from the inside face of walls and excluding common use and non-habitable areas, such as corridors and stairs.

Table 6: Sample space allocations

Allocation by function	Size m^2/EFTSU
Lecture theatre	1.5-1.7
Science laboratories	5
Storage and preparation areas	1
Studios – ceramics	6
Storage	1

Table 7: Indicative good practice utilisation rates

Space type	Target room frequency %	Target room occupancy %	Target utilisation %
Lecture theatre	75	75	56
Classrooms/tutorial room	75	75	56
Computer laboratories	75	75	56
Laboratories	50	75	37.5
Workshops	50	75	37.5
Studio	75	75	56
Music/Drama room	80	75	60
Meeting rooms	45	75	34

Guidelines are also provided for different HE functions, including general teaching space, laboratories and studios. Some examples are given in Table 6.

Space utilisation

Utilisation surveys are recommended, and the method set out is similar to the National Audit Office approach. The TEFMA guidelines give indicative good practice space utilisation rates. These are based on a typical teaching week of 67.5 hours over five days including evening as well as daytime teaching.

Part of the analysis of audited results can be a comparison against these targets.

Space planning guidelines by school/department/discipline

A model in spreadsheet format is provided by TEFMA to assist in calculating space needs. This includes:

- disciplines (with different amounts of space allocated to each discipline)
- staff space
- staff ancillary allowance
- student space according to level of study
- undergraduate space if central class timetabled space is used
- student ancillary allowance.

These factors are put into a grid to build up an indicative space envelope.

Other methods

In addition to these guidelines, many HEIs in Australia and New Zealand use space management methods which focus on effective use of timetabling and space charging.

North America

Different US states and individual institutions have a range of approaches, but many are based on a room use methodology which is used to build up a profile of space need. This methodology has three main components.

1. Space planning standards: usually expressed as an area allowance (usually in assignable square feet, ASF) for different categories of space. The standards are often used as guidelines for projecting current and future space needs and for comparison with actual space availability. Utilisation standards are linked with space planning standards to calculate space factors. Space factors can then be multiplied by weekly student clock hours or contact hours to predict requirements for different types of space.
2. Space utilisation standards: measures of weekly room use hours based on scheduled use and assumptions about occupancy rates.
3. Space programming or design standards: similar to space planning standards but usually applied on a more prescriptive basis in the design of new projects.

For example, an HEI would assess its overall need for classroom space using 1 and 2 above by calculating a space factor and then multiplying that factor by the weekly student clock hours (similar to contact hours) for classroom space. A hypothetical example for a calculation of classroom space is given below. The assumptions used in the calculation are:

Student station size in a classroom – 18 ASF (or 1.67m^2)
Weekly room hours – 35 hours of scheduled use
Student occupancy ratio – workstations are assumed to be occupied on average for 65% of the time when the room is in use
Weekly student clock hours – taken from the HEI's planning and analysis database

On this basis:

$$\frac{\text{18 ASF (student workstation size)}}{\text{35 (weekly room hours) x 65\% (student occupancy ratio)}} = \text{0.79 ASF (space factor)}$$

The space required for classrooms is then the space factor (that is 0.79 ASF in the example given above) multiplied by the total number of weekly student clock hours for classrooms. Thus, if there were a need to deliver 200,000 hours of teaching in classrooms each week, the calculation would be:

Table 8: Sample space standards

Type of space (example)	Space standard in net assignable square feet per workstation Square metre equivalent is given in brackets	
Seminar room	20	(1.86)
Lecture theatre	12	(1.12)
Class laboratory	70-120	(6.5-11.15)
Computer laboratory	35	(3.25)
Office (director)	160	(14.86)
Office (faculty staff)	135	(12.54)
Office (staff)	110	(10.22)
Office (clerical workstation)	75	(6.97)
Office (post doctorates)	6	(6.32)
Office (doctoral students)	44	(4.1)

200,000 (total weekly student clock hours for classrooms) x 0.79 ASF = 158,000 ASF (or some 14,679 m^2 of usable space)

This approach is commonly used for different categories of teaching space. For teaching and for other activities, there are guidelines built into the standards on how much space is needed for different types of activities (see Table 8).

Canada

In Canada, many provinces and institutions follow a similar approach to the one described above. The Council of Ontario Universities does so, and it produces triennial surveys of the space use and provision in its 18 universities. In January 2003, it reported on changing patterns in space use over a period of 22 years. It found that there was relatively little change in the proportions of types of space. Classroom space had decreased slightly; laboratory space had fallen from 8.7 to 5.8 per cent of the total, and academic office and related space had increased by 1.2 per cent.

However, space per student had fallen from 11.6 net assignable square metres (NASM) in 1980-81 to 9.7 NASM in 2001-02. Also, the gap had widened between actual space per student as generated with the state's space standards and space available. On the basis of space factors, the gap between the predicted amount of space and the actual amount of space per student grew from 0.5 NASM in 1977-78 to 2.7 NASM in 2001-02. By 2001-02, the space need calculations were generating 12.5 NASM per FTE student compared with space available of 9.7 NASM per FTE. The 2001 calculations of need are based on an assumption that rooms will be used for teaching for 34 hours per week.

Hong Kong

In the 1990s, the University Grants Committee (UGC) of Hong Kong carried out a major study assessing space and accommodation needs for the eight UGC funded institutions. The final report was issued in 2000.

This work has a close resonance for the UK for a number of reasons:

- at the time that the project was undertaken, the Hong Kong UGC and HEIs were using the UK UGC space norms
- there were concerns that these were out of date because they had not been revised since 1987, and there was awareness that they were no longer recommended by the Funding Councils for use in the UK
- there was also concern that the norms, which were based on HE practice in the 1970s and 1980s, did not reflect changing pedagogy, curriculum developments and the impact of IT on space needs and use
- the HEIs in Hong Kong were highly differentiated in terms of mission, size and types of estate, with some on densely developed urban sites and others with much larger campuses. The report, the Space and Accommodation Study, noted: 'The diversity of Hong Kong's higher education institutions creates a challenge for the development of an assessment methodology applicable to all its institutions.'

Against this background, the objective for the review was to:

- recommend a methodology acceptable to the UGC for a macro-level assessment of the adequacy of UGC funded institutions' space
- make an assessment using that methodology so that the UGC could use the results in assessing requests for additional space and capital projects.

The study concluded that there were two main options: revise the norms or switch to a room use method, similar to that often used in North America.

The study decided against revising norms.

Instead, the study recommended that the UGC should adopt:

- a room use based method
- planning standards

- standards that should include all net assignable space for the purposes of calculating space requirements and collecting space data
- calculations of over/under provision of space using the standards as guidelines and not as absolute predictors of need
- standards as one indicator to be considered alongside other factors, such as condition, bad fit and suitability.

Using this method, the review calculated whether each of the HEIs had an over or under provision. Most had the latter. Further work is now being carried out to revise the standards in the light of a planned change from a three to four year degree programme.

Germany

In Germany in 2003-04, there were 365 HEIs with a total of 19,625,000 HNF (hauptnutzfläche which broadly corresponds to square metres of net internal area) and 2,019,831 students, giving some 9.72 HNF per student.

General guidelines are set out by the federal government and detailed policy is the responsibility of the 16 regional states. HEIs used to have very little autonomy, with correspondingly few incentives to manage space. There has been a move to increase the responsibility of individual institutions, with several models now operating. Institutions may be tenants of their estates with ownership vested in the state, HEIs may be owners with an estates budget, or they may have full responsibility for all aspects of their estates including buying and selling property. Combined with reforms in the HE funding system as a whole, these changes have led to a much stronger focus on space management.

National guidelines on space planning

If regional states want federal support for major building projects, they have to follow national planning procedures. These include subject related space standards primarily focused on the space needs per student FTE. These are shown in Table 9.

There are additional allowances for some specialist institutions and some research activities:

- up to 16 HNF for researchers in humanities, natural sciences and engineering (theoretical)
- up to 27 HNF per researcher in experimental natural sciences
- up to 23 HNF per researcher in experimental engineering.

Table 9: Subject-related space standards in Germany

Subject	Universities (HNF per student place)	Universities of applied sciences* (HNF per student place)	Teacher training HEIs (HNF per student place)	Specialist arts and music HEIs (HNF per student place)
Humanities	4-4.5	4		
Natural sciences, theoretical medical subjects, agriculture, forestry	15-18	12		
Veterinary medicine	31-37			
Teacher training			5.4	
Arts and music				12

* Universities of applied sciences are similar to former UK polytechnics.

Regional state guidelines

Some regional states have their own guidelines for standards for different types of space such as offices. In a number of cases, the Hochschul-Informations-System (HIS) (the higher education information system which provides a range of services to institutions including assistance with space needs, planning and management) has worked with regional states or individual institutions to refine subject specific space standards.

Assessing space needs

HIS has developed the work on space guidelines to generate a parameter model. This combines types of space – for example for offices, laboratories or classrooms – with numbers of students and staff by faculty. The results are expressed in terms of the overall amount of space needed by a faculty and also in terms of amount of space per student, per member of academic staff etc.

Space charging

As yet, space charging is not widespread, although there is growing interest. Where HEIs do charge for space, there is a variety of models in place. Most of the models are based on calculations of space need and space available, with charges being levied on the excess. There are differential charges for different types of space. Faculties which return space get a bonus. In many cases, the charges are symbolic and do not reflect the costs of occupation, although some states/HEIs have been developing models which cover all space costs.

Discussion and recommendations

This section draws together the main findings from the review of the LSC approach and investigation into some international HE space management guidance. It discusses their implications for UK HE space management, and makes recommendations in the light of the conclusions of the review and in the context of the other research areas covered by the Space Management Project.

Summary of findings

The LSC approach to assessing space needs has two main components, which are both driven by the number of guided learning hours to be delivered. The first enables colleges to build up a space needs profile which can then be compared with the amount and type of space available.

During the study, two case studies were researched to assess the feasibility of building up profiles of space needs in HEIs using this method. In one case study, where there was a highly centralised timetable linked to student records, it was found that it was feasible. The institution in the second case study had a devolved system of management, and the data needed to support the approach were not readily available. However, after a period of consultation with faculties, it was possible to arrive at an overview of the hours of teaching by courses in different types of space, which could then be used to drive the space need predictions.

The second component comprises guidance areas based on the most space efficient quartile of colleges in the sector. These provide guidance on the overall amount of space to be provided by colleges. They act as benchmarks for measuring individual colleges' performance and for tracking change in the FE sector estate in England as a whole.

During the study, statistical modelling replicating the method of analysis employed by the LSC was carried out to explore the feasibility of developing guidance areas for the HE sector. In the absence of any sector-wide HE equivalents of guided learning hours, taught student FTE numbers by HEFCE price group were used as a proxy. It was concluded that a model for predicting space need based on this single driver was not as powerful as the SMG model for benchmarking the size of the estate. This is because it did not explain as much variation in the size of HE estates as the SMG model which is based on a range of variables. If sector-wide data on the equivalent of contact hours were to become available in the future, this finding could be revisited, but until such time it is concluded that the SMG model provides a more robust

benchmark. In addition, the SMG benchmark includes research space, whereas the LSC approach was not designed to do so.

The review of international practice investigated space planning and management guidance in Australasia, North America, Hong Kong and Germany. It found a variety of methods in place. In some cases, such as in the guidelines issued by TEFMA in Australasia, high-level ratios are provided for general planning purposes. These relate to proportions of different types of space and to areas of types of space per student. There are also standards and benchmarks, for example on target space utilisation rates for different types of space. In North America, space planning standards have commonly been used to calculate space needs. These use the same coefficients as in the LSC approach, but are expressed differently. In Hong Kong, the UGC decided to move away from norms based on those developed by the UGC in the UK, and instead to adopt a room use and space standard method similar to that often used in North America.

In many cases, where information is given in the international guidance on areas of space per student, they suggest more generous space allowances than are actually available in the UK, although any comparison needs to allow for certain differences in definitions both of student numbers and areas of floorspace.

Most international space planning guidelines are derived from peer group comparisons rather than a detailed analysis of space needs by function. Nor are they driven in general by a goal of seeking the most efficient practice, although there are exceptions such as the target space utilisation rates issued by TEFMA. The LSC approach is significantly different from the international examples and UK practice in one key respect. That is in the basis for the college-wide guidance areas given to colleges. The guidance areas are derived from the space performance of the most efficient quartile of institutions, and other FEIs are encouraged to move towards their performance.

It would be feasible to develop a similar approach in HE. Much of the background work has already been done in the research into the drivers of the size of the HE estate. The main change needed would be to set the benchmark at the level of the most efficient quartile instead of at the level of average performance in the sector.

Conclusions for UK HE space management

Although a number of the space planning systems that we reviewed stress that they are guidelines, there is a danger that they can be interpreted as absolute predictors of need. But methods such as the space planning guidelines used in North America are highly sensitive to changes in the parameters on which they are based. Even tweaking the areas per workplace and varying the utilisation assumptions can have a major impact on an institution-wide basis.

Moreover, the methods do not make allowance for factors such as poor fitness for purpose and mismatches between group sizes and room capacities within existing estates. The space predictions generated by these systems will often need some moderation to take account of the characteristics of the stock of accommodation, where it is unlikely that they can readily be adapted.

Nevertheless, many, if not all, of the space planning and management concepts used by the LSC and found in the international review are familiar to UK HEIs. They are already used by them to manage space to a greater or lesser degree, even if they are expressed in different terms. In recent years, the closest UK guidance is probably the ELWa 2002 report which contains a method of building up space needs from hours of teaching to be delivered.

A number of the methods for calculating space needs profiles outlined in this paper, for example the methods recommended by the LSC and the Hong Kong UGC, follow a sequence of steps that begin with the volume of activity to be delivered, measured in terms of numbers of hours, and then predict the amount of space required by applying target utilisation rates and

areas per workplace. The methods are not complicated, but they depend on having sufficient data about planned hours of activity and about the existing estate. Core data include:

- contact hours for different types of teaching activity
- numbers of workplaces
- areas per workplace for different categories of space
- target scheduled hours of different types of space
- target occupancy rates for workplaces
- actual utilisation information to inform selection of targets.

If the data are not routinely collected by, or easily accessible to, staff responsible for space management, it can be difficult and time consuming to get the aggregate picture. In the case of the UK, institution-wide data are not always available on contact hours to be delivered, numbers of workplaces and areas per workplace. Of these, it is the hours of different types of teaching activity to be delivered which is likely to be the most time consuming to compile for many HEIs unless they already have highly centralised timetabling systems linked to student records.

However, knowing what has to be delivered and whether there is capacity to do so are core building blocks for effective space management. Guidelines on how to build up space needs from the first principles of what type and volume of activity needs to be accommodated would be a useful addition to the range of space planning and management methods available to UK HEIs.

In addition, institutions may be uncertain about appropriate target utilisation rates, especially for specialist teaching space, and they may only have partial utilisation data. They may also be unsure about appropriate areas for different kinds of workplaces. Both projected utilisation rates and workplace areas were implicit in the UGC and Polytechnics and Colleges Funding Council (PCFC) space norms, and the SMG report 'Review of space norms' discusses the feasibility and appropriateness of providing updated space norms along the lines of those issued by the UGC. That report concludes that an appropriate approach would be to provide a space need indicator framework which provides HEIs with the basic method for building up a space needs profile.

Recommendations

Our main recommendations arising from the review of the LSC approach and examples of international guidance are as follows.

1. Many of the methods researched provide the basis for space need calculations based on the volume and type of activities that are to be delivered within an institution. It is recommended that a space management tool is produced for the UK HE sector which follows these principles. However, given the diversity of practice within the sector, we propose that it should be a framework which supplies the structure of the method, with default settings which can be followed or overridden by HEIs depending on their own individual circumstances. Further details of such a method in the form of a space need indicator framework are set out in the SMG report 'Review of space norms'.
2. The SMG model currently provides benchmarks for the size of HE estates. The statistical analysis carried out as part of this study sought to replicate as far as possible the LSC approach to formulating guidance areas. It found that the proxy of FTE taught student numbers by HEFCE price group provided a significant explanation of the relationship between those numbers and the size of the non-residential non-research estate. But, it is not as powerful an explanatory tool as the current SMG model for benchmarking the size of the HE estate. It is recommended, therefore, that the SMG model is retained in its present form, pending any significant change in the key drivers of estate size, such as the impact of the introduction of variable fees or the sector-wide information on the effect of different teaching and learning methods.

3. The LSC approach to providing guidance areas on the total amount of space to be provided by colleges is based on the performance of the most efficient quartile in terms of the relationship between numbers of guided learning hours and total college floorspace. By comparison, the SMG model is based on the average space performance predicted across the sector for a given profile of drivers. It is recommended that additional information is provided to HEIs in updates of the SMG model by supplying space predictions based not only on the average performance and but also on the performance of the top quartile. This would provide an additional benchmark related to the performance of the most space efficient institutions in the sector for given profiles of drivers.


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