

UK Higher Education Space Management Project

Promoting space efficiency in building design



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Foreword

This report, commissioned by the Space Management Group, provides the link between teaching and learning practice and the impact of design on performance (the ‘wow factor’). It is a valuable complement to the SMG report on the impact on space of future changes in HE (ref 2006/10), and to a study published in March 2005 by CABE and sponsored by HEFCE entitled ‘Design with distinction – the value of good building design in higher education’. Together these reports can provide a stimulus to further research, and to more efficient and effective use of space.

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1 Executive summary

This publication is the outcome of a research project conducted by consultants AMA Alexi Marmot Associates for the UK Higher Education Space Management Group.

The aims were to identify which aspects of building design contribute most to optimum space efficiency, and to produce good practice for establishing space efficiency within higher education institutions when embarking on building projects.

The bulk of the publication comprises 15 case studies of recent refurbishment, expansion, upgrading or new builds in higher education institutions.

Below is a summary of what we have concluded to be 10 key points when seeking optimum space efficiency through building design. Below that are 10 points of good practice.

Keys to space efficiency through building design (these are expanded on in section 4.3.2)

- Maximise the built space on the footprint of new buildings and by modest additions and extensions in existing buildings.
- Match new uses to the existing built form in refurbishment projects.
- Provide a high ratio of usable area to gross built area.
- Capture balance areas for active use.
- Provide versatile space, furniture and fittings that can be used for different activities.
- Specify design features that allow different activities at different times.
- Optimise space standards for effective work.
- Create versatile office and research space, with appropriate open plan areas, supplemented by meeting and quiet spaces.
- Optimise furniture sizes for effective work.
- Provide for wireless data access to enable maximum effective use of common space.

10 points of good practice for introducing space efficiency (these are expanded on in section 6)

- Appoint a ‘champion’ for space management and cost in use.
- Systematically collect and update space and cost information.
- Agree targets and monitor their attainment.
- Collect standardised utilisation data, including office space utilisation.
- Collect and apply detailed cost information.
- Incorporate space efficiency concepts into the estate strategy.
- Incorporate requirements for space efficiency into project briefs, feasibility studies, option appraisals and design reviews.
- Develop and maintain a clear decision and communication structure for building projects, including user groups.
- Promote the benefits of versatile spaces and the right furniture.
- Include space efficiency information in post-occupancy evaluations.

2 Introduction

2.1 Remit and objectives

The four UK higher education funding bodies have commissioned research into a wide range of issues relating to space management in order to help higher education institutions (HEIs) manage their space in an efficient and sustainable way that meets their pedagogic, research and support needs.

This report describes the outcome of research into the role of building design in space efficiency, reporting to the UK Higher Education Space Management Group (SMG) as part of the broader Space Management Project (SMP). The study remit was ‘to determine how design can maximise efficient and effective space use for the full range of higher education functions’. The assumption behind the study is that more efficient space is essential in the contemporary climate in the higher education (HE) sector. (Various definitions of space efficiency are examined in section 2.4 and the appendix.)

Further elaboration on our 10 good practice key points to improve space efficiency through building projects are detailed in section 6. They cover processes for HE management and estate departments to execute at the estate and building level. They are based on desk research, experience of space efficient practice in other sectors and on the findings from our 15 case studies. All the case studies are in section 8.

There is ongoing review and debate about the extent to which buildings and their design may have an impact on the reputation and success of an HEI, through the recruitment and retention of students or staff. While recognising that design quality may be important in this respect, this

report does not explore this potential effect of the quality of building design, which is covered in more detail in a recent report from the Commission for Architecture and the Built Environment (CABE)¹.

2.2 Setting the scene – Student trends and academic change

The context includes the following changes within higher education:

- participation in higher education has been increasing overall, with a greater increase in part-time undergraduates than full-time²
- further increase in student numbers is expected. The government target of 50% of 18-30 year-olds attending HEIs could mean 300,000 extra students by 2010³
- there is greater breadth in the types of students, and new subject areas are rising in importance (such as non-medical health professions, media and creative arts), combined with new approaches to teaching and learning, and to the use of IT and e-learning⁴.

2.3 Setting the scene – Impact on the design of space

Changes in higher education are being accompanied by, and in some cases causing, considerable modifications in buildings in the HEI estate. Space efficiency is improving across the sector, with less space on average per student, institutions offering longer teaching hours, and more pooled space:

- there was a small drop in non-residential net internal area (NIA) per student full-time equivalent (FTE) between 1999-2000 and 2001-02⁵

¹ The Commission for Architecture and the Built Environment (CABE), April 2005, ‘Design with Distinction: the value of good building design in higher education’. Written for CABE and the UK Higher Education Funding Councils by PriceWaterhouseCoopers with research by the University of the West of England.

² Universities UK, 2004, ‘Higher education in facts and figures’, Summer 2004, Universities UK, viewed 11 January 2004, www.UniversitiesUK.ac.uk

³ Davis Langdon Everest, 2002, Cost model November 2002, available at www.davislangdon-uk/europe_middleeast/costdata.html under Building Magazine ‘21st Century University Building’.

⁴ JM Consulting, ‘Teaching and learning infrastructure in higher education’ a report to HEFCE, Ref HEFCE 2002/31.

⁵ Estate Management Statistics (EMS), Annual report 2002, available at www.opdems.ac.uk/cgi-bin/pubfiles.pl

- in 2004, 50% of HEIs were operating with less than 8.4 m² NIA per FTE now, compared to 42% in 2000⁶
- HEI estates departments are carrying out many projects specifically to achieve site and building consolidation.

Space efficiency must be balanced against its effectiveness. New modes of teaching and learning, for example, often require a larger space per student within teaching rooms plus the provision of new student-centred learning environments across the estate. Offsetting these increased demands means that even greater space efficiencies may need to be sought in other facilities such as offices.

The management of space and its co-ordination with the wider aims of each HEI is particularly important and has been considered in other papers of the SMP. The impact on space of trends in HE has been examined as part of the SMP study⁷. The report covers future changes in higher education and confirms the likelihood that HEIs will have a prominent and stable physical presence in the long term and act as magnets for other uses, rather than dispersing physically. The report suggests that future space requirements will be affected by student numbers and preferences largely outside the control of HEIs. Institutions can, however, exert influence over the impact on space demand that arises from changes in academic disciplines or pedagogic approaches, and from management factors.

Changes in the external and internal environment will cause all types of HEI – be they teaching-led, liberal arts, or research-led – to remodel and redevelop their estates to meet new needs, often to provide ‘more space for unstructured/ad hoc self-directed learning and peer teaching among students’. Seminars will often be accommodated by creating more small

teaching rooms. Administrative functions are expanding, which may offset the space efficiencies achieved by introducing more open plan office areas.

2.4 Definitions

2.4.1 Measurement

Advice on improving space efficiency must be accompanied by clarity in measuring that efficiency. Measurement is necessary so that targets can be set and space efficiency attained. Space efficiency measurements depend on floor area, which must be measured using agreed definitions. There are several valid ways to measure space and analyse the total area within a building. They are based on the principle of distinguishing the areas used for different functions, including the structure of a building.

The concept of usable space and its relationship to ‘balance’ areas (ie, areas that enable a building to function, such as lifts and toilets) and/or net internal area, is critical when seeking space efficiency. There are differences in the way space is described in commercial buildings and HEIs. Gross and net areas are distinguished in both sectors but usable space may be differently described. The appendix sets down definitions used by the Royal Institute of Chartered Surveyors (RICS)⁸ and in Estate Management Statistics (EMS)⁹. The compilers of EMS definitions suggest that in time a shift to match the RICS definitions could and should be achieved. This would reduce the potential for confusion between different measurement methods.

2.4.2 Space efficiency – Buildings

The space efficiency of any building relates to three factors:

- the quantity of space, generally calculated in terms of floor area though occasionally volume may also be relevant

⁶ EMS, Annual report 2003, available at www.opdems.ac.uk/cgi-bin/pubfiles.pl

⁷ Professor Ronald Barnett and Dr Paul Temple, Institute of Education, 2006, ‘Impact on space of future changes in higher education’. UK Space Management Project. Ref HEFCE 2006/10.

⁸ RICS, 2001, ‘Code of Measuring Practice – A Guide for Surveyors and Valuers’ 5th edition, RICS Books, London.

⁹ IPD Occupiers Property Database in association with GVA Grimley, ‘EMS data definitions’, at www.opdems.ac.uk published November 2004.

- the number of users, potential and actual
- the amount of time the space is used.

A building can be said to be ‘designed for space efficiency’ when it provides:

- The minimum necessary space for the desired functions to be properly accommodated, with minimum ‘waste’ between net internal area and gross internal area (NIA:GIA, commonly expressed as the ratio net:gross) or between net usable area and net internal area (NUA:NIA). These measures are normally expressed as percentages.
- The minimum space necessary for effective learning and research per FTE student (space per student FTE) or staff (space per staff member, or laboratory worker, FTE).
- A high level of space utilisation because the space is used for the maximum possible amount of time¹⁰. This concept is generally applied to utilisation of teaching space, though it can also be applied to office space utilisation¹¹. It is usually expressed as the percentage of hours of use compared to a benchmark (typically 50 hours per week during term time), multiplied by the percentage of occupied seats.

2.4.3 Space efficiency – Site and estate

Considering briefly the site on which the building stands, a space efficient building is one that makes most use of the site, and therefore has a maximum gross external area in relation to the site area (GEA:site area).

This concept can be extended to an entire campus. An estate can be considered efficient if it uses all the land it has for buildings, landscape and access well, while taking into account the need for future expansion, and the density that is suited to the surrounding development.

Many of the case study buildings are part of an estate rationalisation process, seeking to reduce the number of buildings and concentrate on smaller or fewer campuses. Inevitably estate efficiencies have been sought and generally provide ample justification for specific building projects. This applies to buildings that are refurbished, modified or built to accommodate the organisational changes that often accompany, and may be the incentive for seeking, estate rationalisation.

2.4.4 Resource and cost efficiencies

Other efficiency measures incorporate concepts of lifetime cost and use patterns over time. We have not explored these ideas in detail though they are relevant in building projects that seek to maximise efficiency benefits overall. Efficient space in these terms is:

- space that can be modified cost-effectively when functional requirements change, thus permitting reuse of buildings in the long-term
- space that has been specified and detailed to give reasonable cost in use
- space that is built to last and will have a long life.

¹⁰ Education and Learning Wales, January 2002, ‘Space Management - a Good Practice Guide’, Higher Education Funding Council for Wales (HEFCW). These data are requested in the EMS returns.

¹¹ Expressed as the percentage of hours that workspaces are used over a standard day, usually 10 hours from 8am to 6pm.

3 Study method

The study method involved:

- a literature review of available material about space measurement, utilisation and efficiency in university buildings
- comparison with the body of knowledge about the provision of efficient space in other building types, especially offices
- 15 case studies of buildings that appeared to incorporate design ideas to enhance space efficiency.

The literature review examined space measures and concepts of space efficiency currently used in the UK and internationally. We looked at space standards that have been applied to different disciplines in HE at different times, the development of room utilisation measures, and the increase in centrally timetabled, pooled rooms.

The 15 case studies cover recently completed building projects ranging from very small to large, general teaching to highly technically specialised space, new build and iconic to internal rearrangement and refurbishment. We visited the sites, conducted interviews, examined drawings and other documents, and then analysed the data. The selection, shown in section 8, covers: urban and campus contexts; institutions ranging from research focused to former polytechnics mainly concerned with teaching; a wide range of disciplines; and a wide geographical spread¹². All the case studies were checked by the individual estates departments that had provided the information. Our analysis of what they revealed is presented in section 7 with the case study descriptions following.

In terms of resource efficiency, refurbishment projects are more efficient overall, even if the space efficiency measures, as defined in 2.4, are themselves not significantly improved. Many HEIs have major programmes of refurbishment,

a trend that Barnett and Temple's¹³ report highlights, and that can be expected to increase in future. Existing funding direction at the Higher Education Funding Council for England (HEFCE) encourages the refurbishment of space rather than a more costly new building. For these reasons many refurbishment projects were selected for the case studies.

Four cases, which appeared, from the first visits, to provide good information about space efficient design measures, were further analysed and additional material was gathered, including cost information.

Research for each case study collected, analysed and collated the following information where available:

- use of the building
- student FTEs using the building
- type of campus, site and location
- new or refurbishment project
- date of completion
- main client, design team, contractors
- briefing information
- cost overall (and GIA per m²)
- building area (GIA, NIA and NUA)
- photographic record
- furniture measurements for research and learning resource buildings.

¹² A list of over 300 possible cases was initially drawn up, suggested by SMG, Kilner Planning, Davis Langdon from its wide client list, from a review of the technical literature and through our own contacts. This list was reduced to 60 and then further to 15.

¹³ Professor Ronald Barnett and Dr Paul Temple, Institute of Education, 2006, 'Impact on space of future changes in higher education'. UK Space Management Project. Ref HEFCE 2006/10.

4 Results

4.1 Key findings from desk research

The desk research suggests a number of points about space efficiency and building design:

- information about specific buildings, their design and use is sketchy. Only a few institutions appear to collect this information systematically for all buildings
- the contribution of any particular building to space efficiency or effectiveness is not usually identified in institutional information
- EMS data are compiled from individual building information held by HEIs but collated in an aggregated format by each institution
- space standards are commonly used as a guide for design, measured by discipline or function, and for office space, by seniority and role. This was the case for the University Grants Committee (UGC) standards in the past
- in the UK the average space per student FTE is lower than in many other countries – particularly the US and Australia
- utilisation data are collected by many HEIs for teaching rooms, but are under-exploited as a tool to manage space efficiency. Utilisation data for other spaces do not appear to be gathered.

4.2 Office space

Efficient use of space is well articulated in other sectors, especially for office buildings.

Developers of speculative office space have increasingly sought to provide space-efficient buildings, to improve product value. Owner-occupiers also seek space efficiency, in order to control one of their major overheads. Typically office workspace in the UK averages 14-16 m²

NIA in large private organisations. Many organisations have embarked on projects to increase space efficiency through strategies of reducing the average size of enclosed offices and desks in open plan areas, eliminating all solo offices and introducing office ‘hotelling’ for mobile staff. Much importance is also placed on reducing the space taken up by filing and document storage through the use of high density storage, efficient filing furniture, electronic filing and knowledge management. Some of these solutions are applicable to the HEI sector though not widely used as yet.

In the office sector, there are well-established key performance indicators for space efficiency. An NIA:GIA ratio of 85% represents a good ratio of tenant area to landlord area from a landlord’s point of view, and an NUA:NIA¹⁴ ratio of 80% represents an efficiently designed office building from a tenant’s point of view, where primary circulation does not reduce the usable area unreasonably.¹⁵

4.3 Key findings from case studies

4.3.1 Data

The HEIs in the case studies have not generally captured or used data to promote space efficiency. There are some exceptions, but on the basis of our sample, this is not common in the sector:

- a. Space efficiency has not generally been present or high on the agenda in most building projects. For space efficiency to be delivered it must be emphasised more, especially during the briefing and early design stages.
- b. Measurements of space efficiency, such as net:gross floor area, are rarely captured or used. Those provided for the EMS, such as space per student FTE, are not related to individual buildings. The measurements that are available do not appear to be

¹⁴ NUA (net usable area) = NIA minus primary circulation routes for fire exits.

¹⁵ Eley, J & Marmot, AF 1995, ‘Understanding Offices – what every manager needs to know about office buildings’, Penguin Books, London; and Marmot, AF & Eley, J 2000, ‘Office Space Planning – Designing for Tomorrow’s Workforce’, McGraw-Hill, New York.

incorporated into the thinking behind project briefs.

- c. Feedback data are not regularly collected by HEIs. There is little feedback information about floor areas, furniture sizes or space efficiency, so projects cannot benefit by learning from previous examples.
- d. Utilisation data are usually only collected for teaching spaces, sometimes only for pooled teaching spaces. There is scope to use such data far more powerfully, ensuring compatibility in measurement across HEIs and collection of data for more space types, especially offices.
- e. While data on capital spending on projects is generally available, the quality of cost-in-use data captured by the case study institutions varied significantly, with a number simply capturing data on a campus-wide (rather than a building-specific) basis.

4.3.2 Space efficiency through building design

We have identified several design measures, some in common use, adopted to maximise space efficiency¹⁶:

- a. Maximising the built space on the site footprint of new buildings and modest additions and extensions to existing buildings can have a significant impact. Design strategies include:
 - adding a new outer skin or extra area or building on the roof (seen in case studies 9 and 14)
 - filling in atria and voids in the floor plan, making buildings deeper from window to window and providing increased floor area on essentially the same footprint (seen in case studies 4 and 9)
 - small extensions, sometimes incorporating specialised uses, allow buildings to fulfil new functions without much increase in area or loss

of site amenity (seen in case studies 8 and 10).

- b. Matching new uses to the existing building type in refurbishment projects (case studies 3 and 4).
- c. Capturing balance areas for active use where possible (case study 12).
- d. Providing versatile space, furniture and fittings that can be used for different activities (case studies 1, 3 and 4).
- e. Specifying design features that allow different activities at different times (case studies 3 and 4).
- f. Optimising space standards for effective work (case studies 1 and 14).
- g. Creating more versatile office and research space, open plan areas as appropriate, supplemented by additional meeting and quiet spaces (case studies 2, 5, 7 and 13).
- h. Optimising furniture sizes for effective work (case studies 1 and 14).
- i. Providing for wireless data access to enable occasional use of common space.

In addition to design measures the case studies also show that management of space plays a significant role. Many of the case studies use open plan areas, especially for administrative staff, recognising that these are space efficient and reduce the cost of churn. Group rooms for academic offices are being adopted in some cases, to help integrate related disciplines, with an added advantage of opportunities for space saving. Reduction in solo offices does not always receive support from senior management, and is rarely popular with academics. It is more successful when carefully managed, as for example at Sheffield Hallam University, where users' perceived difficulties were addressed and the advantages exploited.

Management can also play a role in controlling the overall size of the workplace footprint by

¹⁶ The case study numbering reflects the list in Figure 1, section 7. Not all ideas listed were found in the case studies.

encouraging efficient storage habits, and investing in electronic filing and knowledge management.

Space efficiency is being increased in some HEIs by making as much teaching space as possible pooled and centrally bookable. This is not necessarily affected by building design, though the detailed design of equipment and finishes may be used to encourage more opportunities for general use of teaching spaces. Location also matters. Teaching rooms used by a diverse population should be located where they can be easily found even by people unfamiliar with a particular building, and be easily controlled for security. Locations at ground level and near stairs and lifts are desirable.

Standards are an important management tool and can play an important role in introducing efficiencies. Space standards or norms are generally desired, and still in common use, especially to gauge building requirements as projects start. They are often based on the old UGC or Polytechnics and Colleges Funding Council (PCFC) standards, usually reduced by a factor determined by each HEI as suitable for its individual purposes.

5 Costs and benefits

Evidence suggests that when the HE sector gets the development process right it can deliver buildings and facilities that are comparable in cost with any other sector. Indeed, many HEIs, particularly those with a significant international status, now benchmark themselves against these other sectors rather than against each other and are moving away from ‘best in university class’ buildings. For instance, when delivering a scientific research building a university may benchmark itself against a leading private sector laboratory, and when delivering a faculty building it may look to review what it is providing against British Council for Offices fit-out guidelines.

Having said that, the HE sector delivers a range of facilities and building types that is far broader than almost any other sector and, therefore, every building can be considered prototypical. This range, with some of the other unique characteristics of the HE sector, means that there are a number of challenges in delivering a new facility.

5.1 Issues affecting costs

Some of the issues that affect costs and therefore useful cost-benchmarking are as follows:

- the need to include significant amounts of ancillary space (such as retail space, or café areas) rather than primary functional space within a new building
- restrictions imposed by funding and phasing may mean the optimum facility cannot be provided
- the pressure on finite funds to address a significant backlog of maintenance work promotes a ‘make-do and mend’ approach rather than a longer term redevelopment strategy
- lack of funds to maintain new facilities
- the need for flexibility and adaptability to accommodate any future changes in teaching strategy and the university’s long-term aspirations

- for inner city universities, a lack of space drives institutions toward the (small scale) refurbishment of existing space and leaves them unable to solve some space standard issues that a new building would overcome
- space use norms on an existing campus can mean that the overall space per student FTE continues to be higher than could be achieved on a greenfield site
- the inability of small- to medium-sized refurbishment projects to make effective amounts of surplus space available
- the need to spend significant amounts on infrastructure upgrades before usable space can be refurbished
- the type of institution – research, teaching, science based, arts based etc
- the briefing process and the need for strong academic leadership throughout the project: aspirations must be clearly identified, not over-specified, and unnecessary (or late) changes should not be introduced
- funding streams and sources that place greater emphasis on capital cost limits (and, in particular, cost per m² limits) rather than space efficiency or whole life cost considerations
- anomalies in the capture of historical data.

The way many HEIs capture and analyse cost data means that information that is publicly available is often of little use when trying to compare in detail how efficient one specific building is against another. Historically, the traditional way to record cost data has been on a cost per m² of GIA basis and this will be influenced by many different factors. Consequently, there may be very little correlation between the cost per m² GIA, user satisfaction and space use within the building. Analysing data on a simple cost per m² GIA basis without further data sources is therefore of limited use.

5.2 Conclusions

Space efficient building design can be helped by:

- ensuring that space efficiency is a conscious target for each project
- collection and use of data on space, cost, and use, for strategic decision-making and throughout projects
- incorporating appropriate specific design ideas found in the case studies
- careful specification and planning of furniture
- following good process in all decisions.

Space efficiency as a specific goal did not seem to have been overtly expressed in most of the case studies. The exceptions are buildings which were designed as part of an estate consolidation strategy, rather than as space-efficient buildings in their own right.

Generally, the data about space that is available to HEIs is not as well-used as it could be, and more data is required. Great variety is encountered when looking at the buildings of different HEIs. This supports the need for HEIs to collect their own space efficiency measures over time, as well as relating their measures to those of other HEIs, through the EMS process.

The design ideas that are most helpful, such as creating versatile, multifunctional spaces or open plan and shared office areas, are closely affected by assumptions about the management of space and its 'ownership' and therefore to the organisational structure and culture. Support at the highest level is needed for the introduction of many of these concepts, both to clarify them in the briefing process and to get buy-in from the users.

Furniture needs to be considered early in a project. Where case study HEIs commissioned furniture specifically for a particular use, space efficiency was not found to be a clearly articulated requirement, although small sizes were in fact bought. New design ideas for furniture that would help multi-use or be more space efficient for a particular building may be needed from traditional, or from new, suppliers.

Furniture innovation that leads to efficient, functional and attractive spaces should be sought for student seating, staff desks and all storage.

6 Good practice guidance – tools for achieving space efficiency

HEIs can take a number of steps to implement greater space efficiency, which are listed in the executive summary. Here we expand on those 10 keys to success.

6.1 Appoint a ‘champion’ for space and cost-in-use

A champion (or champions) is needed for space and for cost-in-use. The champion should have the time, resources and authority to contribute to policy decisions as well as to influence individual projects. It could be the same person or two separate individuals. This champion needs to provide a report on space efficiency to the board, senior management, and to each faculty at least annually. Champions should be involved in setting space efficiency and cost-in-use targets, checking project designs to see that these targets are taken into account, and ensuring that follow-up is achieved through appropriate post-occupancy evaluations (POEs).

6.2 Systematically collect and update space information

A database of information about buildings, internal spaces and faculty or departmental users makes space efficiency policies easier to implement. The database should provide good trend information about space requirements on which future briefs can be built. The database should include area measurements distinguishing gross, net and balance or net usable categories. The areas should be checked against ‘as-built’ drawings to ensure they match and be updated if building changes are made. A standard nomenclature should be part of the database, to allow each room type to be categorised. The database should link to, or incorporate, details of post-occupancy surveys, including details of the space standards achieved and in use and the users’ reactions to these standards.

6.3 Agree space targets, monitor their attainment and report to senior management

Space targets should be developed for the HE sector for the following categories:

- GEA:site area
- net:gross area
- NIA/student FTE
- office NUA/office user FTE
- teaching space utilisation
- utilisation of other spaces – such as offices and learning spaces.

The case studies indicate that net usable:gross floor area ratios in learning resource centres are likely to be higher than in general teaching buildings; while specialist buildings, such as science research and performing arts, will have lower ratios.

EMS data should incorporate area efficiency measures of net usable:gross area, for entire estates, and for specific buildings. This would allow benchmark information to be built up across the sector. Space ratios for specific academic disciplines should be developed.

Individual HEIs should collect and monitor their own detailed information for each building to compare with sector-wide targets.

6.4 Collect standardised utilisation data, including office space utilisation

Utilisation data are key to understanding how well a building meets its objectives. A target utilisation rate for HEIs suggested by Education and Learning Wales (ELWa)¹⁷ is 30% utilisation across a full teaching week. HEIs should carry out utilisation studies using standard procedures for the purpose of benchmarking.

All teaching rooms, whether centrally timetabled and allocated, or used by one faculty or department alone, should be monitored. Utilisation information should be linked to the

¹⁷ ELWa, January 2002, ‘Space Management: a Good Practice Guide’.

scheduling of teaching rooms. It is required by EMS and should be collected in the same way by all HEIs.

The case studies demonstrate that these data are not gathered consistently, for example they vary in:

- length of observed day
- percentage of rooms observed
- whether only centrally bookable rooms are reviewed
- how room capacity is defined
- how actual capacity is recorded.

Non-teaching spaces such as office areas or learning resource centres should be included wherever practical in order to allow appropriate space management policies to be developed around known use patterns.

6.5 Collect and apply detailed cost information

Space champions should ensure proper capture of as-built cost data so that real data can be used to establish parameters for future projects, which will help complete the feedback loop. To enable proper comparison between buildings, we suggest that the following data should be collected:

- a proper elemental as-built cost analysis together with brief specification notes
- a schedule of abnormal costs and key cost drivers
- details of how the contingency was spent (eg unforeseen construction problems or user/client change)
- key details for briefing including the existing space standards and those to be achieved within the new facility
- running and maintenance costs on a building-by-building basis rather than the simple campus-wide analysis that is currently common
- a more appropriate unit cost than cost per m² that recognises the diversity within the

HE sector. Consideration could be given to the construction cost per pound of income per m² as one alternative.

Each HEI should establish an appropriate budget to fit out space to be refurbished – in many instances an insufficient allowance is set which unnecessarily restricts flexibility. Over time, this means that more significant work needs to be undertaken. HEIs should focus on producing flexible space that can be easily changed.

Institutions should consider spending more initially to achieve long-term cost savings through appropriate flexibility, and spending more per unit area while reducing the area to be fitted out. The aim is to make high quality, flexible space work harder without increasing overall project costs.

The benefits of greater flexibility can be illustrated when the HEI undertakes robust benchmarking to establish the cost impact and the usage benefits. Universities should consider establishing examples of best practice solutions within the campus against which individual schemes can be compared and against which the impact of more or less flexibility can be measured, for instance the cost impact of introducing retractable seating to lecture theatres rather than fixed seating.

6.6 Incorporate space efficiency concepts into the estate strategy

All projects should be set in the context of the overall estate strategy of the university so that their contribution can be maximised. Space should serve the main purpose of the university in delivering education and research. The estate strategy, and its efficiency targets, should be co-ordinated with other important university policies such as the strategic development plan, infrastructure plan, and teaching and learning strategy.

Data about buildings being vacated should be reviewed to ensure that spatial and functional improvements are genuinely created in new buildings. Adding floors, or infilling a part of the footprint that was originally open, or both, makes intrinsically more efficient use of the

immediate site. The potential contribution of different buildings and sites in this respect should be understood and incorporated as part of the estate strategy.

6.7 Incorporate requirements for space efficiency into project briefs, feasibility studies, option appraisals and design review

HEIs should include space efficiency within the requirements for the choice of design team or design/build team in invitations to tender (ITTs), Office of the Journal of the European Union (OJEU) notices and in interviews. Hard data from shortlisted teams on the space efficiency of their own recent work should be reviewed. During feasibility studies and option appraisals, space champions should incorporate concepts of space efficiency in assessing alternative strategies.

Institutions should make sure that all project briefs are properly formulated with the right consultation and feedback to users. This includes managing stakeholders' expectations, explaining reasons for any space efficiency issues, and resolving any difficulties this may cause. If organisational or space policy changes are taking place as part of the building project (a very common situation), consultation, follow-up, and support should take place during the period of change, especially for people moving from enclosed offices to open plan work areas. Time should be built into the project to allow this to happen.

In early stages of the design process, HEIs should request area measurements from the design team to compare against norms and against the brief.

6.8 Develop and maintain a clear decision and communication structure for building projects, including user groups

Every project needs a clear structure for decisions on scope, targets and details. The briefing process is exceptionally important and requires careful management throughout the project. Communication about reasons for design decisions is needed. Creating a user team that is kept in close contact with the project as it develops is a helpful approach at all times, and particularly when there are significant changes, for example to policies about space entitlement.

The user team at the design stage may later remain as the team involved in longer term management of the building. This is generally a highly effective way to ensure that a building continues to work efficiently for the users. If groups from several different disciplines share the building, the user team is a useful communication forum.

6.9 Promote the benefits of versatile spaces, with the right furniture

Reduction in 'ownership' of space is one of the keys to more flexible planning and the space efficiencies that brings. While acknowledging the strong sense of territory in academic departments, users need to be encouraged to appreciate that the move towards multidisciplinary courses, the increase in central booking of teaching space and the pervasiveness of information technology, will make it easier for rooms to be used for many different types of teaching and learning by several faculties.

Generically designed rooms can easily be reassigned to different departments. Local amenity space for both staff and students, such as coffee shops, breakout areas and wireless-enabled computer zones, are examples of versatile spaces. Versatility may involve higher capital cost for more equipment or finishes, which must be justified by improved utilisation.

Estates departments along with user representatives should define the flexibility they wish to achieve before a design team is appointed. They need to consider the effective lifespan of the proposed space use. Uses that are unlikely to change significantly over the medium term (10-15 years) require only limited amounts of flexibility.

The way in which furniture fits into a space has an important influence on its use and efficiency. Measurements should be taken of existing situations, especially if long-term furniture contracts are being placed. Workplace furniture includes desks and storage, both of which are vitally important. Appropriate teaching room and learning area furniture should be exploited to the maximum.

6.10 Include space efficiency information in post-occupancy evaluations

A post-occupancy evaluation (POE) is a key element in the feedback loop that allows:

- minor problems to be corrected
- successes to be replicated
- repetition of mistakes to be avoided.

Post-occupancy surveys should include details of the space standards targeted and in use and the users' reactions to these standards, and document building space efficiency. Information should be collected through questionnaires, interviews, and recruitment and leaving information from the human resources department, to verify whether or not users perceive space efficient buildings as better or worse than others.

HEFCE and the Association of University Directors of Estates (AUDE) are currently looking at methodologies for post-occupancy evaluation and their suitability for HEIs. A 'Guide to post-occupancy evaluations' will be published by AUDE in spring 2006. The Higher Education Design Quality Forum (HEDQF) has previously suggested the 'De Montfort' method which has been in use for some time.

The name 'post occupancy' can be misleading as evaluation should take place at the start of a project, to allow the setting of targets and goals to be made against real information, as well as after occupation has been established for some months to assess how well these targets have been met. The post-project evaluations that are currently often carried out as POEs focus less on understanding the efficiency of the space in relation to its uses, and more on understanding the quality of the process and its outcome as a finished project. This must change if POE is to help space efficiency to be achieved.

7 Case study comparisons

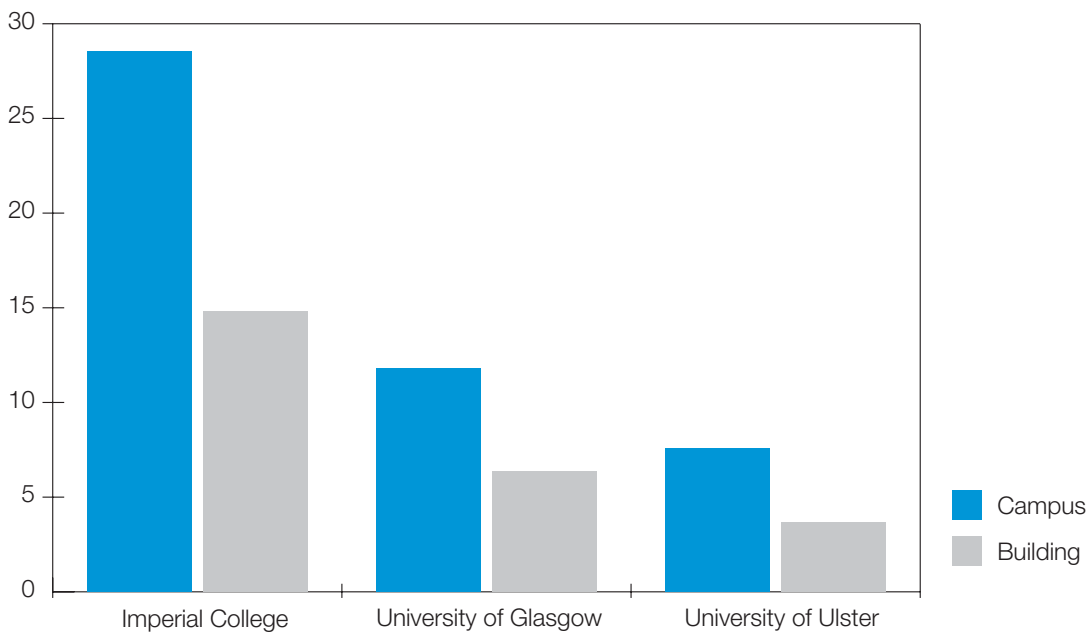
We carried out several comparisons of the case study material on different measures as summarised in the following tables and charts.

Figure 1 Area analysis of the 15 case studies showing a range of area efficiency measures

Ref	Building type	Name and HEI	User	Area m ² GIA	Area m ² NIA	Area m ² NUA	NIA: GIA %	NUA: GIA %	NIA/ student FTE m ²
1	Science/ Biomedical	Sir Alexander Fleming Building, Imperial College	Biomedical Sciences	25,517	19,998	13,308	78.4%	52.2%	13.3
2	Science/Health Studies	Health and Well Being Building, Sheffield Hallam University	Health	8,142	6,770	5,225	83.1%	64.2%	N/A
3	Education	St. Andrew's Building, University of Glasgow	Faculty of Education	12,275	10,676	8,101	87.0%	66.0%	6.36
4	Performing Arts	Foyle Arts Building, University of Ulster	Performing Arts	2,714	2,167	1,773	79.8%	65.3%	3.65
5	Science/ Nanoscience	Nanoscience Research Centre, Cambridge University	Nanoscience	1,720	1,569	1,134	91.2%	65.9%	N/A
6	Science/ Chemistry	Chemistry Research Laboratory, Oxford University	Chemistry	14,174	11,718	8,987	82.7%	63.4%	N/A
7	General/ Multidisciplinary teaching	Owen Building, Sheffield Hallam University	Multidisciplinary	10,323	88,491	7,621	82.3%	73.8%	N/A
8	General/ Multidisciplinary teaching	J Block, University of Glamorgan	General teaching/Admin	8,238	5,882	5,605	71.4%	68.0%	N/A
9	General/ Multidisciplinary teaching	Malet Street Building, Birkbeck College	Multidisciplinary	7,715	N/A	6,042	N/A	78.3%	N/A
10	General/ Multidisciplinary teaching	Canal Side East, University of Huddersfield	Multidisciplinary	4,187	3,333	2,916	79.6%	69.6%	N/A
11	General/ Multidisciplinary teaching/ Student Services	Clarendon Building, University of Teesside	General teaching/ Student Services	11,088	6,599	5,470	59.5%	49.3%	N/A
12	General/ Multidisciplinary teaching/ Student Services	Holgate Building, York St. John University College	Student Services	4,745	4,123	3,229	86.9%	68.1%	N/A
13	Business	Michael A. Ashcroft Business School, Anglia Ruskin University	Business	3,675	3,130	2,383	85.2%	64.8%	N/A
14	LRC	Harrison Learning Centre, University of Wolverhampton	Learning Resource Centre	10,980	10,025	8,851	91.3%	80.6%	N/A
15	LRC	Great Central Warehouse, University of Lincoln	Learning Resource Centre	5,063	4,323	3,665	85.4%	72.4%	N/A

Source: Calculations by AMA from drawings supplied by estates departments.

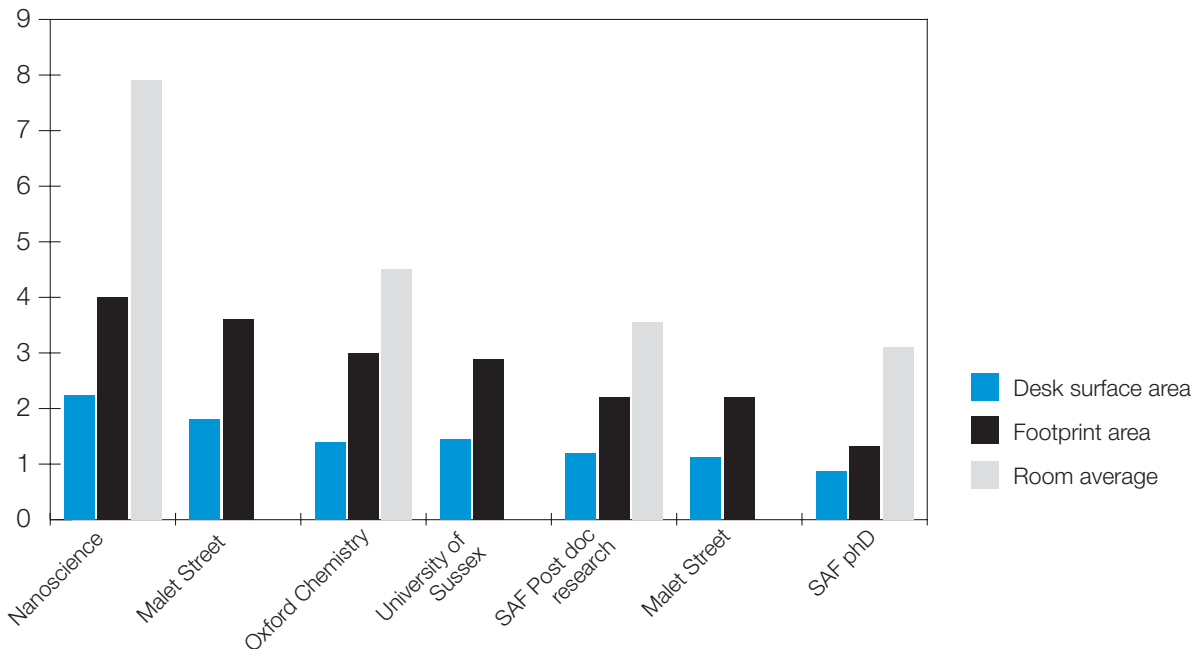
Figure 2 Area per student FTE at building and university level (m² NIA)*



*Data from three detailed case studies compared to EMS 2003-04

Source: EMS data from estates departments; building areas calculated by AMA.

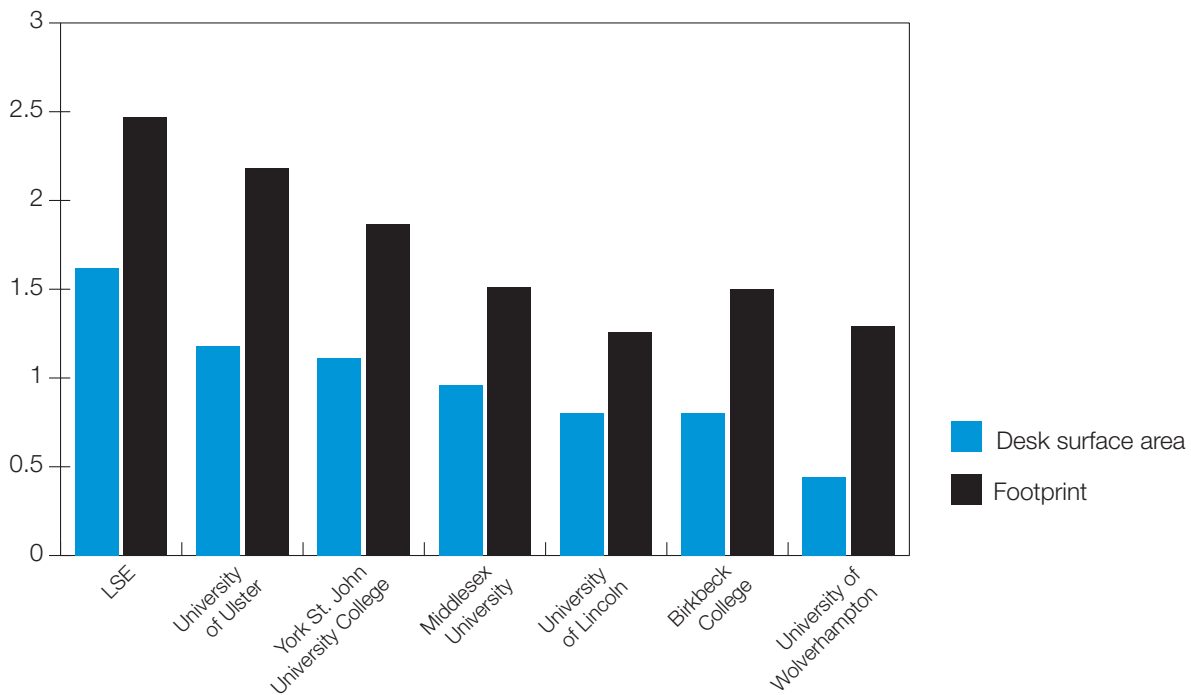
Figure 3 Area per researcher (m²/workspace)*



* Desk surface, footprint, typical room average NUA from six case studies and University of Sussex. N.B. Desk surface = horizontal working area; footprint area = space taken by a desk, chair and local storage; room average = total room area NUA divided by number of desks.

Source: Areas calculated by AMA from drawings provided by estates departments and site measurements of desks.

Figure 4 Area per workspace in libraries or learning resource centres (m²/desk space)



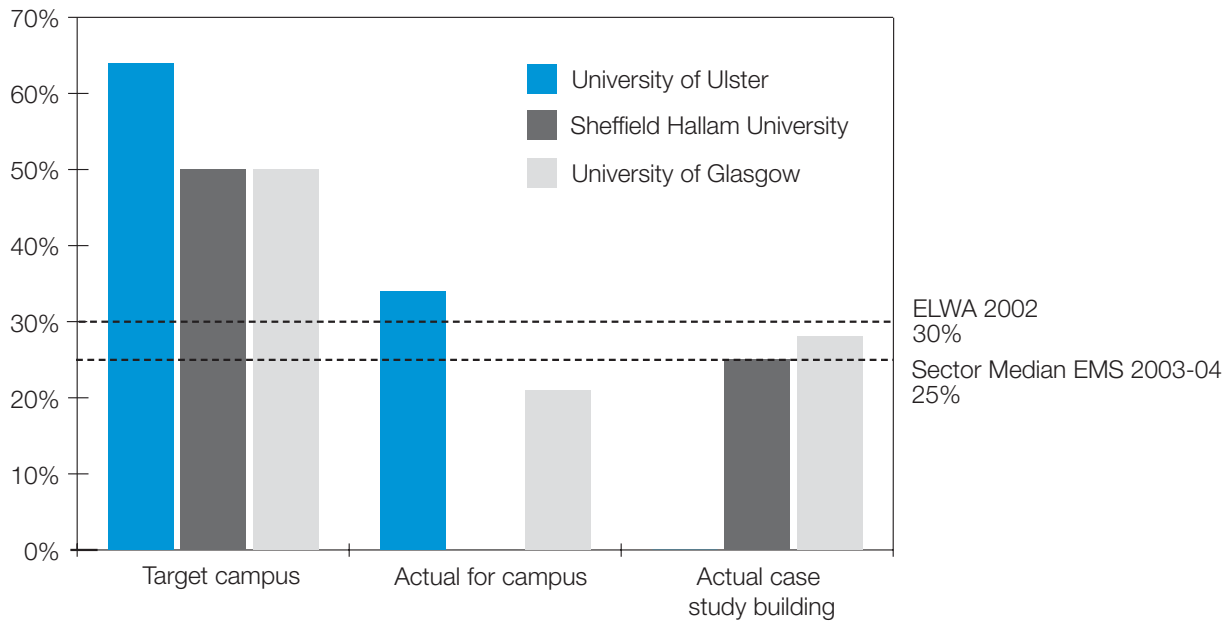
Source: Calculations by AMA, from drawings provided by estates departments and site measurement of desks, from five case studies plus LSE and Middlesex University.

Figure 5 Analysis of area allocation to different functions from our four detailed case studies (% GIA)

Space type	Sir Alexander Fleming	Foyle Arts	St. Andrew's	Health and Well Being
Teaching and learning	13.3%	51.9%	23.8%	30.2%
Research	23.9%	N/A	4.4%	N/A
Teaching/research support	5.3%	N/A	2.1%	2.8%
Staff office space	8.9%	10.4%	21.1%	23.9%
Student amenity	1.5%	N/A	4.7%	4.5%
Circulation	15.5%	18.7%	33.1%	18.1%
Core	17.2%	13.9%	6.7%	16.2%
Other	14.4%	5.1%	4.1%	4.2%

Source: Calculations by AMA, from drawings provided by estates departments.

Figure 6 Teaching room utilisation for three case studies (% utilised)



Source: Data from the estates departments and ELWA: 'Space management: A good practice guide', 2002.

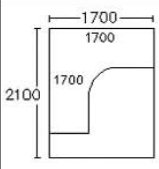
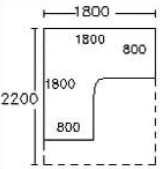
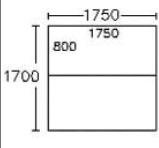
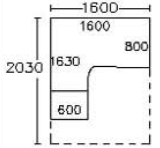
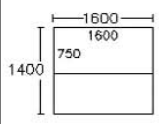
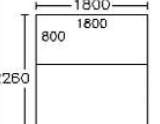
N.B. Utilisation = frequency x occupancy %

Figure 7 Space per desk in 12 case study buildings (m² NUA)

Building	NUA per:					
	Work surface	Desk footprint	Typical 1 person office	Typical 2 person office	Typical 3-10 person office	Typical 11+ office
Nanoscience Research Centre	2.2	4.0	9.0			5.3
Michael A. Ashcroft Business School	1.4	3.6				11.6
St. Andrew's			12.9	7.0	8.6	
Canal Side East	1.7	2.9	11.9	6.0		
Malet Street	1.1	2.2	10.2			
Sir Alexander Fleming Building	0.9		16.2	8.3		
Foyle Arts Building (desk 1)	1.7	2.9			11.5	
Foyle Arts Building (desk 2)	1.6	4.2				7.3
Clarendon Building (desk 1)	2.3	4.3	11.0	7.0	8.4	
Clarendon Building (desk 2)	1.7	2.9	11.0			
Clarendon Building (desk 3)	1.7	2.9				12.2
Chemistry Research Laboratory	2.6	4.8	14.0			
Health and Wellbeing	1.8	3.2	10.2		7.4	6.0
J Block	1.5	2.6	15.2	8.6		
Holgate Building	1.5	2.6	9.7	7.5	4.8	

Source: Calculations by AMA from drawings with furniture layouts provided by estates departments.

Figure 8 Furniture footprints from selected case studies

Research				Office			
University	Desk size	Desk surface area	Footprint area	University	Desk size	Desk surface area	Footprint area
Birckbeck College Malet Street		1.8sqm	3.6sqm	Cambridge University Nanoscience		2.1sqm	4sqm
Oxford Chemistry		1.4sqm	3.0 sqm	Sheffield Hallam University Owen Building		1.8sqm	3.2sqm
Imperial College SAF		1.2sqm	2.2sqm	Anglia Polytechnic University Ashcroft Business		1.4sqm	3.6 sqm

Source: AMA measurements from layout plans provided by estates departments and site measurements.

Figure 9 The main cost data: four detailed case studies

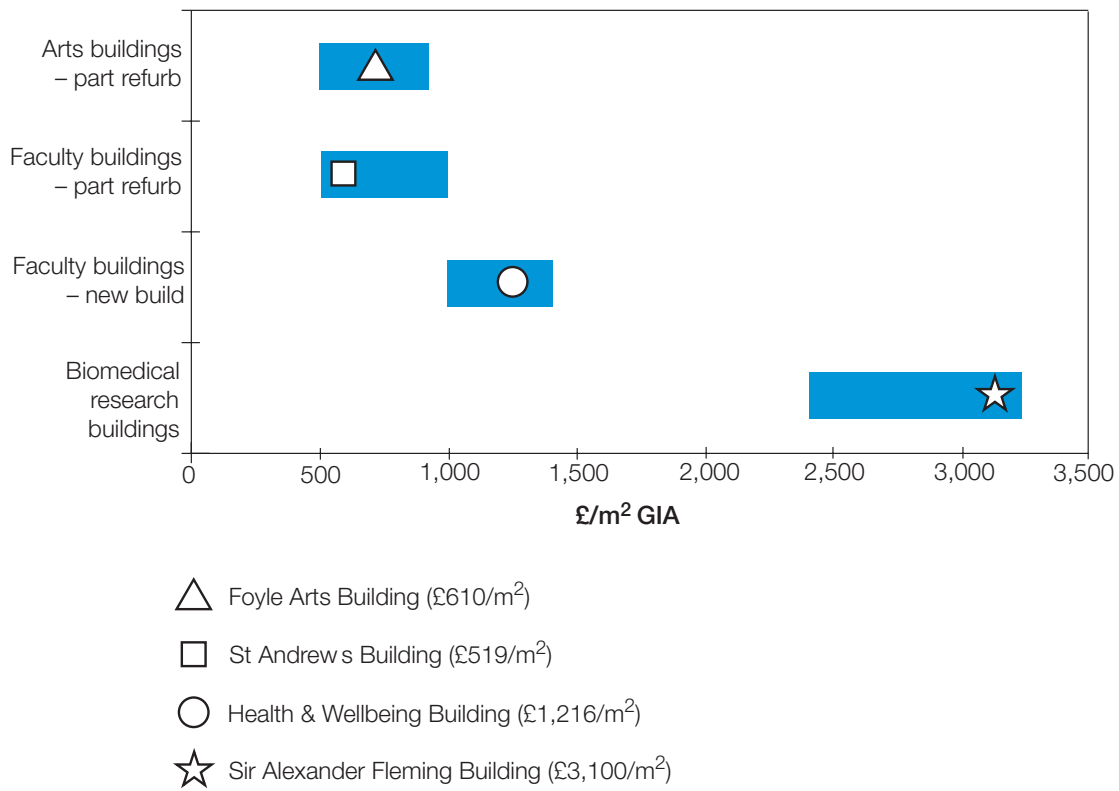
Building	Size (m ² GIA)	Function	£/m ² GIA	£/m ² NUA	£/ FTE	£/m ² Running and maintenance
Sir Alexander Fleming Building	25,517	Science Building	3,100	5,940	not available	106
Health & Wellbeing Building	8,142	Faculty	1,216	1,895	not available	32 ⁽²⁾
St. Andrew's Building	9,632	Faculty	519 ⁽¹⁾	617	2,490	130
Foyle Arts Building	2,714	Arts	610	935	2,573	21 ⁽³⁾

Source: Davis Langdon from figures provided by estates departments.

Notes

- (1) = Excludes subsequent costs to 'complete' the building
- (2) = Running costs only
- (3) = Maintenance costs only

Figure 10 Typical cost ranges for university buildings compared to case studies (£/m² GIA)



Source: Davis Langdon

8 Case studies

Case studies of the following 15 buildings are described in this section. Case studies 1-4 are covered in more depth.

Ref	Building and institution name	User	Date	Type of build	Area m ² GIA
1	Sir Alexander Fleming Building, Imperial College	Biomedical Sciences	1998	New	25,517
2	Health and Wellbeing Building, Sheffield Hallam University	Health	2004	Refurbishment + extension	8,142
3	St. Andrew's Building, University of Glasgow	Faculty of Education	2003	Refurbishment	12,275
4	Foyle Arts Building, University of Ulster	Performing Arts	2003	Refurbishment + extension	2,714
5	Nanoscience Research Centre, Cambridge University	Nanoscience	2003	New	1,720
6	Chemistry Research Laboratory, Oxford University	Chemistry	2003	New	14,174
7	Owen Building, Sheffield Hallam University	Multidisciplinary	1996-2004	Refurbishment	10,323
8	J Block, University of Glamorgan	General teaching/admin	1997, 1999, 2002	Refurbishment	8,238
9	Malet Street Building, Birkbeck College	Multidisciplinary	2003	Refurbishment + extension	7,715
10	Canal Side East, University of Huddersfield	Multidisciplinary	1998	Refurbishment + extension	4,187
11	Clarendon Building, University of Teesside	General teaching/student services	1999	Refurbishment	11,088
12	Holgate Building, York St. John University College	Student services	2005	Refurbishment + extension	4,745
13	Michael A Ashcroft Business School, Anglia Ruskin University	Business	2003	New	3,675
14	Harrison Learning Centre, University of Wolverhampton	Learning resource centre	2002	Refurbishment + extension	10,980
15	Great Central Warehouse, University of Lincoln	Learning resource centre	2004	Refurbishment + extension	5,063

Sir Alexander Fleming Building Imperial College, London

The Sir Alexander Fleming (SAF) building uses space saving methods such as multidisciplinary research labs and expandable seminar/teaching spaces to economise on space. The 'research forum' (pictured right) has a dual function: it is the primary circulation space throughout the SAF and it doubles as an open plan research write-up and study space for postgraduate students.

Overview

The building is centrally located within the South Kensington campus of Imperial College and consolidates three previous research and teaching facilities into one modern research department.

It is located on the footprint of the old RCSII building as well as an adjacent vacant plot, and holds the Department of Biomedical Sciences, the Undergraduate Medicine offices and Life Sciences departments. It provides facilities for undergraduate medical and research students and houses 400 members of staff. The building includes ample research space, specialised as well as multidisciplinary laboratories, lecture theatres, seminar rooms and office space spread over seven storeys. In addition to the academic facilities, a café, catering and 'break-out' spaces are available.

The central atrium or research forum spans vertically from the second to the sixth floor, and is designed to act as a unifier between the levels, encouraging social interaction between the occupants, primarily postgraduate research students.

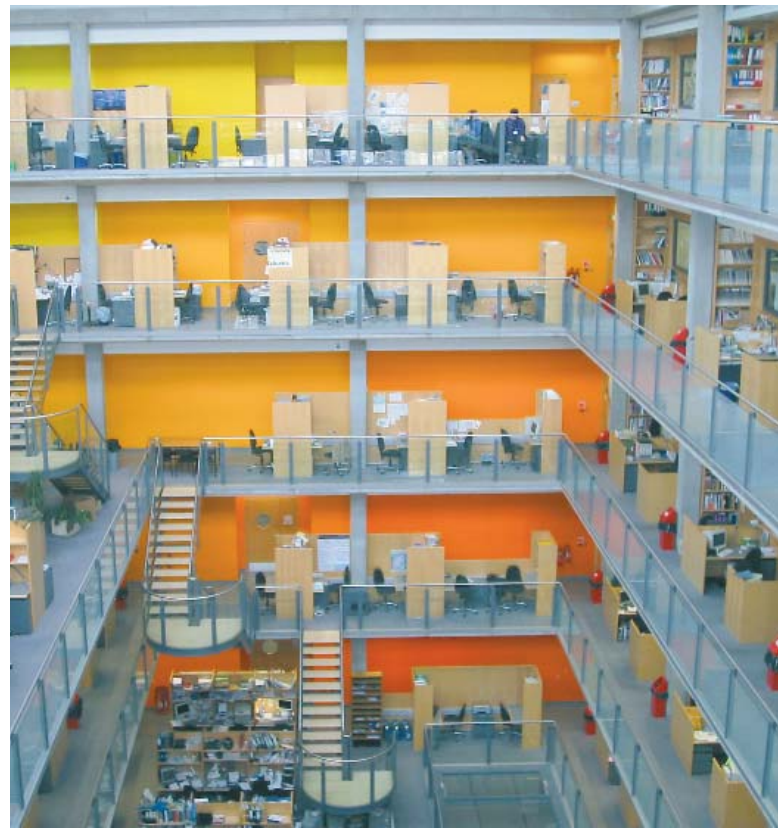


Photo: AMA

Briefing, design and construction process

Objectives

The existing distribution of teaching facilities for medical undergraduates was not attractive to potential students. The need to consolidate onto a single site, as well as the necessary replacement of dilapidated buildings were the primary drivers behind this project.

Reports into NHS activities and hospital provision raised questions about the approach to teaching undergraduate medicine, which reinforced the desire to bring the Biology department onto the main site. By incorporating this function into the SAF building, space could be released for conversion to student residences. Funding was available from the NHS for this project as well as from HEFCE.

Interaction between different teams and individuals was desired by the academic disciplines involved.

Briefing

A paper was prepared to establish the actual space that would be required, to create a business case. There was no head of the faculty at the time to provide specific detailed information, and space norms were used, based on the UGC norms reduced by 10%.

The then estates director and project manager (employed specifically for this building) were the main drivers behind the project.

The early part of the design process included consulting user groups as far as possible. The eventual occupants of the building were not yet known, but potential users provided information about requirements. The lack of specific occupants at the start of the briefing process promoted the development of a very generic design. In addition, the university had made visits to other similar buildings in the sector, both in the UK and abroad.

The restricted size of the site meant that space economies were important and the design team encouraged consideration of open plan

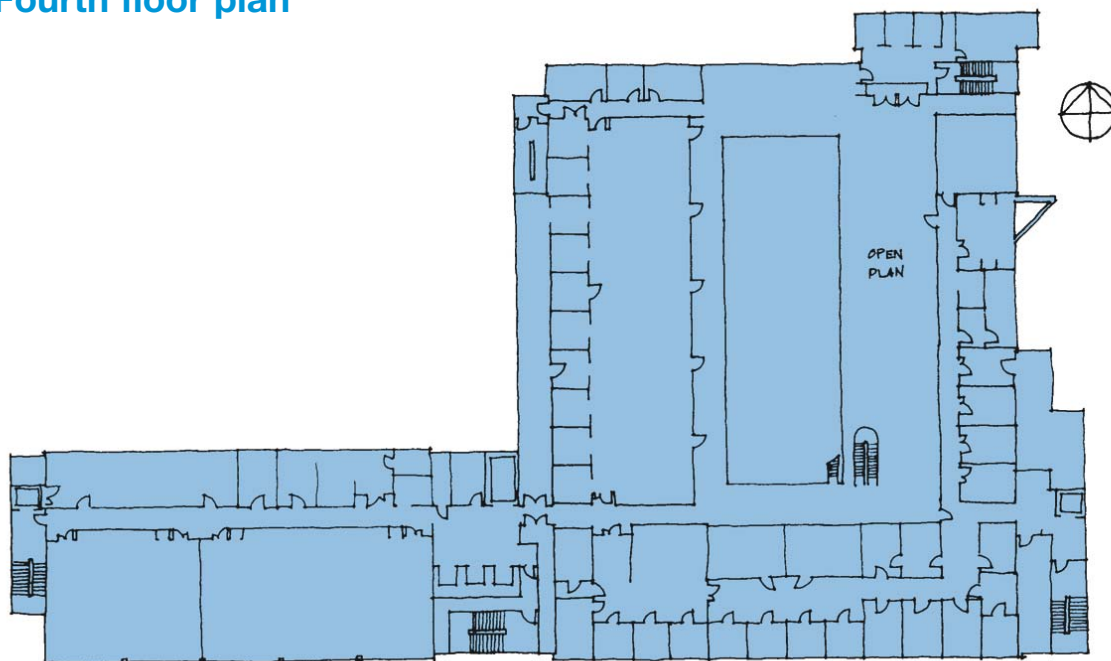
laboratories. This allowed for changes in sizes of research teams to take place while using the space most efficiently, and was accepted as a suitable design concept. This approach was adopted in the final design.

However, the implication of open plan flexible laboratories is that they have to be provided with services suitable for a wide range of disciplines.

Placing these laboratories on the outside of the building with the open plan research write-up area in an internal location allowed the use of an open atrium to provide interaction space, circulation and an economical layout for desks. Had the labs been internal, the atrium could not have been open and the interactive feel would not have been created.

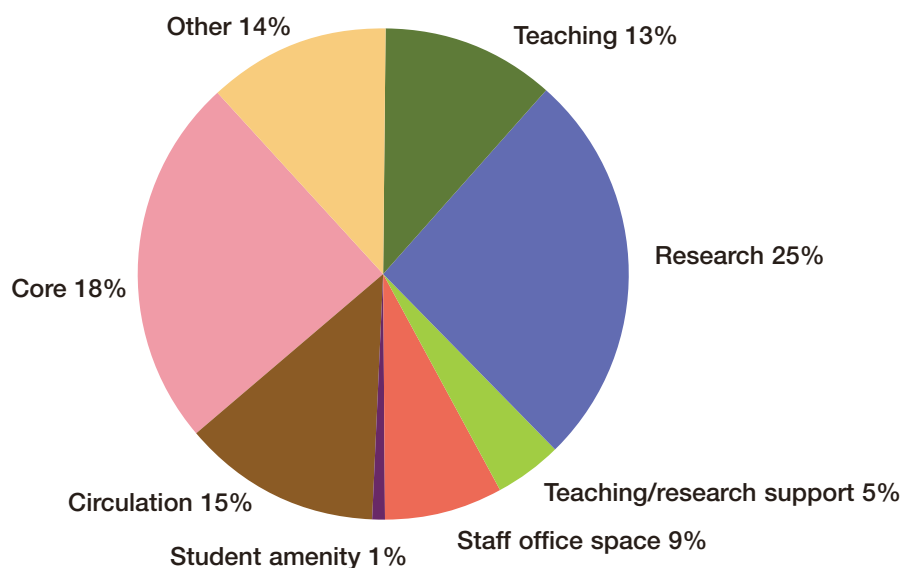
As the design progressed and real users were identified, the open plan concept was somewhat reduced in scope so that a few more enclosed offices were provided.

Fourth floor plan



Sketch: AMA

SAF building: Space breakdown by type GIA



Source: Area calculations by AMA

The multidisciplinary labs have been designed in a generic manner where laboratory worktables are outfitted with the basics such as power, gas and microscope. Specific equipment and tools are stored in an adjacent room, and used as necessary.

Procurement

Planning restrictions on the mass of the building led to the design of the usable, open plan atrium space. Westminster planners objected to the overdevelopment of the site initially in terms of density and mass. To overcome this obstacle in scale, Foster and Partners included an atrium.

Imperial College chose to use construction management (CM) as the route for procurement, which was new to the college at the time. However, the SAF building was one of the first large scale new build projects that the college had undertaken. The project had a number of critical procurement drivers, not least the merger of Imperial College with both St Mary's Medical School and Charing Cross, which necessitated the requirement for a single biomedical faculty building. Had a more traditional approach to procurement been adopted, the building would not have been completed in time for the opening of the new faculty.

Due to the creation at the outset of the project of a new, enlarged faculty, there was no detailed brief so the construction management approach enabled this brief to be developed in tandem with undertaking the basement and frame construction.

In short, a packaged approach to the procurement was the only way to deliver this complex project within the desired timeframe.

Costs

This project comprises a new build biomedical research building, with an emphasis on creating a space that is both functional and inspiring. The overall construction cost of £3,100/m² (based at 2005 price levels) should be benchmarked against a range of £2,400/m² to £3,200/m² for a new build development. This puts the project towards the high end of the range, but that is to be expected given the location and restraints of the site.

Imperial College has, over the last six years, undertaken minimal upgrades to part of the facility. In particular, there has been an emphasis on increasing the flexibility of some of the teaching laboratories and the introduction of campus-wide audiovisual teaching facilities.

In 2004, Imperial College spent in the region of £500,000 on upgrading the fifth floor teaching laboratory.

The construction cost excludes free-standing furniture, equipment, and the fitting out of the catering and basement areas. These budgets were managed directly by Imperial College and there is no cost information available to assess them. However, we consider it the norm that these are excluded from the construction costs.

It is not known if the existing buildings were sold to provide funds for the new building.

With respect to running costs and maintenance costs, we have been able to analyse the EMS data for Imperial College's South Kensington campus, which it has used to provide an indication of the running and maintenance costs of the building. This information is not specific to the building itself and has been calculated on a pro rata basis by area.

We do, however, understand that the SAF building accounts for a high proportion of Imperial College's energy use on the South Kensington campus which is not proportional to the building's area. The data that has been provided can only be analysed on a pro rata basis and so must be considered purely indicative.

There is no information available in order to benchmark running costs or maintenance costs back to the original facilities in order to get a genuine comparison of like-for-like facilities. However, notwithstanding that the new building is more complex and includes a greater degree of mechanical and electrical installation, along with equipment, we would expect the running costs and certainly the maintenance costs to be more efficient.

In order to complete a comprehensive review of the running and maintenance costs a copy of the EMS data specifically recording data for the SAF building will be required. From discussions with Imperial College, this data may not be available in the format that will enable this to be done accurately.

Post project

Use

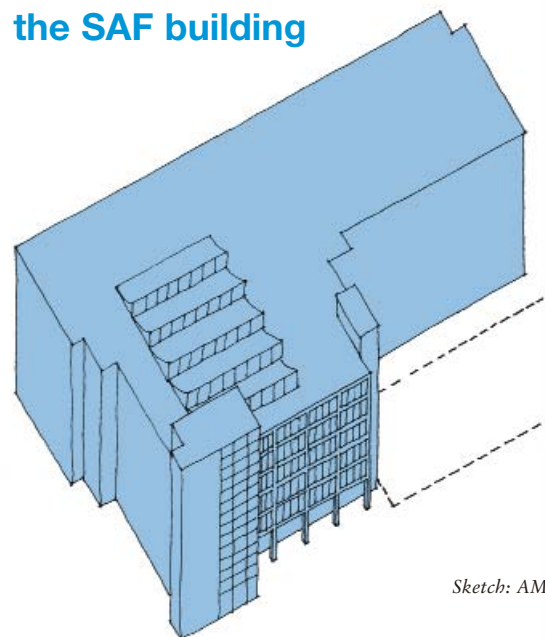
The organisation of the building concentrates undergraduate teaching in the narrow East-West wing and research in the main part of the building. Everyone uses the ground floor entrance area. There is a cafeteria on this entrance floor, which is extensively used by people working in other buildings as there is little other provision on this part of the site. The ground floor is separated from the atrium by a glazed area, which allows light through but cuts down sound transmission. This was a later addition to the project that had not originally been envisaged as necessary.

In the research area the post-doctoral researchers have desk space outside the labs and the PhD students are on the wider landings across the atrium.

The building is well-used, both for undergraduate and research purposes. There have been some changes to accommodate additional people:

- in the undergraduate teaching laboratory wing, two laboratories on the fifth floor have been knocked into one to allow a larger group to be taught at one time. There are

The main entrance to the SAF building



Sketch: AMA

Medical lab partitioning



Photo: AMA

LCD screens that enable the lecturer, or material being discussed or written, to be seen from all over the larger laboratory and these have been extended to other rooms for occasions when this large space is inadequate

- the access routes at the end of the atrium in the research area were originally equipped with bookshelves. These have now been replaced by additional researcher study carrels
- some of the offices that had been available for solo occupation are now being used by two people.

The ideas behind those aspects of the design aimed at increased interaction can be seen to be working. The social spaces in the research area on the third and fourth floors are good examples of this. One tangible outcome of the recognition of increased interdisciplinary interaction is that there are now 24 students funded by the Wellcome Trust to work across shared disciplines.

One undergraduate medical laboratory was modified soon after occupation. It had been assumed that the large groups to be taught would need large laboratories. Because there is a need for smaller groups for practicals, as well as for more seminar space, a series of folding concertina partitions have been installed, and a portion of the lab has been subdivided to provide seminar/practical space (as pictured above).

The flexibility for the research laboratories has proved successful. When group sizes change the teams simply shift up and down the benches to

accommodate the new numbers. This is a cheap and effective way to change teams and means that it can take place whenever it is needed.

For highly specialised facilities there was an existing user representative who was able to suggest suitable technical solutions, and, in the case of a radical approach to air handling, was able to convince the College that this would be more effective than more traditional solutions.

The first level 'flexi' seminar space can be used as a large single room or be reconfigured into two, three or four smaller rooms, able to accommodate 50 to 240 people. In practice, although reconfiguration of rooms is relatively simple, these dividers are used primarily for special events to configure the space to the appropriate size, rather than being used consistently for class size adjustment. In addition to this innovation, the seminar spaces provide external income from hiring out space.

Utilisation

Formal utilisation studies have not been carried out on spaces used for research activities. A recent study on undergraduate spaces has not yet provided results.

Post-occupancy studies are only carried out when specific problems arise and a solution is being planned. However, there is a formal change process that has been instituted, in part because of the SAF building, which makes rigorous assessments of the need for and cost of proposed changes.

User views

Anecdotally people believe that undergraduates, researchers and staff are influenced by the quality of the building when deciding whether to come to Imperial College. In addition, those who work in it do not wish to move to work in other buildings, despite the fact that space in the SAF building attracts higher space use charges.

Some aspects of the building caused unfavourable comment when the perimeter construction period barriers were removed. The perimeter treatment was felt to be unattractive and trees were requested to be planted outside the building.

Staff

Initially there was unease that there was so much open plan space for desk work, as well as about how the open laboratories would work. Some academic staff were against the openness. They were concerned about confidentiality, and made representations to the rector, which did result in an increase in enclosed offices and the consequent problems with air handling. However, since the building has opened there have been few problems with this.

The noise in the atrium was expected to present a problem, and the introduction of 'white' noise was discussed. However, the general hum of activity provides its own 'white' noise and while there are occasional local problems it is not generally an issue.

As space is tight everywhere in the college, there have been comments that the area around the lifts, which joins the research wing to the undergraduate wing, is very wasteful, large and hard to find a use for. This tends to lend force to comments such as 'the atrium is a bit excessive'.

Teaching spaces and lecture theatres are felt to be good with good audiovisual facilities, and generally the finishes are attractive, easy to keep clean and have lasted well, except door handles. Some of these are beginning to fail so that they do not latch the door shut effectively.

Expandable seminar space



Photo: AMA

The atrium



Photo: AMA

Students

The completely open 'research forum' required some time to get used to. While some students liked the open plan and improved social interaction, some students initially felt a little exposed in the space.

The research students appear well satisfied even though their spaces are very small, and they are not usually all together in any particular bay as much of their time is spent in the laboratories.

There are some researcher desks that are located underneath the open stairs connecting the different levels in the atrium. These are not liked because the stairs have open treads and dirt from people's feet showers down on the people sitting underneath. It appears to be impossible to get permission to change this.

Building management

A number of aspects of improved building management have been introduced to Imperial College through the SAF building:

- a. It is a complex building, with, for example, 41 air handlers, (whereas Imperial College's

comparable Flowers Research Building has only four). It is also a building planned for flexible use. It has therefore been seen to be worth providing the building with its own resident building manager to help control how this flexibility develops.

- b. Management teamwork, bringing together technical staff, the services specialists and facilities management knowledge, has been strengthened.
- c. It has been recognised that building managers may need additional training in the skills and knowledge needed to manage buildings effectively and professionally. The importance of user interaction groups has been recognised.
- d. The complexity, as well as the shared nature of the occupation, has meant that a management committee was set up with a building user group, led by the Estates department. This is now part of standard Imperial College practice and is seen to be very helpful in maintaining the most effective and trouble free use of the building.
- e. Because of construction cost overruns on the SAF project the college has put much stronger procedures in place to prevent this happening in future.
- f. The use of space charging was brought in partly in relation to the SAF building, partly in response to the general shortage of space.

Lessons learned

The development of this building and the consequent consolidation of three previous research buildings centralises the department and economises space. The staff in the SAF building came from three different sites: Charing Cross, St Mary's and the Hammersmith campus. The vacated space was re-used for academic purposes as the college won additional research awards and some large teams moved in from other institutions.

The generic approach and the open plan spaces have worked as intended, to allow flexible use to support growth and change:

- a. A 'generic' approach to design, creating multidisciplinary teaching and modular research labs, has helped to maximise usage, allow growth of different cohorts and teams, and adaptation for innovations in technology.
- b. Expandable seminar and lecture spaces have been created by using appropriate room dividers that provide good sound attenuation.
- c. The 'research forum' has been used as additional research and study space rather than as mere circulation space. Since completion, the number of research and study spaces has increased and they now cover virtually all free space surrounding the atrium while there is still a comfortable circulation area.

The openness of the laboratories and the fact that different disciplines can use contiguous laboratory spaces and shared social areas have helped create greater social interaction between the various disciplines within the SAF.

When visitors are introduced to the building by taking them first to the sixth floor in the atrium, a striking 'first impression' is made. This visually demonstrates the spirit of openness and interaction. It appears to be instrumental in bringing high quality staff and students to work at Imperial College.

A large, generic lab



Photo: AMA

Sir Alexander Fleming Building, Imperial College, London

Building use:	Medicine and Biology
Student FTE:	10,336 (campus)
Location and type of site:	Central London
Campus type:	Urban, Multiple Campus
Type of build:	New Build
Completion date:	1998
Team responsible:	Architect: Foster and Partners Research facilities design: Sandy Brown Associates Construction: Schal Construction

Brief	Brief established by: Estates Director and Project Manager
	Space standards specified: UGC norms reduced by 10%
	Procurement route: Construction management

Area breakdown	Area GIA: 25,517 m ²
	Area NIA: 19,898 m ²
	Area NUA: 13,308 m ²

Efficiency

Area/student FTE m² NIA building:	14.8 m ²
Area/student FTE m² NIA Campus (EMS):	28.6 m ²
Area/Faculty FTE m² NIA:	15.6 – 18.0 m ² (single office) 7.8 – 9.0 m ² (2 person office)
Utilisation target:	none
Utilisation actual:	unknown

Cost	Cost/m² GIA – construction: £3,100/m ² (based on current price levels)
	Cost/m² GIA – running: £79.16/m ² GIA
	Cost/m² GIA – maintenance: £26.85/m ² GIA

Health and Wellbeing Building

Sheffield Hallam University

A new extension and the refurbishment of the original building are helping the university further its plan to accommodate almost twice the number of students with a space increase of less than 10%.

Overview

Sheffield Hallam University (SHU) has two main campuses, the City campus on a site close to Sheffield's main railway station, and Collegiate campus a few miles away in a more residential part of the city, as well as three smaller sites.

The estates department has been very active in providing, monitoring and managing space for the university. In 1992 there were five sites and various options for change were reviewed, including the possibility of a greenfield campus. It was decided, despite the poor state of many of the existing buildings, to concentrate on the two main sites and upgrade, improve and match the space provided to student and faculty needs.

We have profiled two separate buildings at the university in our case studies, the Owen building and the Health and Wellbeing building which have together helped the university plan to accommodate almost twice the number of students with a space increase of less than 10%.

The Health and Wellbeing building on the Collegiate campus was an existing building onto which a substantial amount of new space has been added. Many of the design ideas, for example clusters of shared staff offices and multi-use teaching spaces, were developed and tested in other buildings including the Owen building (see case study 7).



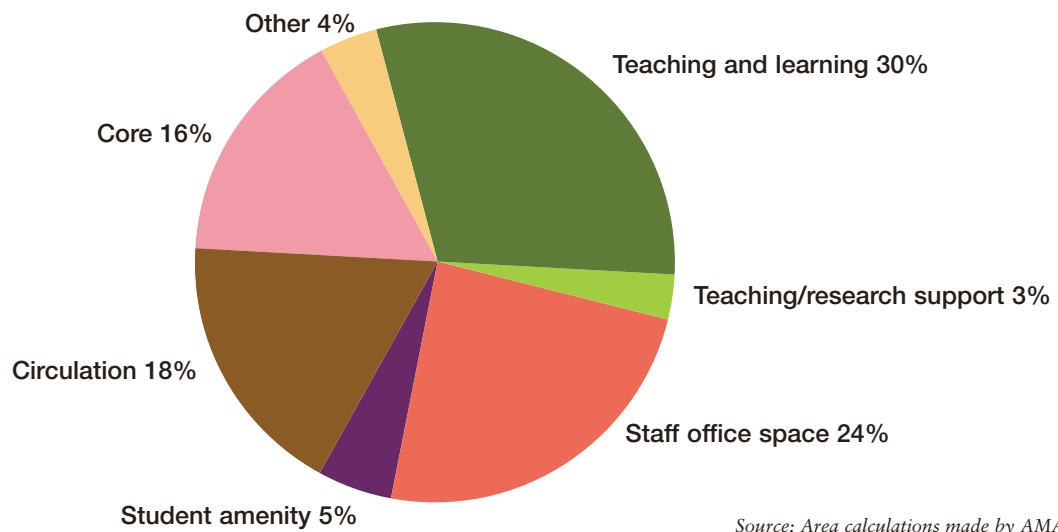
Briefing, design and construction process

Objectives

The purpose of the work was to provide new accommodation for the Faculty of Health and Wellbeing. Teaching rooms were needed to replace outdated provision for a discipline that could be relied on as a steady or growing market.

The university wanted to integrate the teaching to meet varying professional needs in the health and social care fields, by bringing people into one building and creating shared office areas for a mix of disciplines. The NHS is seeking a more 'joined-up' approach, so a hybrid approach to teaching is required, breaking down some of the existing professional barriers.

Health and Wellbeing building: space breakdown by type



The development aimed to provide high quality specialist teaching areas to enable the students to have an appropriate grounding before their clinical placements.

The brief and design for this project was decided upon before the university embarked on its restructuring, which created the new Health and Wellbeing Faculty, incorporating part of what had been a School of Health and Social Care. This change meant that in the end a slightly different group of people were moved into the building than had originally been envisaged. There are more administrative and fewer research staff than had been planned at the start. The brief was delivered with only two small changes during construction.

Briefing

The head of the school, who then became dean of the Faculty of Health and Wellbeing, set the objectives for the building. The detailed work of collecting the briefs for particular spaces, establishing sizes of student cohorts, understanding the equipment needed in different specialist rooms, was co-ordinated by Sue Holmes, Head of Facilities Planning. A technical manager from another faculty also helped at the briefing stage.

The university established a project board to oversee the process. It consisted of the pro vice-

chancellor concerned with planning and resources, the director of finance, the director of estates, an academic champion and two members of the estates department to co-ordinate supply (projects) and demand (facilities planning). The project board also had three members of the School of Health and Social Care, (later the Faculty of Health and Wellbeing) on it, the dean, assistant dean responsible for academic development and the faculty's head of business services, as well as the academic champion in the school responsible for co-ordinating needs and communication.

Staff were asked to fill in comprehensive questionnaires to record the detailed requirements for all their areas, and these were eventually translated into comprehensive room data sheets that they had to sign off. The questionnaires led to discussion about the brief's development. Once agreed, the data sheet process took place.

Some work practices (such as technicians laundering lab coats) were discovered and were not accommodated in the new premises.

Staff made requests for the amount of space that they thought they needed. These were compared to the space actually used, realistic predictions for new student numbers, and changing teaching and learning practices.

In SHU space charging is used and well understood, and has been systematically developed to take account both of amount and type of space, so departments are ready to balance their space wishes with a realistic assessment of likely demand. Since the briefing process is not exactly a science, the board tried to ensure some flexible space created around the brief to meet changing demands, as well as creating flexible spaces within the brief.

Well aware of current good practice in office space, the estates department sought to create generic, adaptable office areas, able to accommodate a range of departments with the room for growth and change. This led to the cluster offices that generally accommodate between three and five members of staff. These were particularly suitable for the Health and Wellbeing building to meet the desire to bring together different disciplines in the staff offices.

Procurement

Once a sufficiently detailed brief was assembled, a team of consultants – architect, mechanical and

electrical engineers, planning supervisor, quantity surveyor, and contract manager – were selected on a fixed price fee after tendering.

This team developed a detailed design, incorporating a portion of the existing building on the site and adding a new wing. The original intention had been to mothball more of the old building, but student numbers increased as a result of winning more NHS teaching contracts so a larger building was required. The new wing was in fact ‘bent’ in order to:

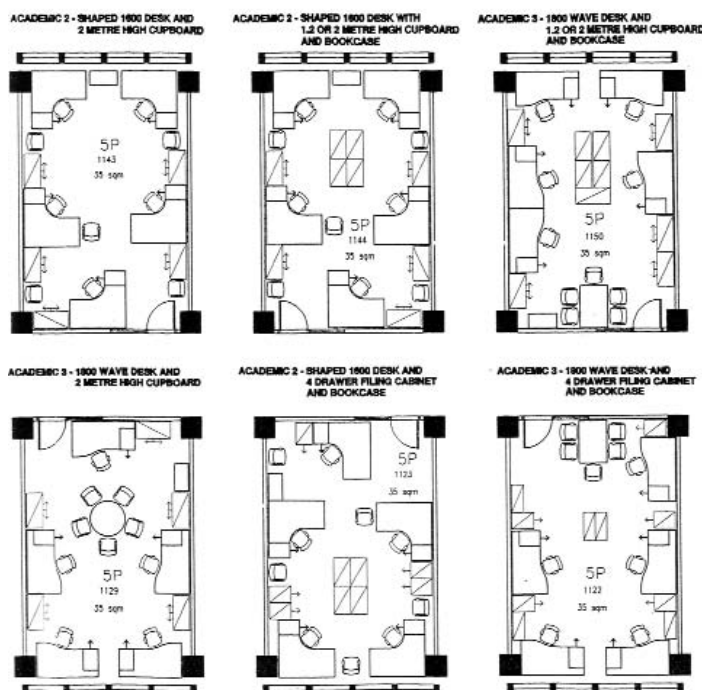
- provide sufficient accommodation
- meet planning restrictions/conditions
- fit onto the site.

The design was then included as a part of the final tender information for a design and build project with a guaranteed maximum price on a Joint Contracts Tribunal (JCT) contract.

The contractors continued to use the architects, although they were not obliged to, and used their own mechanical and electrical (M&E) designers. The planning supervisor and quantity

Five-person office module with alternative furniture arrangements

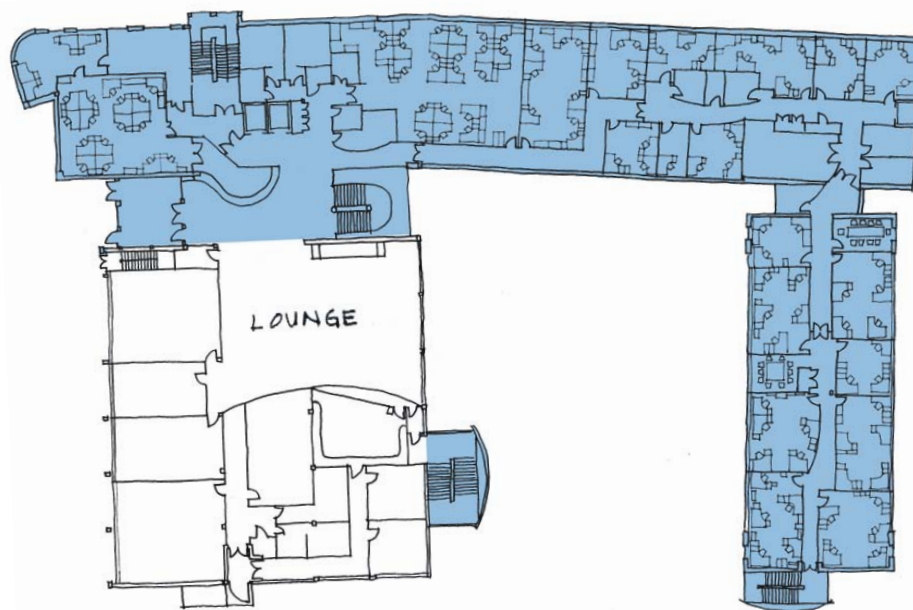
OPTIONS FOR 5 PERSON OFFICE



Administrative staff are accommodated in more open plan areas, as has become common in the university.

Source: SHU

Level four of the building: shading shows the new extension



Source: AMA

surveyor remained employed by the client throughout. This type of process has regularly delivered projects to time and budget for the university and is the preferred approach.

The new boiler plant for the adjacent seven-storey residential block was used to provide heating for the new building and this was part of a separate but parallel contract, which finished before the main contract.

Costs

This project comprises part new build and part refurbishment, however there is insufficient detailed data to understand the split in the capital cost between the two areas. The overall construction cost of £1,216 per m² should be benchmarked against a range of £1,000 /m² to £1,350/m² for a new build development and £600/m² to £850/m² for a refurbishment. At face value this would suggest that this project was priced at the high end of the market.

Looking more closely however, inclusions such as the upgrade of the existing boiler house which also serves the adjacent residential block, new escape stairs and plant access to the existing building, a full external works scheme and the extensive nature of the refurbishment, increased the outturn construction cost.

The construction cost excludes the specialist health equipment fit-out and the furniture, computers and audiovisual provision, which were all provided as new. These might not necessarily have been immediate capital expenditure had the faculty not relocated to the new facility, however they would ultimately have been required to upgrade old facilities to a similar standard.

There is no information available in relation to the purchase price of the original building and land. This would require consideration for a true comparison of the capital and running cost differential between the old and new facilities.

The other old buildings are currently being refurbished to provide new teaching space for the university. Although this has not been undertaken to recoup some of the expenditure, it does enable more teaching to take place at the university and subsequently bring in more revenue if used to increase enrolments.

We have received some information with respect to the energy and water costs.

The energy consumption for the Health and Wellbeing building is currently calculated at 155 to 200 kWh/m²/yr. This can be compared to the average energy cost for the university of 202 kWh/m²/yr. Therefore, even if the final

New double-height reception area



Photo: AMA

consumption were at the higher end of the range, the new building would be more efficient than the average.

The estimated water consumption based on information to date for the new building is $0.30 \text{ m}^3/\text{m}^2/\text{yr}$, compared to the university average recorded at $0.49 \text{ m}^3/\text{m}^2/\text{yr}$.

There is no information available in order to benchmark this specifically back to the original facilities in order to get a genuine comparison of like-for-like facilities.

To complete a comprehensive review of the running and maintenance cost, a copy of the EMS data would be required as this contains key information such as property, maintenance, cleaning and property management costs.

Post project

Use

The Faculty of Health and Wellbeing building contains several specialist teaching rooms, with specialist equipment or laid out to replicate medical and household spaces, as well as general teaching spaces, staff and administrative offices.

A POE is planned, but it will not be an HEDQF-style POE. The SHU estates department is keen to find out the contractors' views. An external consultant will examine the design and procurement process by interviewing relevant people. One objective will be to find out how to improve the transmission of information. For example, it may look at issues such as whether the room data should be on a drawing instead of, or as well as, on room data sheets.

Utilisation

Utilisation of teaching rooms, both general and special, is monitored regularly, but staff offices are not. The data is used when assessing new space requirements. These studies collect information on the frequency and percentage of capacity used of all bookable rooms. SHU has set a target of 50% utilisation.

In semester 1 of 2004-05 utilisation was 42% due to changes in teaching and learning resulting from the planned revalidation of courses. The potential to co-teach more groups in better-sized facilities meant space was more efficiently used, and there is capacity for further planned growth.

Since the building was completed, the faculty has submitted further tenders for additional contracts.

User views

The university does not routinely collect user views on the suitability or attractiveness of the accommodation. However, there is ample scope for views to be expressed and passed on so that any problems can be resolved. Informal comments are noted and acted on. For example, positive feelings about wide corridors in a particular conversion, and dislike of narrow ones in a relatively new building, led to a policy to ensure generous spaces for student movement between classes where possible.

Staff

We contacted staff to find out how they felt about the available accommodation in the new building. They expressed generally very positive views. There is better information technology, the spaces are 'light and well-designed' and the building is well liked: 'I feel so strongly about it, it is just so good'.

Use of bold colour makes spaces brighter and livelier



Photo: AMA

People now feel far more integrated. They used to feel isolated and the new facility has enabled a broader view of their discipline. Being interdisciplinary 'has opened up a new world'.

The cafeteria is already often overcrowded, and could perhaps be bigger. However, it has become a very important functional part of the building. When it is quiet it provides a good location to meet students or have an informal team meeting. It has encouraged socialising and supported the interdisciplinary approach for which the building was designed. It is 'very helpful to be able to meet without having to look for a room'.

The design of teaching spaces to allow a 'patient journey' to be followed is a very effective teaching device. It allows students to 'see patients in different locations'. (There are some wide corridors to allow bed movement to make this 'patient journey' possible.)

People were anxious about the shared offices and said that 'if everyone is in it can be noisy'. Generally shared offices have not been as problematic as anticipated partly because there are other areas where it is possible to have privacy.

It is felt that as the building becomes more crowded it may get more difficult to book tutorial rooms but currently there are rooms to use for group projects and the building is very convenient. SHU has a culture of shared offices.

Other areas of the site provide 'other teaching and general spaces'. The building was never planned to entirely meet the needs of this staff group on campus.

Students

We found that student opinion on the new development was influenced by the poor quality of accommodation in the old spaces that they had used. They had been taught in a building that was 'drafty or too hot, dark and dingy, with poor acoustics, in need of repair'. The corridors were too small and had convoluted routes.

This new building is 'modern, comfy, bright'. It is easy to get from one lecture to another and 'there is coffee on hand', although the coffee area does sometimes fill up.

One of the many specialised teaching spaces



Photo: AMA

Some students raised the issue of having to leave the building to go to the library and expressed the desire for a 'mini-library' and a photocopier in the building. A quiet study area would also be appreciated.

The inter-professional feeling of the teaching areas is good and the specialist rooms with their 'state-of-the-art equipment' are appreciated. Although students meet in inter-professional shared learning activities, they did not seem to mix very much with students in other specialisms.

Parking problems were the only serious complaint. Some students come from a great distance as they cannot get the teaching they need near to where they live, or near the hospitals in which they do their clinical experience.

Building management

The estates department manages all the buildings directly. The heating plant for the building is shared with the neighbouring seven-storey residential block.

Lessons learned

Across the estate, the average space per student FTE has greatly decreased. In 1996 the area GIA per FTE was around 10 m², by 2003 it had dropped to around 8 m²/FTE. This is paralleled by running cost efficiency, as running costs had dropped from about £50/m² to under £32/m² per annum. This is a reflection of the careful work put into space use and planning by the estates department.

The SHU space management champion, Sue Holmes, has devised an approach to space charging that makes the faculty aware of the ways in which its space is used and helps it to focus on finding ways to reduce space-related costs.

For the Health and Wellbeing project, the collection and use of data about actual room areas, utilisation and use patterns was integrated with the briefing process, allowing teaching objectives to be aligned with good practice in building planning.

The space planning of the cluster arrangement for academic offices has helped to deliver considerable space efficiency and also delivers an integrated feel.

The internet café in the cafeteria



Photo: AMA

Health and Wellbeing Building, Sheffield Hallam University

Building use:	Health, including old School of Health and Social Care
Location and type of site:	A residential area in Sheffield
Campus type:	Urban site, multiple campus
Type of build:	New and refurbishment
Completion date:	2004

Brief	Brief established by: Head of the school (later became dean of the Faculty of Health and Wellbeing)
	Space standards specified: SHU has developed its own space standards
	Procurement route: Design and build contract with guaranteed maximum price

Area breakdown	Area GIA: 8,142 m ²
	Area NIA: 6,770 m ²
	Area NUA: 5,225 m ²

Efficiency	Area/faculty FTE m² NIA: 7.0–7.8 m ²
	Utilisation target: 50%
	Utilisation actual: 25.5%

Cost	Cost total – construction (year): £9,900,000 (2004)
	Cost/m² GIA – construction: £1,216/m ²

St. Andrew's Building

University of Glasgow

The 'Battery Pack' extension to the Faculty of Education replaces the ill-fitting 1930s extension, reflecting effective estate planning and a relatively modest upgrade to 'join up' several haphazard extensions done in previous years.

Overview

The University of Glasgow occupies an urban site on the western edge of the city centre.

St. Andrew's building is a six-storey, Edwardian building (1913), with two multi-storey extensions and one single-storey extension (a gym) added during the 1950s, 1960s and 1970s. The most recent addition, the 'Battery Pack' extension, was finished in 2002 and is a full height circulation zone, which unifies the various portions of the building. It replaces a 1930s two-storey addition to the original building.

The building houses the newly formed Faculty of Education, which includes adult education as well as teacher training.

The Battery Pack is an example of two aspects of space management:

- a. **Effective estate planning:** acquisition of a building, previously used for a function similar to the intended new one, on a site with development potential, to house a newly acquired teacher training function.
- b. A relatively modest intervention to upgrade a haphazard building and solve its problem of confusing and poor disabled circulation, which was making it difficult as well as unattractive to use.



Photo: Courtesy of Andrew Lee

Briefing, design and construction Process

Objectives

The objective of the project overall was to provide accommodation for an entirely new Faculty of Education. Once the building was chosen, the specific objective was to remedy failings and bring it into use in time for the start of the new academic year in 2002. A significant problem to address was the disjointed physical communication between different parts of the building that had arisen as a result of several different additions.

The initial trigger for the project was the proposed merger with a teacher training college located in Bearsden, a northern suburb of Glasgow. The Scottish Funding Council encouraged this merger as part of a drive to merge university resources, including space, more efficiently. This Catholic teacher training college was to be merged with the existing Adult and Continuing Education, and Educational Studies departments in the Faculty of Arts. A new Faculty of Education requiring a new home was the result. The suburban site of the teacher

training college was to be sold to finance the necessary building work.

The initial intention was to build a new building specifically for the new faculty. The OJEU procedure was initiated, an architectural team (RMJM) chosen and a feasibility study for the new building undertaken. A vacant site, currently used for car parking in the centre of the campus, was chosen for the project. At this stage the merger was still under discussion and details had not been finalised.

The feasibility study generated a requirement for £12 million or about £1,700 /m². This was too expensive for the university. At this time the St. Andrew's building came on the market. It had previously been used for catering training by Glasgow Caledonian University, and, despite being rundown and of piecemeal design, the basic pattern of accommodation fitted the desired needs well. The site also provided a possibility for future development so the project was adapted to this new opportunity.

Briefing

The estates department took a major lead in this project together with the dean of the faculty and the merger implementation group.

The job architect from the estates department prepared the preliminary brief from the existing teacher training college staff. Riach and Hall Architects were also employed to carry out

briefing at Bearsden and for other potential occupiers of the building already on the main campus.

The brief that was originally drawn up was based on the assumption that there would be a new building. Space calculations were based on the typical space provided on the main campus as the norm. No special space efficiency targets were specified in the brief.

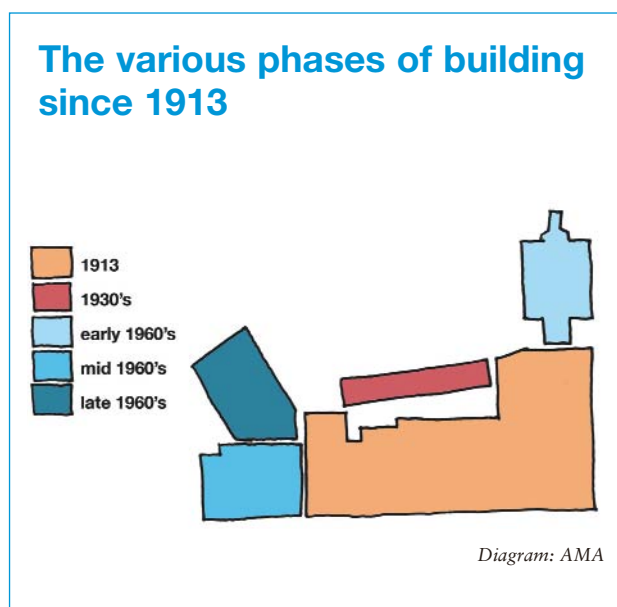
Eventually, as the project changed, the user requirements had to be fitted to the existing building and to the somewhat constrained project budget.

RMJM, originally chosen for the new building project, was retained to design this project. Its brief was now to accommodate the new faculty in the existing building, and in doing so to rationalise the circulation, address the requirements of the Disability Discrimination Act (DDA), and improve the appearance of the building. RMJM's solution was to remove the most inefficient space (the 1930s block) and link and unify all the others with a new 'front' to the building, thereby changing the main entrance to face the street frontage, rather than the park.

The building was to accommodate a wider group than those coming from Bearsden, and several different groupings were proposed, seeking a 'best fit' with available space and synergies between groups.

Cultural and 'political' issues about the merger and the move meant that the project team was reluctant to be too prescriptive about specific locations and floor layouts for particular groups.

The dean of the new faculty, a member of the Bearsden team, took a major role and signed off the stacking plan, which determined which parts of the building would be used by each group. Decisions were made in a series of short, sharp meetings. Detailed space planning, deciding who would go into each office and how the spaces were to be laid out, was left to the groups themselves. This helped to ensure that even those who were most reluctant to move would have some control over how they would work in the new environment.



Level four of the St. Andrew's building – shaded area shows new extension

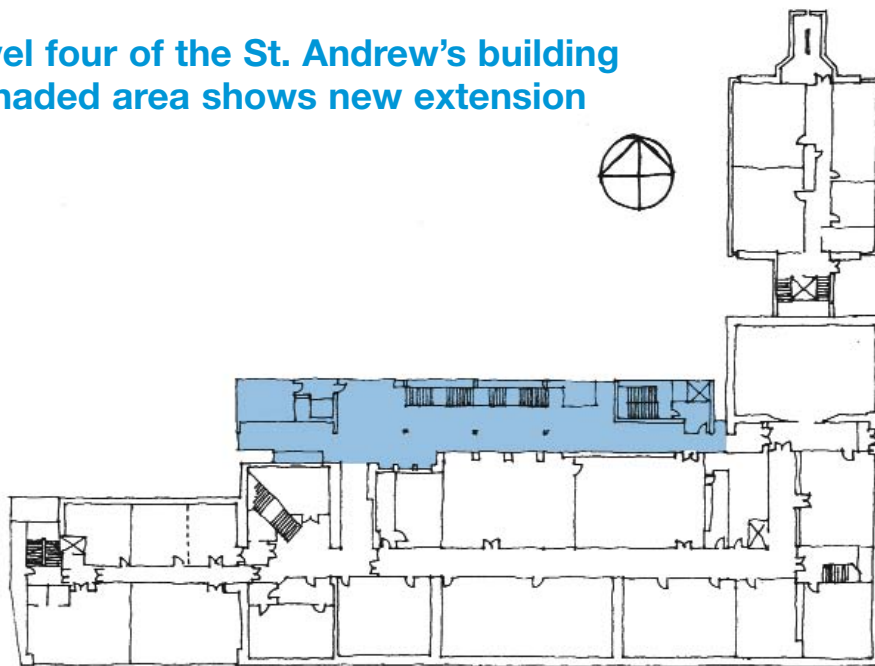


Diagram: AMA

Procurement

The university estates department preferred to take a traditional procurement route. The intention was to start in September 2001 and finish by August 2002.

Due to problems with the existing building fabric (asbestos and rot), difficulties with ground conditions, and an increased scope of works that resulted from decisions to provide higher standards than originally specified, the project overran in terms of time and budget.

The project was separated into batches so that parts of the building could be used as they were completed, given the considerable time pressure to complete before the start of the new academic year.

The relationships with the contractor on this project were poor. The estates department had regular disagreements about the amount of money due for payment each month, and had to tightly monitor the works. For example, the university's clerk of works found that on many occasions there was a disparity between the number of workers supposed to be on site and the number of workers' certificates presented for payment.

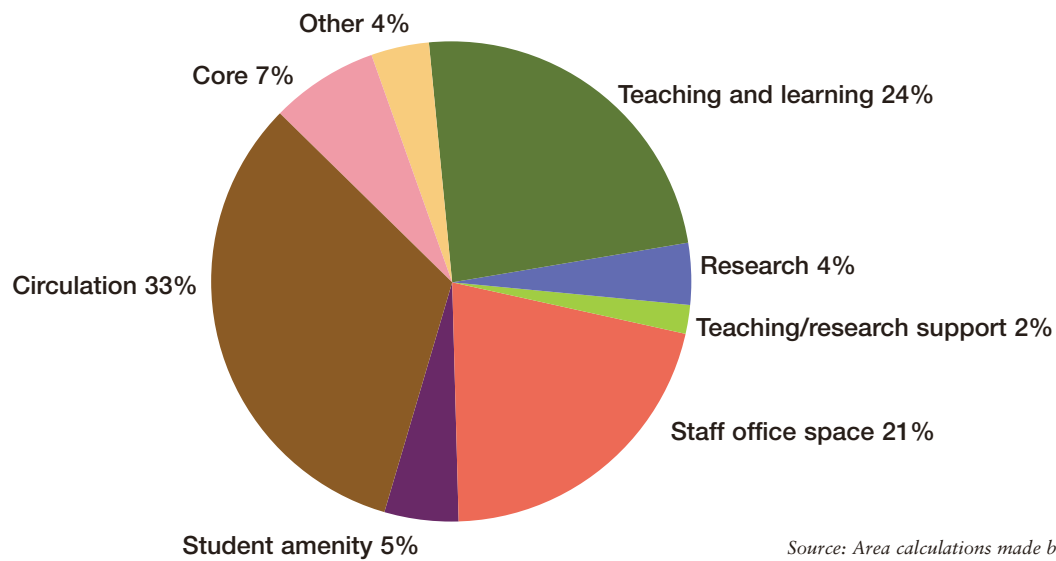
The building was not completed until May 2003 though staff and students were able to move in and start to use the building in August 2002, albeit without access to the new Battery Pack.

Costs

Due to the nature of the construction work it is difficult to accurately assess how effective the capital expenditure has been on this project. The overall construction cost of £519/m² is relatively low due to the low scope of works across a large refurbishment area. Unfortunately, the capital cost information available is not detailed enough to establish reliable £/m² specifically for the refurbished areas and the new build extension.

The brief for the project was to provide a facility for the new Faculty of Education to work effectively in one building. In comparison to the original complete new build proposal of £1,700/m², the construction cost of this project would appear to have maximised value for money. It also compares favourably with a benchmarked average of £900-1,200/m² for a new build facility.

St. Andrew's building: space breakdown by type



The construction cost excludes the purchase price of the existing building and land as this information is not available. This should however be considered for a true comparison with the original new build proposal which was to be constructed on land already owned.

The Bearsden suburban site was initially due to be sold to finance these works. This site has now been retained and leased out. No income information is available for this arrangement and its impact on either the capital expenditure budget or the relative benefit of this additional income to the university.

From the EMS data received from the University of Glasgow (2002-03) we have calculated the average running cost per m² of non-residential space to be £94/m² per year. In comparison, the new St. Andrew's building has a running cost of £91/m². This difference is attributable to lower utilities costs.

There was no building specific information within the EMS data, all costs are campus-wide. However, it is reasonable to anticipate that the running costs for the St. Andrew's building may be slightly higher than the university average as it has its own building superintendent due to its remoteness from the rest of the campus. However, the cost impact of this cannot be established.

There is insufficient information available specific to the original St. Andrew's building on the Bearsden campus to compare the total running cost of the two facilities. The average running cost across the campus for all non-residential accommodation of £94/m² can be compared to an industry norm for this type of facility of £80-150/m².

A direct comparison can be made on the utilities component of these costs. On the Bearsden site utilities costs were £12.70/m² per year and on the new St. Andrew's building the costs are £7.29/m² per year. This reduced expenditure is largely due to more efficient heating methods than the combined heat and power plant used previously.

The EMS data received from the University of Glasgow (for 2002-03) identifies an average maintenance cost across the non-residential space of £39/m² per annum. There is insufficient information available specific to either the original building on the Bearsden campus or the new facility to analyse this aspect in greater detail. This can however be compared to an industry norm for this type of facility of £25-50/m² per year.

Corridor in the Battery Pack

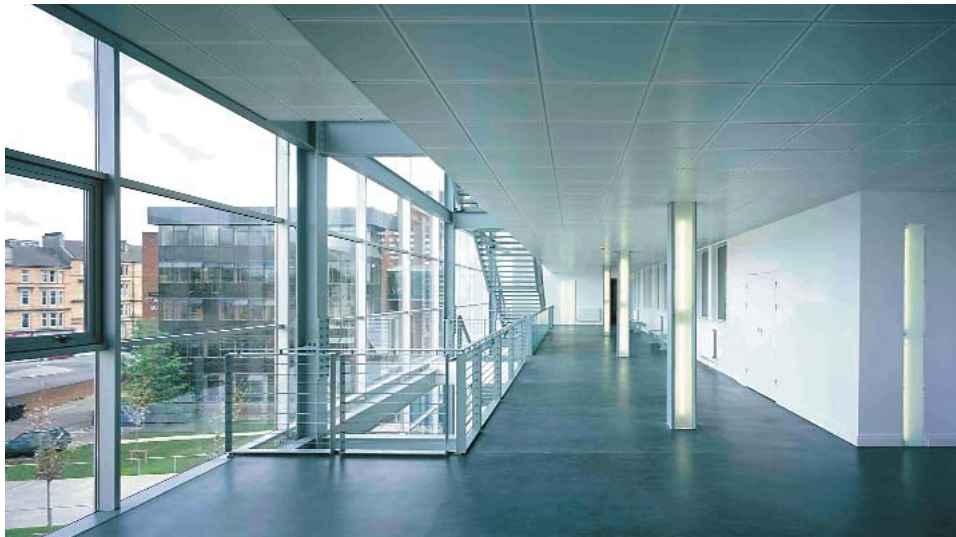


Photo: Courtesy of Andrew Lee

Post project

Use

The building was acquired to house the education faculty for teacher training, continuing professional development (CPD) for professional teacher training, and continuing adult education courses, which were already part of the university's offering.

There are approximately 1,500 FTEs scheduled into the 9am to 5pm teaching space facilities in this faculty.

The estates department has the impression that the building is 'working hard' in relation to area per person.

Utilisation

The university monitors teaching room use. All 46 teaching rooms in this building have been added to the university's pool of shared rooms on the central booking system. They represent nearly a quarter of the total number of shared teaching rooms.

So far, the use of these new rooms is lower than the university's target of 50%. Utilisation measured by building, taking into account both the number of times used and the approximate amount of use of the full capacity of each space, is 28%.

Some rooms are recorded as being used very little, for example those used for CPD for teachers working out in the field. However, these rooms are used extensively at certain times. It is possible that the utilisation observation survey took place during a period of inactivity in CPD delivery. Rooms lower down the building are used more than those higher up.

Other faculties may be reluctant to use these spaces as the building is further from the centre of the university than other available teaching rooms.

User views

The users were initially reluctant to leave their self-contained and peaceful suburban campus. However, now, as part of the University of Glasgow and with easy access to public transport, the students are able to integrate more fully into a mixed university population as well as live in the city. Previously most had to live on site as there was limited public transport to the old location.

There has been no formal evaluation of user views. Heating and air circulation issues have arisen as a result of enclosing one side of the building with the new Battery Pack. This has been the trigger for additional construction work that has been done since completion.

Staff

We contacted several members of staff to discover their views on the building and the process. Some are more positive than others, but despite this, the views expressed cover the same points.

There is general disappointment that the department did not get the new building that it had originally been expecting. Most staff feel let down, some very badly, by the fact that their original understanding of the proposals for the current building included a rather larger version of the Battery Pack that suddenly disappeared from the proposals.

They keenly feel the loss of the additional office and teaching space and the possibility that some student social space would have been included. There is thought to be too little space overall, contributing to poor relations between different groups of staff. One difficulty is that the faculty has grown faster than expected. This made the problems related to trying to save money and cut back on the project as it was being constructed more critical.

The memory of the unpleasant experience of moving into an unfinished building has not yet faded.

Some people who moved in early acquired 'squatters' rights' which is not popular. Most people mentioned the shortage of student social space. The cafeteria is small and not well located or welcoming. The site is a long way from other campus facilities and there is not enough time before, after and between classes for students to get refreshments, especially a hot meal. As there are very large cohorts this is particularly felt to be a problem.

There is no space large enough for very large groups of students but it has been appreciated that the university is taking action promptly to remedy this by converting further space nearby.

The faculty generally appreciates having a building that is 'its own', where all departments have been brought together, at the same time as being part of the university.

The teaching spaces are appreciated as being light, bright and pleasant. Some staff offices are

Aerial view of the Battery Pack (shaded)

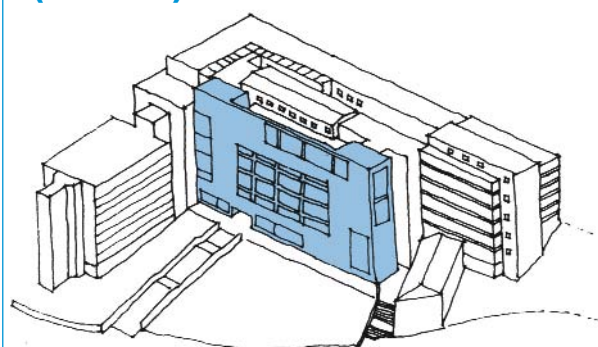


Diagram: AMA

pleasant, but on the sixth floor they are 'more like cupboards'. Staff do not like those offices where four to five people are sharing. Some of the offices only have secondary borrowed light and very poor ventilation.

Although the Battery Pack has improved circulation, the building is still an amalgam of several different buildings and better signage is needed to ensure people unfamiliar with the space can find their way around.

Students

We asked several students their views about the St. Andrew's refurbishment in an impromptu manner. The views expressed were varied but we have detailed the common comments, both negative and positive, below.

Nearly all students interviewed expressed their desire for a larger coffee area. There is also a wish that food were subsidised.

Given the building's remoteness from the rest of the campus, including other campus amenities, most students questioned agreed that the St. Andrew's building was greatly in need of social areas, particularly when there is a fair amount of time between classes. Using the cafeteria as study space has been frowned upon and signs on the tables clearly indicate this sentiment: 'Whilst we appreciate that seating space within the building is limited, please do not use these tables for studying. Due to limited space available, the tables are required for paying customers only.'

The lack of social space has led some students to use computer clusters, seminar rooms and the general circulation as social and eating spaces. Chairs and bins are not permitted in the Battery Pack on the grounds of health and safety. Additionally, students voiced a desire for display space.

In general, students feel the distance between the main library and the St. Andrew's building is too far, and suggested a more localised book 'drop off' point for greater convenience.

There have been generally negative comments about the booking system. Classrooms are not subject specific on the central booking system, so the system is not adequate.

There is a lack of IT equipment in the classrooms: 'classrooms mostly have just desks'. It was felt that classrooms are not set up well. In general, better computer access is needed. Some felt that the technology in classrooms was 'OK'.

The quality of the space has been widely criticised: students have commented on the poor ventilation, mentioning the building is either 'too hot or too cold', and conditions are 'worst in the summer'.

There have been some positive comments related to the atmosphere in the new building: 'we like the fact that you know lots of people in the building... staff [are] very pleasant and know everyone's faces'.

Building management

The university estates department manages all the buildings and as this one is slightly remote, on the edge of the campus, it has its own building superintendent responsible for running it.

Lessons learned

This project had some straightforward goals, which have been met and which focus on the requirement to improve some aspects of the existing building. The Battery Pack provides a clear and simple circulation pattern, similar for all floors. Despite minor level changes the extension provides compliance with DDA through use of lifts, and makes it easy to move around the building. The circulation zones on

each floor also provide small drop-in computing facilities for students.

The project demonstrates how a proactive estates planning programme can maximise the benefits for the university through solving the accommodation needs of a particular group. The strategy for this building has added functionality through a minor new build. Unlike former additions to the building, this has been designed to create additional generic space, which will help future adaptability.

The university has acquired a potential development site, as well as bringing the teacher training department to a location where the staff and students mix more with the university as a whole and share general resources. The specialist library, for example, has been housed on one floor of the main university library, and the majority of catering and social space is elsewhere on the campus. The gymnasium, on the other hand, is available for use by other students and staff when not booked for teacher training.

The briefing process was less successful than it could have been once the project changed from being a new build project to one of refurbishment. Given the known reluctance among the main occupiers to make the move to this building, more information giving the reasons for the change in plans would have been helpful.

The move process contributed to some bad relationships between the faculty and the university. It could be that this was inevitable, but more open communications as slippage occurred in the timetable and budget possibly would have created an atmosphere of greater understanding. Budgeting to ensure that money was spent where it would be appreciated could have prevented some of the relatively minor, but very real, current user dissatisfactions.

Collection of real data about actual problems and a more formal feedback process about the successes and failures of this project could have provided lessons for other projects, at the same time as helping the occupants to make the difficult transition to becoming a new faculty in a different location.

St. Andrew's Building, University of Glasgow

Building use: Faculty of Education

Student FTE 2003: 1,273

Location and type of site: Constrained site on edge of city centre

Campus type: Urban

Type of build: Refurbishment and extension

Completion date: 2003

Team responsible: Architect, Structural and M&E Engineering: RMJM.
Cost Management: DLE

Brief

Brief established by whom: Estates department, dean of faculty and the merger implementation group

Space standards specified: Mixture of UGC, PCFC and space weightings

Procurement route: Traditional

Area breakdown

Area GIA: 12,775 m²

Area NIA: 10,676 m²

Area NUA: 8,102 m²

Efficiency

Area/student FTE NIA building: 6.4 m²

Area/student FTE NIA campus (EMS): 11.8 m²

Area/faculty FTE NIA: 6.7 m²

Utilisation target (teaching): 50%

Utilisation actual (teaching): 28%

Cost

Cost total – construction (year): £5,000,000 (2003)

Cost/GIA – construction: £519/m² (based on 7,735 m² refurbishment and 1,897 m² new build, total 9,632 m² GIA)

Cost/GIA – running: £91/m²

Cost/GIA – maintenance: £39/m²

Foyle Arts Building

University of Ulster

The refurbishment has brought four disciplines together in the new Faculty of Arts, providing multifunctional space, improving course offerings and acting as a template for space efficiency in ongoing university rationalisation.

Overview

The Foyle Arts building is on the Magee campus of the University of Ulster, on the edge of Derry/Londonderry close to the banks of the river Foyle. The university has four main campuses, Jordanstown (10,513 FTE) near Belfast, Belfast (1,136 FTE), Coleraine (4,873 FTE) and Magee (3,018 FTE). These campuses have different educational origins and were brought together as the University of Ulster in 1984.

The Foyle Arts building is a listed building from the early 19th century, originally Foyle College, which was closed in the 1960s. The building was then acquired by the City Council for office space and some performing arts uses. It has basement, ground and two upper floors and is at the bottom of a steeply sloping site.

The building has been renovated to provide a home for three schools within the Faculty of Arts, which were previously accommodated on three separate campuses. Art and design (largely graphics) has moved from another building on the Magee campus, performing arts has come from Coleraine, and music from Jordanstown. In addition dance has been added to the faculty for the first time. Fine art remains in Belfast.



Photo: AMA

The objectives of the Faculty of Arts and the physical resources team have been effectively brought together in this project. The Faculty of Arts wanted to bring separate functions together to exploit overlaps, synergies and the possibility of offering a more attractive course to prospective students. The physical resources team has been pursuing its aim to achieve continuing general improvement in the efficient use of space across all the sites.

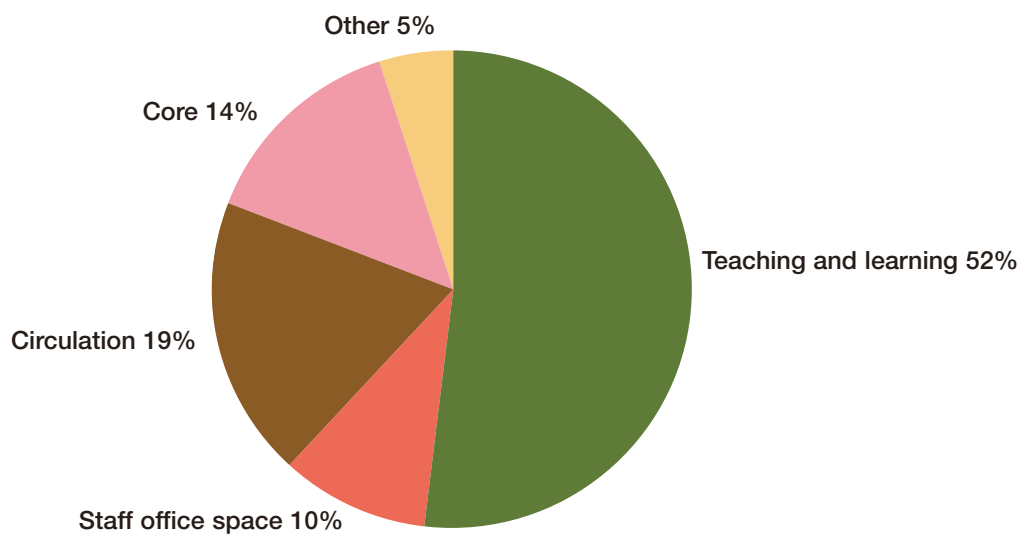
There has been a strong focus in this building on changing the way the department uses space. The building provides, as far as possible, multifunctional spaces used by the different schools occupying the building, and the academic staff occupy open plan areas, again emphasising appropriate sharing of space.

Briefing, design and construction process

Objectives

University and departmental motivations informed this project. The university wanted to increase the number of students on the Magee campus and Derry has a strong cultural emphasis on performing arts, which indicated there was an opportunity to attract more students from the local area. The various

Foyle Arts building: space breakdown by type



Source: Area calculations made by AMA

departments wanted to bring courses together and the physical resources team aimed to utilise space well. The site was a natural choice when the opportunity arose to acquire it, due to its performing arts history. The site was also an obvious extension to the campus as the university had recently acquired the Aberfoyle site situated between the older parts of the campus and the Foyle Arts building.

The co-ordinated objectives of the faculty and the physical resources team were important in this project. The dean of the faculty was influential in ensuring these goals were met when the inevitable problems arose connected with uprooting various groups and changing their working patterns.

The project was part of a wider initiative to rationalise space for several different departments, which have been similarly brought together from disparate sites.

Briefing

The physical resources team took the lead in establishing the outline of the brief, talking to the dean of the faculty and to each of the separate schools. The team prefers to start the process, before a design team focuses on the detailed brief, to ensure that the overarching objectives of the university are fully integrated

with those of the proposed users. The capital projects team sees it as important that users do not introduce unattainable 'wants' into the 'needs' picture.

The initial client team consisted of 'four determined people' led by the dean of the faculty. Plenty of enthusiasm and rapid progress ensued.

There were a number of iterations, initially between the faculty and the physical resources team, to clarify the vision behind the project and ensure that available resources could meet this. Later, the architects were brought into the process. It was an intense but rapid process as there was very little time in which to complete the project.

The emphasis on flexibility and shared use of space came from both the dean's vision and from the requirements to increase efficiency. The music recital room has a sprung floor so that it can be used for dance, and rehearsal rooms can be used by anyone. One existing large room has been equipped with a dividing partition allowing it to be used in two parts. Some new space was added, filling in a 'C' shaped part of the perimeter at ground and basement level. Foundations have been designed to allow this added area to be extended to the full height of the building if expansion is needed in the future.

First floor plan of the Foyle Arts building shows the new build extension (shaded)

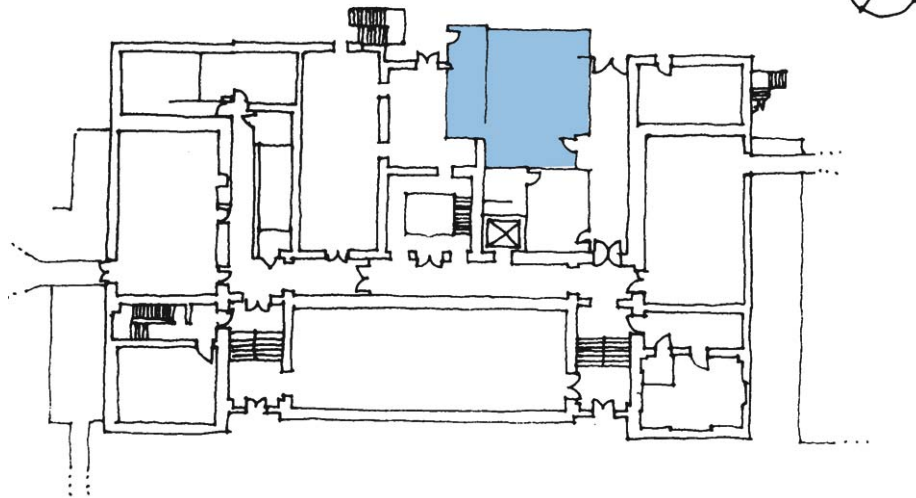


Diagram: AMA

Procurement

The procurement process was traditional, with a full design developed by the architectural team and tendered on a bill of quantities. This process is regularly used by the university and works satisfactorily. The project cost was £1.4 million, for 2,713 m² GIA.

Once the project was well-defined, an architectural firm with appropriate performing arts experience was selected from the eight firms in the university's framework agreement, in place since 2001. Other consultants were similarly selected to build up the team.

The designers did the work at risk (before planning consent had been achieved) because of the tight time scale, and were finished before the purchase was finalised. Completion of the final purchase was only achieved late in the process, and contractors started on site the next day.

Main and secondary uses were established during a site walkabout when drawings were signed off. Details were resolved before construction started. Room data sheets were prepared by getting the key stakeholders around a large version of the plan and brainstorming for a couple of days with all the relevant consultants. These were then signed off as part of the co-ordinated design stage – stage D. There were no user-led changes after stage D.

The building programme was fast: the building was purchased in April 2003, and occupied in September 2003.

The contractor was very carefully chosen in order to meet the tight timeframe.

Costs

The project comprised the refurbishment of an existing building, including a small amount of new build. For benchmarking purposes we consider this to be a refurbishment project. Looking at the construction costs, for comparison purposes based on current day price levels, the construction costs are £610 per m² GIA, which compares very favourably with benchmark data of £585-905 per m².

One of the main cost drivers behind the project was the level of specification adopted by the university and the inventive use of the existing building (acoustic studios in the basement). Together, these issues contributed to an efficient project.

One issue that arose during our visit, and that has been discussed as part of the case study, is the requirement within the building for social space/interaction areas. The lack of these areas may also have contributed to the relatively efficient capital expenditure. We are not aware of any plans to include these areas in future.

The running and maintenance costs for the building have been calculated on a pro rata area basis based on the overall campus. While they should reflect the costs incurred (the remainder of the campus is also relatively lightly serviced) they should still be considered indicative.

One area that we will need to review further is how the EMS data is collated to allow for the analysis of individual buildings and perhaps space uses.

Post project

Use

The building is only partially occupied. The different campuses of the university are so far apart that students who began their studies on one of the other campuses are finishing their course on the campus on which they started. At the time of writing, there are two year cohorts of students in the building, and the third year is on another campus, with staff having to commute and manage teaching on both campuses. This is inevitably complicated.

Folding partition walls allow for flexible use of space



Photo: AMA

Two schools within the arts faculty – performing arts consisting of music, drama, dance, and art and design (part of which is at Magee and part in Belfast) occupy the building.

Utilisation

The physical resources team, which is in charge of timetabling the use of teaching space, follows utilisation patterns closely. It ambitiously targets 80% use and 80% capacity giving 64% utilisation. This is measured across a 12-hour day – 9am to 9pm. Utilisation figures for 2004-05, taking the percentage of capacity occupied into account, are:

- teaching rooms – 38%
- specialist rooms – 22%
- computer labs – 51%
- overall – 38%.

The physical resources team is more focused on use than on capacity measures when timetabling spaces. It attempts to plan appropriately for capacity, but cannot control whether or not students actually attend classes.

This building cannot yet match targets owing to the incomplete nature of the current occupation.

Only three or four representative spaces are surveyed in this building as part of the routine utilisation studies that are undertaken each semester. To do more would present timing difficulties as the building is somewhat distant from other buildings being surveyed by the same team.

User views

No formal surveys of user views have been undertaken. We have obtained anecdotal evidence from the physical resources team and during site visits.

The courses being offered in the new centre are benefiting from the synergies between different areas, and are attracting even more students than had originally been predicted.

The building is generally very well-liked. Staff and students made the following suggestions for improvement:

- space may become very tight when all three years of students and an increased staff body are in occupation
- there is no space for students, or students and staff, to gather informally, no relaxation areas or places to eat lunch/snacks between sessions
- students want somewhere to buy sandwiches and hot drinks
- there is not quite enough storage space, especially for drama
- some miss the theatre at Coleraine (but in many ways its absence is positive as several Derry theatres are very co-operative in hosting student projects)
- students would like internet access.

Staff

Staff were positive about the open plan work areas. These have been successful in helping to create the right atmosphere for teaching and learning, and have not had the problems that people may have anticipated:

‘It’s OK to be creative. Creativity takes skill and application and (here this) becomes visible which generates collective energy.’

‘In separate offices you become very isolated. (Here) you see who’s about, it gives you a chance to speak to your colleagues, swap DVDs etc. It’s a good collegiate atmosphere.’

‘I don’t mind losing a square yard of space, because you can actually talk to people.’

‘We need to evolve ways to exploit the free flow of space (for) real serendipity.’

‘It’s a light and airy building, not like Coleraine. There are high ceilings which is very important for the performing arts.’

Students

We contacted students on a random basis. It became clear that they are not familiar with other parts of the campus: ‘We could go to Magee – (for food).’

Staff work in open plan offices with storage used to create privacy



Photo: AMA

More surprisingly, those we talked to were not familiar with students or spaces used by disciplines other than their own, despite the integrated courses.

They commented on positive and negative aspects as follows:

‘The space may get tight for drama next year, but it’s nice that there are lots of music practice rooms.’

‘I want internet access in the practice rooms – then I could listen to the music I am working on.’

‘We need food here, a café or a sandwich bar like in the learning resource centre.’

‘There’s no common room to hang about – there’s only 15 minute breaks (between classes).’

‘The studios are great, better than before, with more modern equipment.’

‘Heating and air-conditioning are not good.’

For graphics students: ‘there is nowhere for individual study – if there’s a class in here (graphics studio) we have to leave.’

‘There’s no access to the web.’

‘The building is new, has a great atmosphere, it’s calming and cosy, not like the rest of the campus, which is dull.’

Building management

The physical resources team manages all the university buildings. The team is based with the rest of the administration on the Coleraine campus, but has some staff on the Magee site.

Space charging has been used for some time and is effective in getting faculties to plan to use space efficiently and in balancing the use of space by different schools within faculties.

More complete information about the cost of space, such as translating the under-use of teaching rooms into the cost per annum, is proving effective in creating changed behaviour and has improved the efficiency of space usage.

There are penalties for booking but failing to use teaching rooms.

Overall, the university space is not lavish – the space per FTE overall is 6.9 m². This varies considerably between the different campuses and is largely achieved because of the large numbers of students at Jordanstown who use on average 5.3 m² per FTE. The Foyle Arts building has been based on 6 m²/FTE, and is in line with the current figure for the campus of 6 m²/FTE. This is reasonably efficient for performing arts uses.

Lessons learned

A clear approach to briefing and procurement was a great help in enabling this building to introduce a changed approach to teaching and learning in this faculty.

A good choice of building has helped achieve the aims of the faculty and physical resources team.

Flat screens save space in the graphics studio



Photo: AMA

The building was naturally well-suited to the uses now accommodated, with high ceilings and large rooms. This made it easier to keep maximum open plan and shared areas. Only in the basement, where there is no natural light, has there been any significant subdivision of space to create small music practice rooms. Unnecessary intervention in the existing fabric was avoided, which helped to keep costs down.

Open plan working is appropriate for staff areas and supports collaboration. The emphasis on working more co-operatively, sharing space and bringing different groups into closer contact with each other has proved successful from the point of view of the physical resources team. A similar policy is now being pursued with other groups such as media, history and law, and administration. The university is undergoing a large number of moves and rationalisations of a similar sort, to bring groups together currently separated on different campuses. Lessons from this project are being used to help continue to press for space efficiency.

Collecting views of users in a structured way will help ensure that future changes meet their perceived needs.

Foyle Arts Building, University of Ulster

Building use: Centre for the creative and performing arts – art and design, performing arts, music and dance

Student FTE: 643 (building)

Location and type of site: Edge of city campus

Campus type: Semi-urban, one of a number of dispersed campuses

Type of build: Refurbishment

Completion date: September 2003

Team responsible: Architect: GM Associates
Physical resources and Faculty of Art

Brief

Brief established by whom: Physical resources team

Space standards specified: Space weightings

Procurement route: Traditional

Area breakdown

Area GIA: 2,713 m²

Area NIA: 2,345 m²

Area NUA: 1,773 m²

Efficiency

Area/student FTE NIA building: 3.7 m²

Area/student FTE NIA Campus (EMS): 7.6 m²

Area/faculty FTE NIA: 7.9 m²

Utilisation target: 64%

Utilisation actual: 34% (Magee campus)

Cost

Cost total – construction (year): £1,539,500 (2003 price levels)

Cost/GIA – construction: £567 m² GIA

Cost/GIA – maintenance: £21.44 m²

Nanoscience Research Centre

Cambridge University

The building has fostered interaction between researchers from various disciplines, and provided a state-of-the-art facility that has enabled the department to expand.

Overview

The University of Cambridge's West Cambridge site is dedicated to science faculty buildings, largely engineering. A master plan has been prepared for this site to improve and extend the science facilities. The Nanoscience Research Centre is one of the projects undertaken as part of the plan.

The building is single storey in three distinct parts: a group of about 10 specialist laboratories for delicate equipment requiring vibration-free conditions; a suite of ultra-clean rooms; and a write-up and office area. This last area is slightly separate, lower, partly because it is without extensive plant, and partially sunk into the bund that has been created to protect the views of the neighbouring residential area. It looks out onto an attractive courtyard garden and is surrounded by landscaped areas.

The building houses nanoscience research. The research unit is a joint venture between the Engineering and the Physics departments, and run by Professor Mark Welland. A multidisciplinary team works at the site as the research pertains to areas relevant to other sciences.

The procurement process made it possible to meet the user's exacting requirements and at the same time to cut almost one-third off the initial



Photo: AMA

contract price, which had exceeded the strictly limited budget.

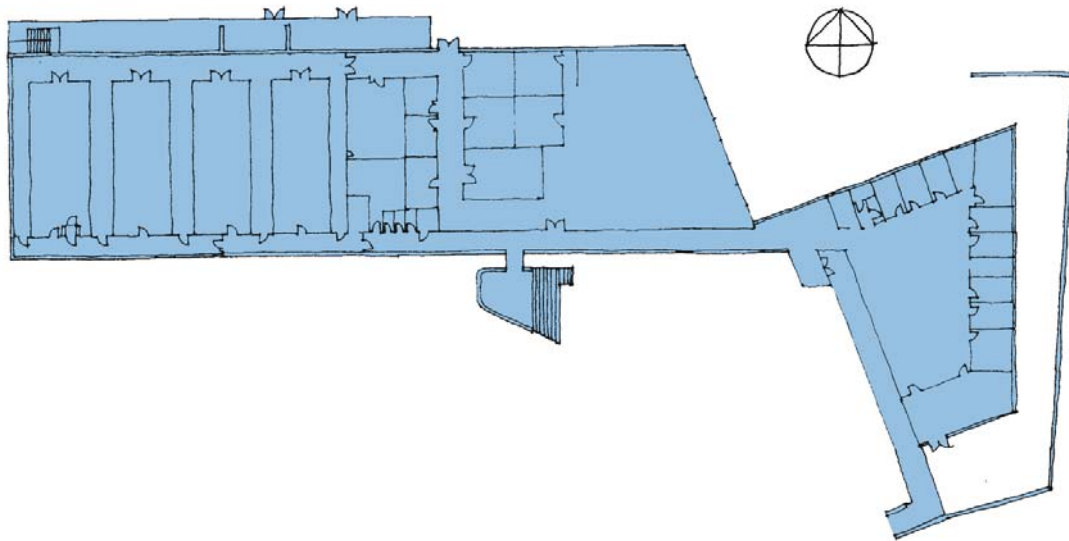
Design process

The need to expand an important subject area, which had already outgrown inadequate premises, was the main driver for this project. The head of the unit was instrumental both in setting the requirements and in structuring the complex funding which made it possible.

The availability of Joint Infrastructure Fund (JIF) funding triggered the scheme, which obtained planning permission in 1999 as part of the JIF process. Funding was ultimately secured at a later date and the project recommenced in May 2001.

The Estate Management and Building Services (EMBS) department of Cambridge University was in charge of the construction project. Based on the initial brief, EMBS sought a design team through the OJEU process. Building Design Partnership was selected, in part for its strength in providing a fully multidisciplinary team, including specialist experience of vibration-free design. This was important to the project team as the building had many stringent requirements and a single point of responsibility was desirable for risk management purposes.

Plan of the Nanoscience Research Centre with laboratories on the west side and offices on the east side



Sketch: AMA

The client comprised senior staff in four different specialisms. EMBS required certainty over the brief and the different client teams jointly commissioned a facilities expert to carry out this role and establish the definitive detailed brief, including fitting out the office furniture.

The project was procured through a two-stage main contractor tendering process, ensuring early integration of design and construction teams and the parallel design and tendering of work packages. The ECC Contract Option A (fixed price contract with activity schedule) was used, with wholehearted adoption of ‘the spirit of mutual trust and co-operation’ that it advocates. This proved to be very beneficial, with savings of £1.5 million – almost one-third of the budget – as the project neared the fixed price stage. The ‘open book’ approach was an important factor in achieving this.

In order to achieve the cost savings both the contractor and the mechanical and electrical designers scrutinised their costs. The building elements and finishes were each scrutinised and were the source of half the cost reductions. The services were redesigned radically to take

advantage of hitherto unrecognised opportunities for synergies between groups that were coming together for the first time. These modifications were achieved through a very intensive period of iterative design and costing exercises. The resulting changes all had to be agreed by the client, but this process enabled the project team to deliver the building within budget, without reducing any of the essential high standards, or losing space.

At all points the head of the research unit, Professor Welland, was of prime importance in determining needs, agreeing designs and organising funding. Experienced project management by EMBS provided the essential framework in which the project could be realised.

Evaluation

The users have been provided with a building that meets their very specific needs and greatly improves their facilities. Groups with hitherto separate premises now share space.

The fact that there were few difficulties during the settling in period, despite the complexity of the building, is a testimony to the success of the

The corridor linking the labs with the study/office area



Photo: AMA

project. The building has allowed the research unit to grow and there is talk of future expansion, possibly creating office space on the adjacent site. Formal reviews of satisfaction and use patterns have not been carried out, but a project review workshop was held with the project team identifying lessons for future projects.

The users wanted space where people doing individual, highly specialised work could interact and benefit from contact with others whose background disciplines might be different. So the write-up area is open plan for most researchers, with some small offices for senior academics. The desks are large but the space is not extravagant. There is a small meeting/social space outside the access doors to the laboratories and clean rooms.

Growth in nanoscience has been made possible by this building and further additions could be accommodated in the specialist areas, simply by expanding the office provision. The clean room block is designed to be extendable, should the need arise in the longer term.

Co-ordinated briefing, using a specialist approved by all the participating groups, and a careful procurement process, helped this become a building that serves its users well and should continue to provide a base for ground-breaking research into the future. The ECC contract used was not wholly suitable for a project where changes were taking place in the design after the contract had been let, but the co-operative approach made the changes possible. The budget control and cost savings were achieved without losing space.

Open plan office space



Photo: AMA

Nanoscience Research Centre, Cambridge University

Location and type of site:	On a separate science campus to the west of Cambridge
Type of build:	New
Completion date:	2003
Team responsible:	Professor Mark Welland, Cambridge Estates Management and Building Services Building Design Partnership, and CRC for specialist clean room and services design and build contractor Main contractor – Shepherd Construction
Campus type:	Campus on the edge of Cambridge
Building use:	Nanoscience research unit
Cost total (year):	£5,470,000 (excluding VAT and fees) (2003)
Cost/m² GIA:	£2,809.45
Area GIA:	1,720 m ²
Area NIA:	1,569 m ² (91% of GIA)
Area NUA:	1,134 m ² (66% of GIA)

Chemistry Research Laboratory

Oxford University

This new state-of-the-art building replaces several smaller, older, inefficient facilities, and incorporates write-up space adjacent to the labs and suitable areas for high profile presentations.

Overview

The site is an infill plot in the science area of the university. The laboratory is on five floors, with plant on the roof of one part of the building. Two of the laboratory floors are below ground and the building steps down in three sections from the street frontage to the back of its site, to make an appropriate juxtaposition with adjacent smaller buildings. The building is subdivided into a narrow block of offices, joined to the main laboratory block by a long, thin atrium.

The laboratories are organised as eight-person areas, where each person has a fume cupboard opposite a work bench, and immediately outside has a desk in the open plan write-up area, where desks are clustered in groups of four – two groups per lab.

A number of chemistry labs for different specialisms – inorganic, organic, physical and biological chemistry – are grouped in this building for the postgraduate research teams. Senior members of the chemistry department have offices in the building. The building brings together facilities that were housed in a range of smaller, older buildings of varying levels of efficiency, some of which were even potentially unsafe.

This building has provided very modern research facilities in 48 separate labs, some with highly



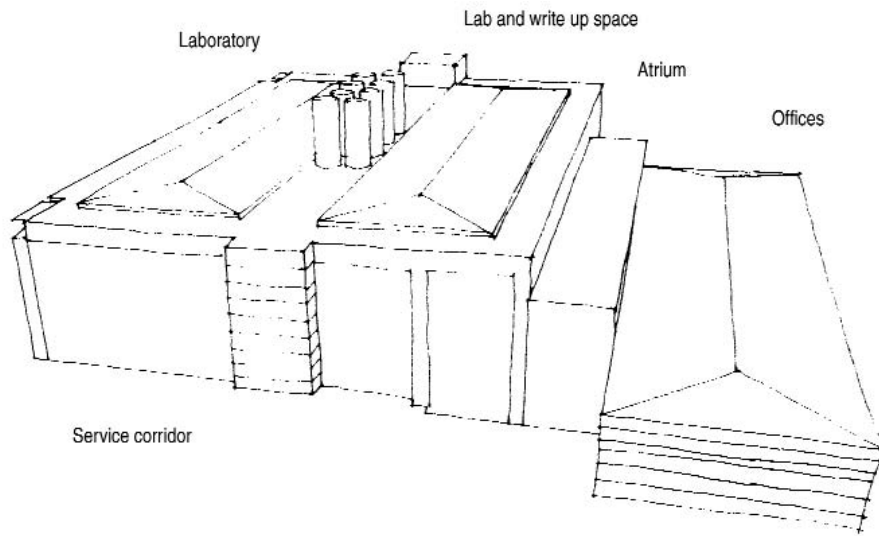
Photo: AMA

specialised equipment. The research students are generally grouped in areas of 48 desks, giving a much greater sense of spaciousness than is common and providing concurrent write-up facilities immediately adjacent to the labs, which is very convenient.

Design process

The existing facilities were outdated with split functions and inefficient space. Researchers had space in small group rooms, which were often remote from their labs. This meant they often did their write-ups in the labs – not a desirable pattern of work. Additional space was needed for prospective growth and more future flexibility was required. The availability of Joint Infrastructure Fund (JIF) funding was a factor, and the university sanctioned a new building on the available site. The need to present the department's research to high profile commercial visitors, such as potential investors in research and spin-off companies, was also something that could not easily be accommodated in existing space.

The Chemistry Research Laboratory



Sketch: AMA

The university commissioned a space review by RMJM, which recommended wholesale rationalisation. This could not be done in the existing space. RMJM interviewed key occupiers and then prepared an initial feasibility study. The OJEU process was used to select the individual members of a joint, experienced team. The final team included RMJM with its experience of the users, and Faber Maunsell and Turner and Townsend for their experience of the new chemistry lab at Southampton University.

The new chemistry labs at Southampton influenced the 'diagram' for the arrangement of labs and write-up space at Oxford. Creating two basements has increased the use of an atrium which has been maximised as social space. Glass fronted lifts and bridges to link the offices to the labs help visual communication.

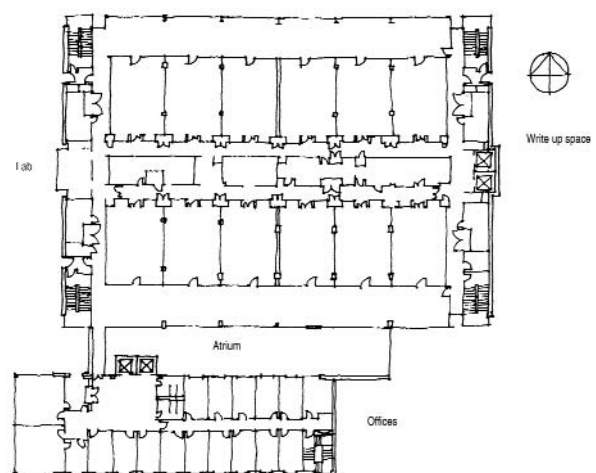
The procurement process was carried out via a two-stage traditional contract. The initial feasibility planning took place in 1998-89. In 1999 the design team was appointed, practical completion was achieved in September 2003, and the lab was occupied in January 2004.

The department academics were the most important people in shaping the project. Professor Richards, the Chair of Chemistry, and senior members of the different specialist divisions, as well as departmental administrators,

formed a vital team bringing both vision and realism to the briefing and detailed design phases. The various funding organisations also influenced the process and outcome.

The university charges the department for space, which encourages efficient space use. This process has meant that, for example, while some professors were reluctant to put eight researchers in a laboratory, they were less able to fund the

The south section houses primarily offices, and the north side labs and research desk space



Sketch: AMA

project with fewer and so generally they all use the space very effectively. A building manager on site, employed by the university, is responsible for day-to-day facilities management. The estates department looks after the M&E through various maintenance contracts and in-house direct labour. An administrator is responsible for the building as a whole, managing it as a 'research-hotel'.

Evaluation

Overall, the feedback is that the building is very well-liked. A formal post-occupancy evaluation has not yet been carried out, but is being considered. There are some issues resulting from the complexity of the building infrastructure, but it is so much better equipped than the old accommodation that users are generally satisfied.

The building accommodates 400 researchers and appears to be fully occupied except for one or two spaces that could be laboratories and have not yet been used as such (one currently houses a library).

The building is bigger than the areas vacated, in order to accommodate anticipated growth. The department has reviewed its space holdings and is considering giving up more existing space in other buildings because the new building can accommodate more people than originally planned. The building appears to have a low net:gross ratio – a result of incorporating risers, plant and separation areas that will contribute to future flexibility.

Bringing people together from many buildings to share common resources – stores, meeting areas, and social space – enables more efficient use of these resources and more interaction between different groups. The atrium functions as a social space and on each floor there are 'office style' break-out lobbies with comfortable furniture and kitchenettes. These areas provide the right atmosphere for hosting influential visitors.

Flexibility has been built in, allowing the building to be subdivided both by floor and by vertical quadrant should future developments in the chemistry department make this necessary.

The building services manager who runs the building was recruited a year before practical completion. This made the moves and initial occupation much smoother than might otherwise have been the case.

The site has been well-used, but the constrained nature of the area has meant that the labs are not the most ideal size (as seen at Southampton) though this does not seem to be causing problems.

There was good co-operation with the contractors. A much desired feature – a glass wall to the laboratories suitable for making notes and communicating diagrams between team members – was preserved because the contractors took trouble to find the most economical suppliers when high costs made it vulnerable to being axed.

Typical eight-person laboratory adjacent to write-up space



Photo: AMA

Chemistry Research Laboratory, Oxford University

Location and type of site:	Part of the science area in an urban campus
Type of build:	New
Completion date:	2003
Team responsible:	Architects: RMJM, Faber Maunsell, Turner and Townsend Academics – faculty head and heads of departments Managed through the university and an on-site administrator
Campus type:	Single; a department within a collegiate organisation
Building use:	Chemistry postgraduate research
Cost total:	£62,000,000 (inc. works, fees, VAT, furniture, fixtures and equipment)
Cost/GIA:	£3,043 m ²
Area GIA:	14,178 m ²
Area NIA:	11,718 m ² (82% of GIA)
Area NUA:	8,987 m ² (63% of GIA)

Owen Building

Sheffield Hallam University

The cluster arrangement of academic offices and multi-use teaching areas in the refurbishment have helped deliver greater space efficiency. Large 60-student laboratories mean two classes can be taught simultaneously.

Overview

The Sheffield Hallam City campus is an urban site close to Sheffield's main railway station, and is one of the university's five campuses. The Owen building was constructed in the 1960s, a slab block 12-storeys high, approximately 18 m wide and 110 m long. It is a column and beam structure with a self-supporting skin. The building sits across a sloping site with its main entrance on the fourth floor and all floors below only lit from one side. The new building has been located on the lower side of the Owen building and a five-storey atrium containing catering and retail outlets connects the old Owen building to the new one.

At the entrance level there is a lecture theatre and gathering areas used for conferences as well as student teaching. The upper floors house several different schools, each with areas for administration, academic offices, research and teaching. The teaching spaces range from general lecture and seminar rooms to specialised laboratories.

This building has been undergoing a floor-by-floor refurbishment for the last eight years. In this process, design concepts have been developed for efficient, effective space planning – especially the 'clusters' of academic rooms and multi-use teaching spaces, which have been progressively refined and are now being trialled in the new Health and Welfare building on the Collegiate campus (see case study 2).



Photo: AMA

Design process

The services in the 1960s building were coming to the end of their useful life and needed full renewal, despite having been modified several times. Many of the areas had not been renovated for 15-20 years and were not functioning well. There was a recognised need for specialist equipment, to be provided in a more integrated way.

The staged renewal meant that the various schools occupying the building would be dealt with in sequence. Sue Holmes, Head of Facilities Planning, outlined the brief from the input collected from the relevant staff in each department. Once a project was underway, the staff worked with the estates department's project team and the designers to refine the brief. The departments were given freedom to arrange the office areas in ways to suit their own needs, within the standard clusters. Office areas were planned mostly to suit the building design. Additionally, the clusters of academics chose the furniture layout and type.

The estates department, well aware of current good practice in office space, was seeking to create generic, adaptable areas, able to

The new atrium linking the Owen building to the Harmer building, with shading indicating the refurbishment

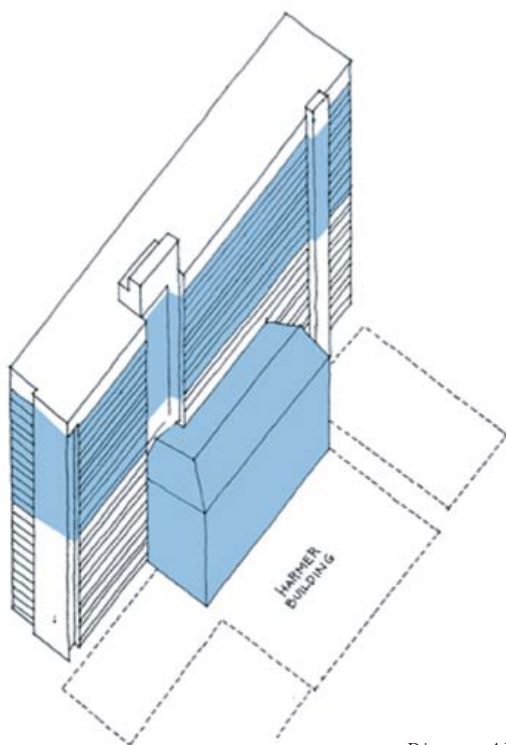


Diagram: AMA

mechanical and electrical engineers, planning supervisor and quantity surveyor, and any others relevant to the specific project – were selected on a fixed fee after tender basis. This team developed a detailed design. This was then included as a part of the final tender information for a design and build contract with a guaranteed maximum price. The contractor in the various projects usually continued to use the design team, but was not obliged to do so. The planning supervisor and quantity surveyor remained employed by the client throughout. This process has regularly delivered projects to time and budget.

Senior members of the estates team have a range of knowledge and experience about facilities management and good practice in space planning.

The estates department manages the building.

Evaluation

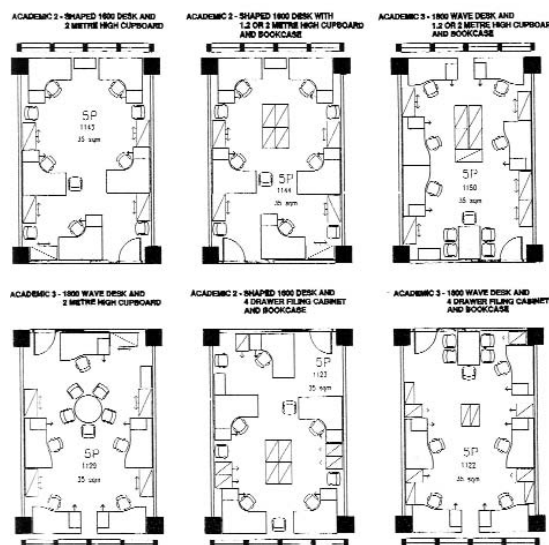
Regular surveys of staff and students provide relatively little feedback about building accommodation. The estates department listens to and acts on informal comments. For example,

accommodate a range of departments with possibility for growth, as well as providing an energy efficient solution. The departments are charged for the space they use so they were willing to contain their areas to a workable minimum. They sought to establish open plan areas for administration, group offices for most academic staff, and teaching areas that could be used more intensively and flexibly.

Early in the design brief process, those involved had to look at the consequences of a faculty losing five staff, or gaining five staff. The design brief contained built-in contingencies for both staff growth and reduction. The rooms were designed generically, and electrical and data points provided for the maximum assumed number of people to use a particular room, plus one.

Each stage of the refurbishment followed a similar process. Once a sufficiently detailed brief was assembled, a team of consultants – architect,

Five-person office module with various furniture arrangements



Plans: Sheffield Hallam University

positive feelings about wide corridors in a particular conversion, contrasted with negative ones about a relatively new building, have led to a policy to ensure generous spaces for student movement between classes. Some staff have found the move to open plan difficult, but it has been generally accepted. In turn, these staff have been used as sources of experience for other staff going through the refurbishment.

Utilisation of teaching rooms is monitored regularly, but not of staff offices.

Across the estate, the average space per FTE has greatly decreased. In 1996 the area GIA per FTE was around 10 m², and in 2003 it had dropped to around 8 m²/FTE. This is paralleled by cost efficiency, which improved from about £50/m² to under £32/m² per annum.

The space planning in the Owen building, incorporating cluster arrangements for academic offices and multi-use teaching areas has helped to deliver greater space efficiency. Deep and narrow one/two-person offices have been replaced by wider five-person rooms, or shallower three-person rooms with small, quiet, bookable interview rooms beside them, saving 1 m² /person or more, in more flexible and attractive spaces.

Sheffield Hallam did not have a history of single offices. Office planning also involved clarity on staff and student interface and reception points.

Teaching spaces have been enlarged. In place of three or four small labs, large 60-student laboratories have been organised so that two different classes can be taught simultaneously. This economises on space and, for example, on technician time and effort. Teaching spaces also allow for some peripheral research activity to take place all week.

On the services side, energy economy was sought, particularly in the new 'smart' lighting that was installed. The system uses movement detection to operate lights only when the room is in use. The lights automatically turn off after 30 minutes if no activity is detected.

The new atrium entrance and social area linking the Owen and Harmer buildings



Photo: AMA

The School of Sport and Leisure Management has different kitchen styles in one large space



Photo: AMA

The building has the ability to attract research, enterprise and consultancy works related to accommodation, and there have been visits from other institutions and organisations with an interest in space management.

AV equipment can be hidden, allowing a complete change of mood in the room



Photo: AMA

Owen Building, Sheffield Hallam University

Location and type of site:	Central Sheffield, sloping site
Type of build:	Refurbishment
Completion date:	1996-2004 various phases
Team responsible:	Estates department
Campus type:	Client building management organisation
Building use:	Several different design teams Urban, multiple campus Primarily a teaching building. Also includes: conference, catering, biology, chemistry, physics, food and leisure
Area GIA:	* 10,323 m ²
Area NIA:	* 8,491 m ² (82% of GIA)
Area NUA:	* 7,621 m ² (74% of GIA)

* These figures represent the area of the floors that have completed refurbishment and not for the entire 12 floor building

J Block

University of Glamorgan, Pontypridd

J block has been revitalised by new, cheaper-to-maintain cladding and roofing, while providing more space for growing departments and several open access computer areas.

Overview

The University of Glamorgan started as a school of mines and later became a polytechnic. In 1992 it became a university and is now on two sites, ten minutes apart on either side of the River Taff, near Pontypridd. Several other institutions are affiliated to the university or have their courses accredited, as part of Glamorgan Outreach. J block is on the main Glamorgan site and dates back to the 1970s. The university was facing a backlog of maintenance, and has therefore upgraded many of its older buildings. As a result of growth in some areas, such as electronic music, more space was needed to accommodate the expanded departments so a new extension was added to the rear of the building.

The site slopes, and the building is made up of a series of distinct but linked blocks, of four storeys at the back and front, linked by a two-storey centre section. The adjacent buildings H and G blocks are all system-built Consortium for Local Authorities Special Programme (CLASP) buildings, two with concrete floor slabs, and one with timber floors.

The building houses teaching, administration and academic offices for the department of electronics and the department of computing, as well as providing accommodation for the university's e-learning and corporate IT department. Also housed in the central section of



Photo: AMA

the building is a suite of lecture theatres and other centrally timetabled classrooms. Several teaching spaces have specialised equipment for electronics and digital music.

Design process

J block was 'grey, dark and dingy, and not enticing for students'. It was also reaching a stage where maintenance costs were heavy and the accommodation was outdated. This project followed on from one for G block, also a CLASP building, which the estates department re-clad with white Bauclad resin-based sheets to brighten up the external appearance and reduce long-term maintenance. The new 'rain screen' panel system is not entirely weatherproof, so the joints between the CLASP panels were sealed before re-cladding. New roofs with curved profiles have been added, as part of the J block project, in order to reduce the need to repair the original flat roofs, which have proved troublesome. An additional lift has been located in a new dedicated entrance to the south end of the building.

As part of a general trend the university is providing computers for open access in each department or building, including J block. Few students have their own laptops so these rooms are heavily used.

The estates department compiled the initial brief from the heads of the user departments, and then a user group was set up to provide more detailed briefing.

J block's new curved roof and canteen extension (shaded)

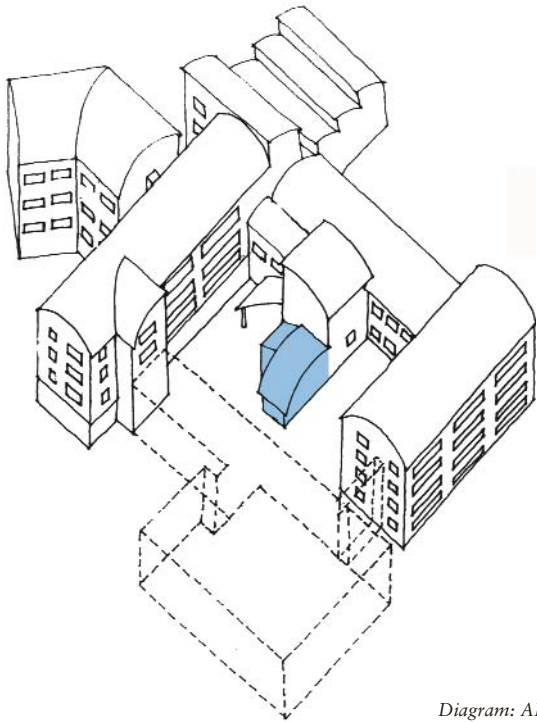


Diagram: AMA

A design team was selected by competitive interview process, following an advertisement. Once an acceptable design was agreed, a design and build contract was tendered by four companies, to be carried out in stages, taking one of the linked blocks at a time, to minimise the decanting problems. The competing firms were expected to follow stage one with the subsequent two phases. The winning contractor was a local firm that had been incorporated into Wilmott Dixon but still traded under its earlier name of E. Turner and Sons. The university procurement group insisted that each phase be separately tendered, but they were actually all won by the same contractor.

All the projects were completed as design and build, and carried out while departments were in partial occupation, with the use of some portacabins, and there was a phased handover.

The estates department plays a major role in all capital projects. Prior to the refurbishment, the university had been striving to catch up with the repairs and upgrades needed. It is an expanding

institution and increasingly short of space, with average space per student of 4.2 m²/FTE NIA, down from 5.1 m² in 2002.

The estates department maintains and manages the building, with a building caretaker assigned to each building or group, to deal with day-to-day problems. The cafeteria on the ground floor of the second phase is one of two similar ones and there are also two larger restaurants elsewhere in the university, managed by in-house catering.

Evaluation

The university has not routinely sought user views in the past but it is now introducing a post-occupancy evaluation system for significant developments. The refurbished building appears to be well-liked, the cafeteria is busy and the open access computer rooms are well-used. The availability of more, properly equipped space has been very popular and has allowed a comfortable increase in student numbers.

A utilisation study of shared bookable teaching space is carried out annually by the firm providing the space management system, and there are plans to extend the survey to all the open access computer rooms. Overall utilisation

Specialised electronics laboratories in the upgraded space

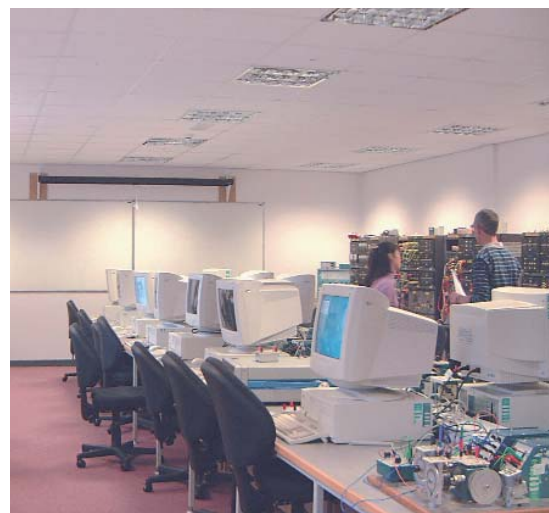


Photo: AMA

for all the rooms surveyed in J block is below 26%, however there are a number of computer labs in J block where utilisation is 65% – they were occupied at all the survey times, often about half full or more.

The building has been successfully altered and upgraded to be more functional. The decision was made to retain as much as possible of the original buildings, though many internal walls were removed and new metal stud and plasterboard walls were put up, which can be removed and altered if needed. Enclosed offices are now generally occupied by two or more people except for the most senior academics who have single offices.

The estates department has recruited a space manager to help ensure space is efficiently used, and is preparing guidelines for the amount of space required by different user types. These have not yet been fully resolved but comparative measures found in other universities are being considered.

The process used was efficient. Old stock can be effectively renovated with minimal disruption.

Ground level cafeteria with courtyard seating



Photo: AMA

The cladding is a cheap way of giving a completely new look to the building. It has not caused any problems with the re-clad areas as the existing walls are still intact and weatherproof.

Computers are available close to each subject area and are heavily used as many students do not have their own computers



Photo: AMA

J Block, University of Glamorgan, Pontypridd

Location and type of site:	Small town, split campus in a steep-sided valley
Type of build:	Refurbishment
Completion date:	1997, 1999 and 2002 for the three phases
Team responsible:	Architect: Wigley Fox Partnership Design & build contractor E Turner and Sons (Wilmott Dixon)
Building use:	Teaching, administration and academic offices for electronics, computing and IT department
Cost total (year):	£6.4 million (1997–2002)
Cost/GIA:	£776/m ²
Area GIA:	8,238 m ²
Area NIA:	5,882 m ² (7,114.7 m ²)
Area NUA:	5,605 m ² (68% of GIA)

Malet Street Consolidation Project

Birkbeck College, London

The Malet Street consolidation project includes the infill of the existing courtyard, and addition of two floors as well as the refurbishment of the existing building – boosting floor space by 45%.

Overview

Birkbeck, which became a college of the University of London federal system in 1920, specialises in the education of part-time and mature students, as ‘a college specifically for working people’. The Malet Street consolidation project is located at the main body of Birkbeck College’s buildings. The Birkbeck campus is in central London. The college occupies several buildings, mostly around Torrington Square, beside the University of London and University College London, but with some more remotely situated buildings.

The Malet Street consolidation project is occupied by a range of disciplines and departments: economics, mathematics and statistics, geography, biology, chemistry, psychology, central computing services, general teaching, catering, administration and the college library. The original brick building has been extended from six to eight storeys. The new glazed addition, an infill within the arms of a C-shaped building, accommodates one extra floor because of reduced storey heights.

The glazed addition houses an extension to the library on floors 1-4 which has consolidated three previously separate libraries and meant the



Photo: Birkbeck College

college has been able to terminate the lease on its Gresse Street building. The ground floor contains the entrance area, and the top three floors are laboratory and general teaching spaces. An enlarged basement area accommodates four new lecture theatres. The consolidation adheres to the strategy of reducing the number of buildings held by the university.

The project has added 45% additional floor area on the existing site. The incorporation of multidisciplinary laboratories has made it possible for the university to stop leasing serviced laboratory space in UCL laboratories. Open plan offices have been promoted generally throughout Birkbeck, and these were used here, where appropriate. The college has made other consolidation savings such as reducing the number of trips being made between sites.

Design process

The Malet Street consolidation project had some major objectives for Birkbeck College:

- to create a new ‘Heart of Birkbeck’ by expanding central facilities to accommodate the needs of additional students

Aerial sketch indicating the infill extension and newly built upper floors (shaded)

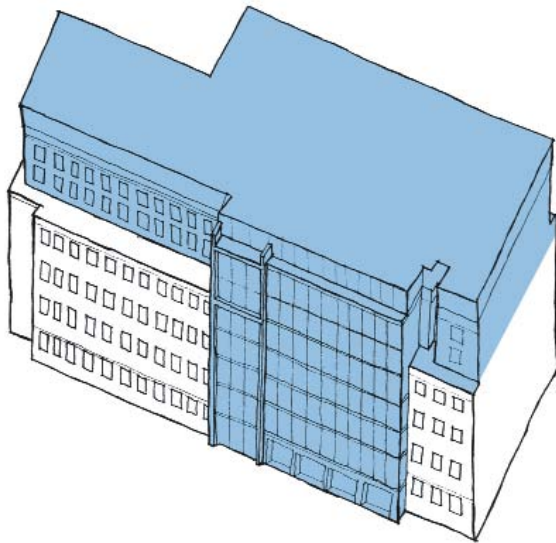


Diagram: AMA

- to consolidate the most remote teaching sites onto the centralised campus
- to create an integrated teaching/library centre for use seven days a week.

The project involved the demolition of 1,400 m² of poor quality, inefficient area, and replacement with a 6,500 m² extension coupled with a significant refurbishment of the existing building.

The college also targeted cutting its dependence on space it did not own: to stop leasing 973 m² from UCL and to terminate the lease on the 4,825 m² building in Gresse Street which the college had previously sold and leased back – approximately 5,800 m² in all.

The main people driving this project were the then Master of the College, Professor Tim O'Shea, and the Chair of Governors, Dame Judith Mayhew, supported by the college's senior administrators.

An estates strategy group carried out the planning and budgeting of the project followed by the space planning phases, to see what

properties could be released or altered, and to assess consequent moves. Governors were consulted very early in the project.

In order to ensure the correct provision of classroom sizes and configuration, academic schools affected by the move, the facilities office, and the librarian were all consulted at an early stage of the design process.

Birkbeck obtained funding of almost £8 million through HEFCE's poor estates grant and a similar amount from selling existing sites. The procurement was initially traditional using a Joint Contracts Tribunal (JCT) contract but was changed to design and build during the tender stage. After reviewing tenders for JCT one of the lay governors (a property developer) suggested design and build would provide better value. Tenders for both approaches were received and the construction project used a guaranteed maximum price (GMP) design and build approach. The fit-out did not use GMP, and in the event exceeded the budget.

The day-to-day maintenance of the Malet Street building is managed in-house. Speciality contracts for lifts, cleaning, night security and catering are outsourced.

Evaluation

The completion of the Malet Street project provided space for 900 FTE students/staff from outlying sites as well as the release of the Gresse Street building.

Generic lab design allows for easy use by multiple disciplines



Photo: AMA

In 2000 central management information services (CMIS) software was implemented for booking purposes. All timetabling, booking and invoicing are now accomplished through this system. The system shows positive gains for room utilisation and income.

Although there are fewer teaching rooms available now than when the Gresse Street building was leased, more students can be accommodated due to better accessibility and more efficient design.

Multidisciplinary laboratories are designed to accommodate biology and chemistry students.

Birkbeck serves a student body where the majority of teaching is concentrated in the evenings while research activity continues during the day. Excess daytime teaching space is used by other institutions and provides £1 million per annum revenue. The university has been actively encouraging Friday evening teaching and has had a positive response, leading to an increase of room utilisation college-wide.

The provision of additional office and laboratory research space has eliminated Birkbeck's dependence on buildings belonging to other local colleges.

The use of up-to-date technology, such as flat screen computer monitors, allows for desks with a narrow depth to be used in place of the traditional deep work surfaces for computer rooms and research students. Open plan areas are being used for staff and researchers.

Responses from both students and faculty staff have been positive and most agree there are definite benefits to the newly refurbished Malet Street location. Students and staff previously located at the Gresse Street building were isolated from the rest of the student population but are now accommodated close to all central facilities. Due to the delays the fit-out stage took longer than planned which drew negative feedback from staff and students.

There are plans for a post-occupancy evaluation of the Malet Street building.

The central booking system shows positive gains for room utilisation and income

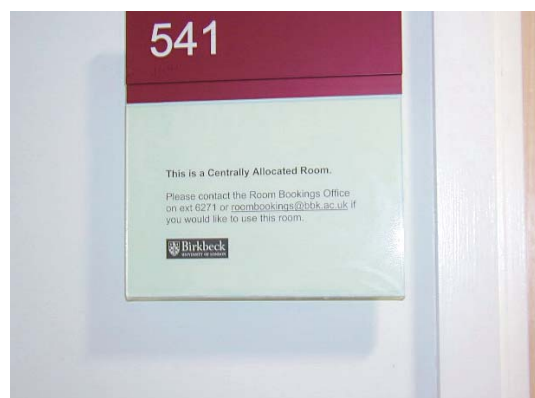


Photo: AMA

Intervention in an existing building, making the most of a new addition, has fulfilled many of the college's aims. The change in floor-to-floor height between the existing building and the glazed library extension may reduce future flexibility but allowed an extra 1,400 m² to be built on the site.

Malet Street Consolidation Project, Birkbeck College, London

Location and type of site:	Central London
Type of build:	Refurbishment and extension
Completion date:	2003
Team responsible:	Architects: Richard Hopkinson of Nick Evans Associates Contractor: D+B Miller Construction M&E Initial Design: Chapman Bathurst Structural Engineering: McBains Cooper Project Manager: Kevin Whitehead
Campus type:	Urban, scattered building
Student FTE campus:	7,300
Building use:	Multidisciplinary
Cost total (year):	£15,000,000 (2003)
Cost/GIA:	£1,944 /m ² [including upgrading of existing building facilities]
Area GIA:	7,715 m ²
Area NUA:	6,042 m ² (78% of GIA)

Canal Side East

University of Huddersfield

The East Mill refurbishment provides flexible space, enabling the education department to take over space previously allocated to engineering.

Overview

The University of Huddersfield is located on a single main campus, within the town centre. Over the last 12 years the university has invested over £30 million to improve the academic property portfolio. This development was part of the work to consolidate the campus onto one central site from a previously sprawling campus, by the refurbishment of derelict buildings, and new construction.

The East Mill building is a 4,460 m², five-storey, grade II listed, former mill building. Originally built in 1865, East Mill has retained historical features while undergoing major changes. Roof lights were installed in order to provide good north light for art and architecture studios.

More space was needed than was available, so the building was lengthened by a small extension the full five storeys high, and a 120-seat lecture theatre was built on the footprint of a former loading bay. A new lift tower was also added.

The conversion works were designed and undertaken to complement the earlier conversion of West Mill. This extension has a curved front and was built using reclaimed stone from a similar building, so it blends with the existing stone.

The East Mill is a flexible building and occupants have already made minor changes since completion, in response to careful biannual monitoring of the amount of space each faculty needs. The ground floor now houses education, the first and second is occupied by computing and engineering and the third and fourth by architecture. A refectory located on the second floor caters to the people on this part of the campus.



Photo: University of Huddersfield

Design process

The campus strategy called for the improvement of derelict buildings and the consolidation onto one site. The mill buildings were one of only a few places for expansion on the main university site.

From early design stages and right up to the fit-out stages of the project, the university consulted a user group to ensure an appropriate overall brief, as well as to decide how space would be subdivided for the different departments. The user group was made up of the architects, members of the estates department and representatives from the building users (architecture and engineering respectively).

The design and procurement stages followed a very precise schedule. A budget was formulated based on the space requirements arising from the brief and an anticipated cost per square metre. A strategy team consisting of the estates director, the vice-chancellor, the pro vice-chancellor for finance, and a dean from one of the faculties (a rotating position) managed the processes, procurement and construction throughout the project. This group made the overall decisions and formulated the general project direction and budget. Based on the broad brief, a designer and then contractor were selected.

The strategy team used a guaranteed maximum price, as well as an open book, policy for this project. The client provided incentives to ensure the project cost met budget – if the final costs came in below target, the university and the

Second floor plan: shaded areas indicate the new building, including a new lecture theatre in a narrow full height extension

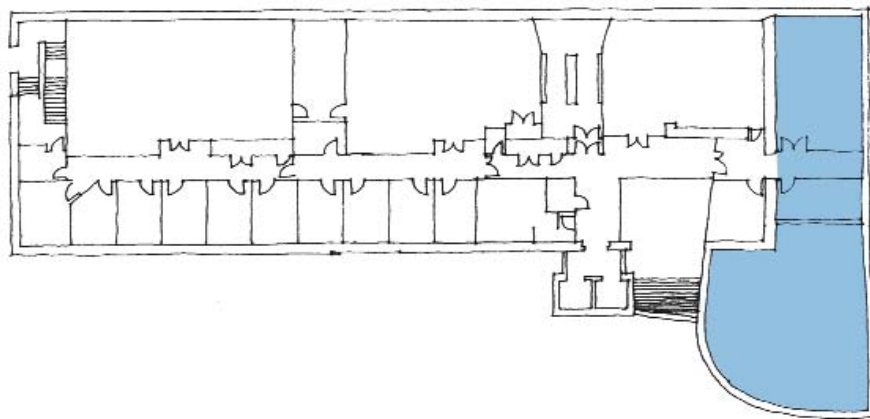


Diagram: AMA

contractor would split the balance. The rationale for this approach was based on the university's poor experiences using traditional methods of procurement in the past. The university prioritised cost control as a vital component of the success of the project.

The building is managed in-house using in-house and outsourced service providers (security and cleaning).

Evaluation

Due to the open plan nature of the original structure, the space is flexible and can withstand internal modification and change. Raised floors, cooling and easily removed stud partitioning have further future-proofed this development.

The focus on providing generic space, that could easily be changed to suit a different department, is being actively implemented in other buildings.

This generic space is managed by biannual departmental evaluations that have become a successful method in allocating the appropriate amount of space to each department. The university's strategic space management group take into account yearly growth of departments, as well as the level of earnings the department generates relative to the space they use. Should an assessment indicate that a department is using space poorly, it is reallocated. The East Mill building provides an example of reallocation since space originally provided for engineering has been taken on by education.

The procurement method selected ensured the budget was met. The same process has now been used several times with all projects coming in at, or under, budget.

Shaded areas indicate new extensions including roof lights to illuminate the architecture department

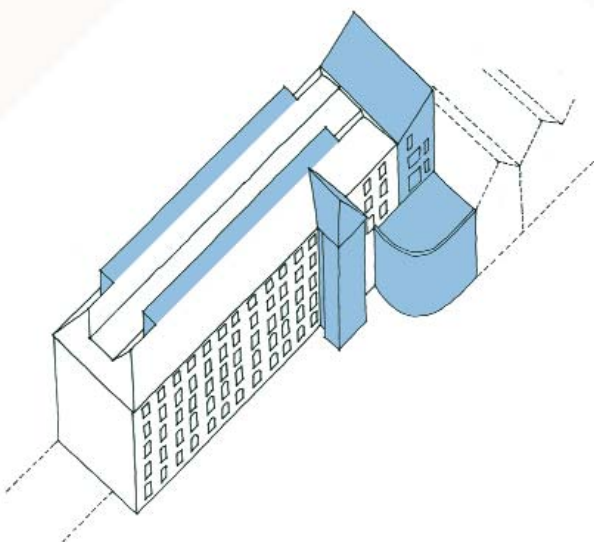


Diagram: AMA

The new north lights introduce daylight without compromising the old structure



Photo: University of Huddersfield

The entrance area exploits the building's historic character



Photo: AMA

The investment in the estate and the consolidation strategy has succeeded in improving the space efficiency of the entire campus. While gross internal area increased by 22% over this period, the number of student FTEs over the same period increased by 89%. This was achieved by centralising all academic activities on a single campus, creating a single library and so avoiding duplication, improving the suitability of buildings, demolishing unviable property, and through new build and refurbishment. The University of Huddersfield was able to demolish two, six/seven storey towers (late 1950s and early 1960s construction), upon completion of the East Mill refurbishment.

The university has not formally assessed user views. While there have been some minor problems, the users are generally very satisfied with the facility. Single person offices are modestly sized at 10-11 m² and many offices are occupied by two people. Offices are used for student 'face-time' and small group teaching.

Mobile dividers provide display surfaces and allow flexible use of the open plan areas



Photo: AMA

Canal Side East, University of Huddersfield

Location and type of site:	Constrained site centrally located within town
Type of build:	Refurbishment
Completion date:	1998
Team responsible:	Architect: Allen Tod Architect Construction: Jarvis Construction Project Manager: A. Johnson, University of Huddersfield
Campus type:	Town centre campus
Student FTE campus:	12,582
Building use:	Multidisciplinary – education, computer engineering, art, architecture and design
Cost total:	£4,100,000 (exc. VAT)
Cost/GIA:	£980 /m ² (exc. VAT)
Area GIA:	4,187 m ²
Area NIA:	3,333 m ² (80% of GIA)
Area NUA:	2,916 m ² (70% of GIA)

Clarendon and Student Services buildings

University of Teesside, Middlesbrough

A new block links the two upgraded buildings, improving pedestrian circulation and utilising courtyard space and open planning to promote space efficiency.

Overview

Teesside University occupies a site close to Middlesbrough town centre. It began as a technical college in 1930, later became a polytechnic, and then the University of Teesside in 1992. In the 1970s, Basil Spence designed several buildings conforming to an estate plan for a grid of three-storey buildings filling several city blocks.

The university has now refurbished two of these buildings, the former library, and the Clarendon building. As was common for buildings of their period, pedestrian circulation was separated from ground level road traffic, with most activities located on the first floor and above, with plant and car parking at ground level.

A new circulation link has been added between the two buildings, providing more accessible ground level access with convenient lifts. The former library, built in 1978, has become a student support centre with a cafeteria incorporated.

The Clarendon building, built in 1973, provides offices and teaching space for the business school and for part of the school of social sciences and law.



Photo: AMA

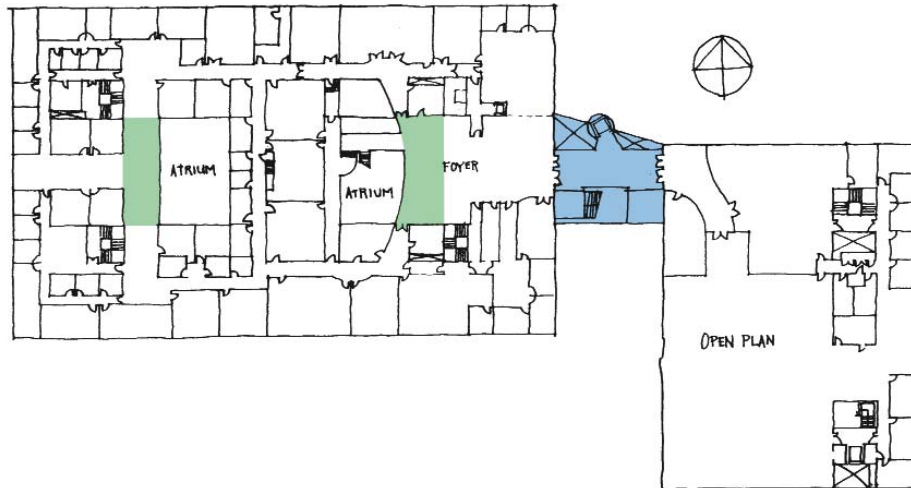
The former library, a largely open plan building, had been vacated. This provided an opportunity for re-use as the student support hub where the majority of staff work now in open plan office space. The Clarendon building, a deep building with two open courtyards, was no longer an acceptable space for work or teaching and it had confusing circulation giving very little sense of orientation, as well as having heating problems.

The two consecutive projects have created more accessible space, and an efficient location for all activities supporting the student body. The university has introduced more open plan working and more efficient space standards for enclosed rooms for academic staff, as well as providing shared interaction space with future flexibility, for both students and staff.

Design process

These redevelopment projects were started when Teesside became a university in 1992. The old library was redundant and this provided an open plan area for the first project – a new student services hub using open plan offices. The university was keen to use what it learned from this first project on the adjacent Clarendon building. Both projects allowed the university to bring these premises up to standard for DDA requirements.

Second building plan: Clarendon building (left) and student support building linked together (blue shading indicates the new extension, while the green shading the former atrium space). Most of student support area is open plan and can be easily reconfigured.



The initial move for the first project was to look for an architect with a suitable approach. The university sought a firm with a track record in university buildings and with appropriate design ideas. After holding competitive interviews it identified a Sheffield firm, Bond Bryan Partnership.

Student support needed an effective, efficient, coordinated location to serve a larger and growing student population, and to help attract the local students that Teesside wanted to serve, who might otherwise not attend university. Legislative drivers and staff expectations were becoming more demanding so higher performance within the same building was needed.

The initial project was traditionally procured. In the Clarendon building project, the same architect was used but a construction company was given a design and build contract with a guaranteed maximum price. The university had the chance to acquire an inexpensive office building when the local authority structures changed. This provided decant space that has continued to be used for subsequent projects. This office building was cheap, has had little spent on it, and is likely to be retained for car parking.

Additional floor space captured by reducing the courtyard size



Photo: AMA

The university secretary has been instrumental in ensuring that everyone is aware that Teesside cannot afford to have buildings that are inefficient or underused. The estates director of the time was a strong proponent of open plan offices.

The snack bar in the student centre is one of four campus-based catering facilities that are managed by the department of campus facilities, together with all the buildings.

Evaluation

The university held regular user group meetings during the project and 18 months after, to seek the views of the users. There have been few complaints and anecdotal evidence suggests the staff using the Clarendon building prefer the new facilities. The new covered atrium that is used as an open plan office area has presented a few practical problems such as access and maintenance, glare, dripping water (condensation or rain) and noise disturbance.

Specialist space on campus is surveyed over a one-week period in each semester, as set out in the EMS data gathering guidelines. The new shared interaction areas are generous, for students and in the secure staff areas. There is space to incorporate more of the facilities housed in these areas: meeting tables, drop-in computer terminal clusters, casual comfortable seating etc. The snack bar is well-used, with students tending to congregate on the lower level and staff upstairs.

The Clarendon building has an increased floor area, as the old courtyards are now atria with smaller footprints. This has also meant there is now less external perimeter to maintain. Staff offices are smaller in the Clarendon building than previously, and in the student centre are largely open plan. Typical footprints have therefore been reduced and an efficient precedent has been set.

The average size of a single person cellular office has decreased in size, from 16.8 m² NIA for the old Clarendon building, to 13.2 m² NUA in the Clarendon refurbishment.

More benefit could probably be gained from these buildings if the university captures more factual information about user preferences and utilisation of the shared and office areas.

Open tables at the Clarendon first floor entrance, for social interaction and collaborative work



Photo: AMA

Open plan work area in the student support building



Photo: AMA

Clarendon and Student Services buildings, University of Teesside, Middlesbrough

Student FTE campus: 20,300

Location and type of site: Urban campus

Type of build: Refurbishment

Completion date: 1999

Team responsible: Director of estates

Client: Student services, school of social sciences and law and Teesside business school

Architect: Bond Bryan Partnership from Sheffield

Campus type: Urban, compact, single site

Student FTE campus: 20,300

Building use: Student services, offices, teaching, computer laboratories and snack bar

Clarendon only

Cost total (year): £5,300,000 (1999)

Cost/GIA: £1,144/ m²

Area GIA: 1,088 m² inc. ground level parking

Area NIA: 6,599 m² (59.5% of GIA)

Area NUA: 5,470 m² (49.3% of GIA)

Holgate

York St. John University College, York

The refurbishment creates additional space within an existing building footprint by roofing over the open courtyard.

Overview

York St. John University College (YSJ) campus is located just outside York city centre. The Holgate building, originally built in the 1850s as the Archbishop Holgate School, was bought in 1962 by the college. Holgate comprises a main, grade II listed, school building, a smaller adjoining 'Head Master's House' and numerous small extensions spread over two storeys.

Previously a multifunctional university building, Holgate had housed administrative facilities, a library, IT, reception and porter's lodge. The new refurbishment is a 'one stop shop' for student services consolidating all student support systems, such as student records, finance, and campus reception, into one location in the centre of the campus. Holgate will also house the university's international teaching department. The refurbished building completes a walkway through the campus connecting one side of the campus to the other, as well as the new 'heart'.

The design brief sought to improve the building environment by removing the library, consolidating different student support offices into one central location, and 'the use of open plan offices where possible' – quite a radical approach relative to YSJ's history.

The refurbishment of Holgate creates additional space within an existing building footprint by the simple method of roofing over the open courtyard. The teaching spaces are generic, so a wide range of departments can use them. The opportunity is being taken to focus international teaching in newly upgraded space, as this department produces a very good stream of income for the college.



Photo: YSJ

Design process

The Holgate refurbishment project was made possible when the library was moved. The estate's strategy was consolidation, and the vacant Holgate site presented an ideal solution to meet its needs.

Members of staff in student services expressed a desire to consolidate all student support into a single building and believed that a review of student services was needed. In the early design stages a strategy committee of user groups was created to identify key necessities for the refurbishment. Visiting other universities with similar 'one stop shop' facilities helped to develop the initial brief in more detail.

Although the building is essentially cellular, the workspace provided in new additions is for open plan offices. The chief executive of the college and the estates director emphasised the necessity of moving in this direction as growth is planned and the college cannot afford excessive increases in office space. The consolidation project targeted 67% less space with 16% more students for the university as a whole.

A two-stage tender process with a guaranteed maximum price was chosen for the project, based on the successes of other recent projects that utilised the same procurement route.

The student centre has gained additional space by filling in the courtyard and building a modern glass extension (shaded)

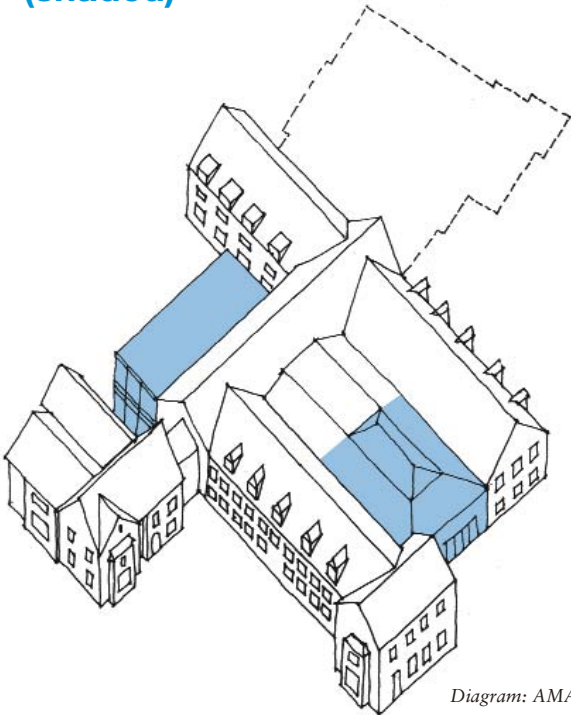


Diagram: AMA

Evaluation

The consolidation of student support onto one site is expected to be a time efficient measure for staff and students. This project was completed in 2005 and the college will be seeking the views of users.

It is anticipated that external contracts will use the teaching space for about 50% of the time but that it will be available for other users for the rest of time.

The project is part of a staged upgrade of the building, and this first phase provides space that will give the college an improved image, catering for the immediate needs of students in a strategic and central location on the main pedestrian route through the campus.

The ground floor central corridor creates a link through the campus: and houses student services in an open environment



Photo: YSJ

Typical multi-person office space



Photo: YSJ

Holgate, York St. John University College, York

Location and type of site:	Located in York town centre
Type of build:	Refurbishment
Completion date:	2005
Team responsible:	Architect: Bond Bryan Mechanical and Electrical Engineering: Black & Veach Structural: Jacob Gibb Cost Consultancy: Iddion and Dodd Partners + College Estates
Campus type:	Small city single campus
Student FTE campus:	5,500
Building use:	International teaching department, and student support services 'One Stop Shop' including reception, central student services, student finance and accommodation office
Area GIA:	4,745 m ²
Area NIA:	4,123 m ² (86.9% of GIA)
Area NUA:	3,229 m ² (68.1% of GIA)

The Michael A. Ashcroft Business School

Anglia Ruskin University, Chelmsford

The new Ashcroft building is significantly smaller than the building it replaced but houses the same number of students with space for more in the future.

Overview

Anglia Ruskin University's Chelmsford campus is at the edge of town, a short distance from the train station. It is one of two Anglia campuses, the other being in Cambridge. Previously a polytechnic, Anglia became a university in 1992 and the majority of its students are mature learners. The university is gradually releasing buildings elsewhere in Chelmsford and concentrating on a single Chelmsford site.

The Ashcroft building creates a new 'front door' to the campus. Connected at one end to the 'green' Queen's building, the Ashcroft was also designed with an environmental agenda using the latest in energy efficient technology.

The building houses the business school. It is on five storeys and contains administrative offices for the business school, a small café and a larger refectory, with the general reception and information on the ground floor. General teaching spaces are located on the first and second floors, staff offices are on the third, and on the fourth there is an open plan flexible space for conferences and business clients. There is also a large lecture theatre over the entrance area.

The Ashcroft business school decided on room sizes by consulting a user group of faculty and estates directors, in order to assure properly sized teaching spaces and to achieve high



Photo: AMA

utilisation. Both administrative and academic staff, including the dean, work in open plan areas, where the only assigned cellular office is that of the dean's personal assistant. As a new main entrance, the building gives the university a better image. The building is significantly smaller than its predecessor but accommodates the same number of students and still has potential for student numbers to grow.

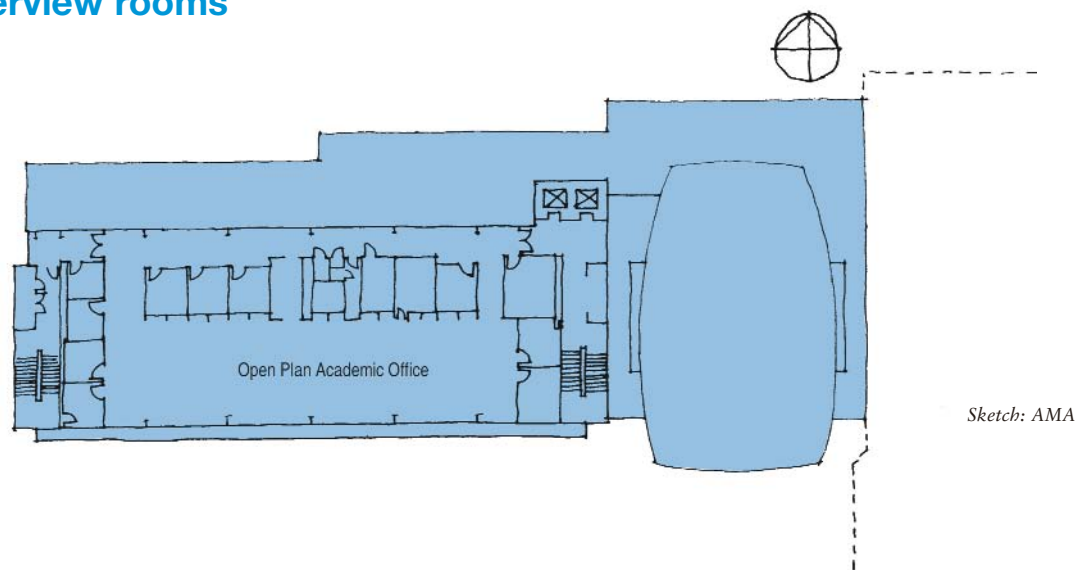
Design process

Anglia received a generous donation for the project, and the donor stipulated the new building must be for international business, as well as a landmark building. The university wanted to create a new front door to the campus and saw the Ashcroft as a good opportunity to do so.

The university completed a space evaluation and timetabling analysis early in the design stages, and a strategy committee of user groups was created in order to identify key necessities for the refurbishment. A two-tier project management and project steering group was created. Members of the first tier included the vice-chancellor, director of estates, director of finance and the donor. The second tier included representatives of staff and students.

The procurement route was initially a single stage 'develop and construct' job, which, through extensive value engineering, essentially became a two-stage process. Wilkinson Eyre,

Third floor plan illustrating open plan office space and student interview rooms



architects, were selected through an international RIBA design competition, with the rest of the design team being selected initially through an OJEU notice and final selection through interview. The interview panel did not know the candidates' fee information so selection had to be based upon 'value and competence'. Construction was funded through private donation. The project was 95% designed to a budget set by the university before going to tender and then according to the amended JCT98 contract with the contractor's design.

The Ashcroft is mainly managed in-house, with maintenance and cleaning outsourced.

Evaluation

A user group of faculty and estates directors developed a series of teaching room sizes, based upon a combination of both academic practice and theory applied at other HEIs, creating classrooms of 15, 25 and 50 person teaching capacity. Some reconfigurable partitioning was used, and rooms can be expanded to accommodate 75 people. Utilisation initially increased by approximately 5–10%. More recent changes to the booking/timetabling process have further increased utilisation. The university will determine the exact increase in utilisation when it carries out further surveys.

Open plan office space on the third floor has only one private office for the PA of the dean. Provision is made for student and faculty meetings in small cellular spaces dividing the staff area from the primary circulation. Staff who require privacy or need to maintain concentration also use these. Student interviews must be pre-arranged and are carried out in these rooms. However, due to the popularity of the open ground floor refectory and coffee shop, student faculty meetings are often conducted there.

The new business school provides a new front door to the Chelmsford campus



Photo: AMA

There was initial great resistance to the move to open plan among the faculty. Although there is still some resistance, the overall methodology and approach to working has changed and staff are beginning to accept the move. The dean helped make open plan a more acceptable working system, by setting an example of his workspace.

The functional approach to space provision, along with the faculty move from an inefficient grade II listed building, has resulted in increased space efficiency and cost savings in both recurring revenue and capital costs. The university will conduct more detailed analysis through post-occupancy evaluation.

Overall, the building has been received well by its occupants. However, users have not yet 'grown into' it and there is much to be improved in terms of room booking and utilisation.

The main reception provides computer terminals for access to general information



Photo: AMA

Third-floor open plan academic office space with adjacent single rooms for student/faculty meetings and individual faculty work

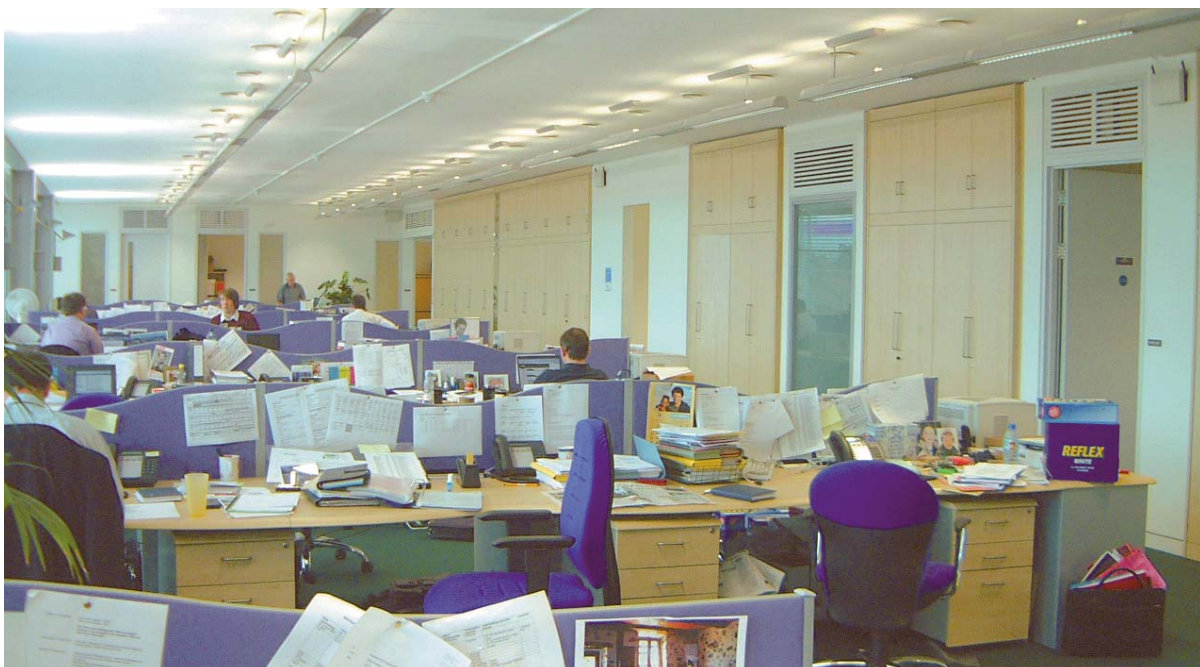


Photo: AMA

Project summary

The Michael A. Ashcroft Business School, Anglia Ruskin University, Chelmsford

Location and type of site: Edge of town location alongside River Chelmer

Type of build: New build

Completion date: 2003

Team responsible: Architect: Wilkinson Eyre

Structural engineer: Buro Happold

Contractor: William Verry

Services engineer: Atelier 10

Project manager: Gardiner and Theobald

Campus type: Small city multiple campus

Building use: Business school

Cost total (year): £6,445,000 (2003)

Cost/GIA: £1,471 m²

Area GIA: 3,675 m²

Area NIA: 3,130 m² (85.2% of GIA)

Area NUA: 2,383 m² (64.8 % of GIA)

The Harrison Learning Centre

University of Wolverhampton

The building extension provides a prestigious new entrance, lots of daylight and additional study spaces incorporating innovative sunflower study pods.

Overview

The Harrison Learning Centre is a four-storey building on the City Campus South, in the centre of Wolverhampton. The campus has had to improve its building stock and space efficiency, having been in a bad enough condition to qualify for poor estates funding from HEFCE.

The Harrison Learning Centre (HLC) underwent two major refurbishments in 1998-89 and 2002, resulting in a new look and refurbished interior to a 1970s library building that no longer met the university's needs. HLC absorbed the art and law library in 1996-97 (about 900 m², 45,000 volumes and 90 seats). The first HLC extension involved the addition of a triangular portion to the east of the building, incorporating an atrium and creating a new entrance and circulation space.

The closure of the Dudley campus including its learning centre (about 1,900 m², 107,000 volumes, 20,000 journals, 339 seats) required an expanded provision at Wolverhampton to support the school of humanities, languages and social sciences. This is incorporated into the second extension. This extension faces west and extends the full width of the building. It is a narrow 3m strip atrium, rising the full height of the building with a fully-glazed front elevation. This provides a prestigious new entrance and more daylight as well as additional study space



Photo: University of Wolverhampton

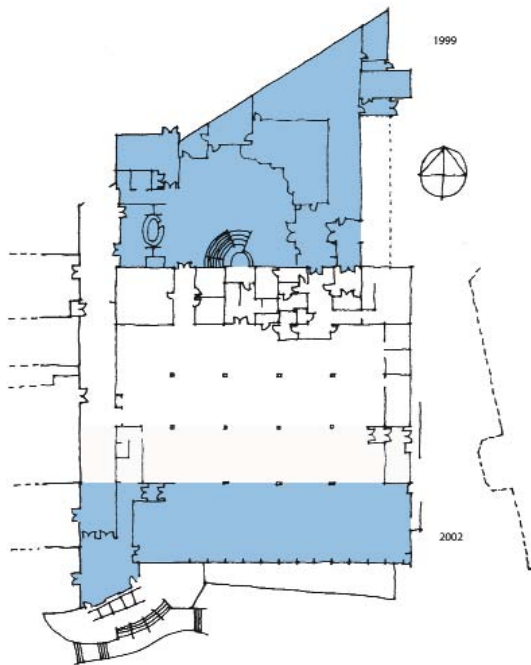
to the building interior. These extensions together with other new buildings create a centrepiece to the campus, providing an improved image for the university.

In 2004 the contents of three smaller libraries on hospital trust sites were divided between HLC and the Walsall Campus Library (total about 615 m², 25,000 volumes plus journals, and 143 seats) when the nursing and midwifery education programmes were moved onto the campuses.

The four-storey structure houses the refurbished learning centre, which has consolidated several libraries into one location over the two projects. The refurbishment altered the old library by including new IT-enabled study areas, both individual study and group study, some with wireless access, as well as additional space for book stacks. The building also includes a covered street (complete with bookshop, copy/print shop, hairdresser, computer/mobile phone outlet), enhanced by its co-location with the students' union, and has ultimately become a well-utilised social space.

The project creates a 'new' building, and has improved its image quickly and cheaply. It aims to persuade staff and students to teach and learn differently as part of a more extensive, university change agenda.

Ground floor plan with shading indicating the new extensions to the building



Sketch: AMA

Design process

Since 1998 the University of Wolverhampton has been engaged in a major strategic regeneration project named New Horizons. This academically driven project includes provision to improve the buildings on all its campuses (Wolverhampton, Walsall, Telford and Compton Park – the Dudley campus was closed as part of this initiative). It addresses the issue of the poor condition of the estate. A lack of investment in the physical infrastructure of the university meant that cash reserves had been preserved. The new Pro Vice-Chancellor, Roy Newton, has been playing a major role in the conception and implementation of this project.

A strategic assessment of the estate concluded that the University of Wolverhampton had too much space of poor quality. As a result of the New Horizons project, the university has been equipping its campuses, with major new build

and refurbishment projects, some of which have been completed while others are in progress. The strategy initially sought to invest £60 million, which grew to a projected estimate of £120 million, over a seven-year period.

The redevelopment of the Wolverhampton campus, including work on the Harrison Learning Centre, was driven by several factors:

- the necessity to improve a much neglected and deteriorating campus
- the need to eliminate the 25% of the total estate deemed unnecessary
- and the need to improve the image of the university.

Additionally, with respect to the Harrison Learning Centre, some outdated infrastructure also needed to be upgraded – heating and lighting had to be improved to acceptable standards. The university also believed that buildings are an important part of what a university has to offer and they have a role to play in marketing: ‘You can’t compete in the market without proper buildings’.

New west extension providing additional study space and ample natural lighting



Photo: AMA

Sunflower learning clusters



Photo: AMA

The procurement of the project was traditional, with architects selected using the OJEU process.

Furniture was procured by working with suppliers to create designs and systems that would meet the needs of the users.

Evaluation

To date, the university has reduced its estate by approximately 12%, nearly half of its New Horizons objective of 25%. This project has played a role in this by bringing a variety of different libraries into this single location.

The merged libraries have improved building efficiency, allowing the university to release surplus property and reduce maintenance costs.

In order to keep the building flexible and allow for further changes in future, the lighting in the old part of the library which needed to be upgraded was re-orientated on a 45° angle. This will allow book stacks to be arranged in several ways on the floor without tall shelves casting shadows.

The Harrison Learning Centre has successfully become a more attractive learning environment. It explores the merits of a new prototype for IT learning in its use of desk pods or groups. This pod shape, also referred to as ‘sunflower’ and ‘dog-bone’, allows both group interaction and individual research as required. There is an

extensive wireless system, allowing students and staff greater mobility. The combination of the use of wireless and flat screens has helped to make it possible to use furniture with a small ‘footprint’, which has further improved space efficiency.

The new extension has provided a good environment for study – brighter and more open than before. It also creates a new face to project to the city. The façade incorporates exterior lighting giving the university an attractive city-facing image, while the courtyard-facing extension reorganised and rationalised an otherwise uninspiring building. Overall, the Harrison Learning Centre extensions and refurbishment give the perception of a new building. This approach is not only cheaper than a complete new build, but also easier and faster to design and deliver.

West extension



Photo: AMA

The Harrison Learning Centre, University of Wolverhampton

Type of build:	Extension and refurbishment
Completion date:	2002
Team responsible:	Architect: Bond Bryan Partnership
Campus type:	Rural, multiple campus
Building use:	Learning resource centre
Cost total:	£4,797,597
Cost/GIA:	£1,263/m ²
Area GIA:	10,980 m ² (total including existing)
Area NIA:	10,025 m ² (91% of GIA)
Area NUA:	8,851 m ² (81% of GIA)

Great Central Warehouse

University of Lincoln

The award-winning refurbishment of a derelict building to house combined libraries incorporates wireless technology and space efficient interiors.

Overview

The University of Lincoln's Brayford Pool campus is located at the fringe of Lincoln city centre. A rail line and major road intersect at the centre of the campus creating four distinct quadrants. The Great Central Warehouse (GCW), is located in the south-east portion of the campus and houses the university library. It is a refurbished, redbrick structure, originally built in 1907 as a goods and grains warehouse. The refurbishment, completed in 2004, includes a new two-storey glazed extension on the north façade as well as the reconstruction of 'loading bays' to the south side.

Typical floor plan showing the new extensions (shaded)

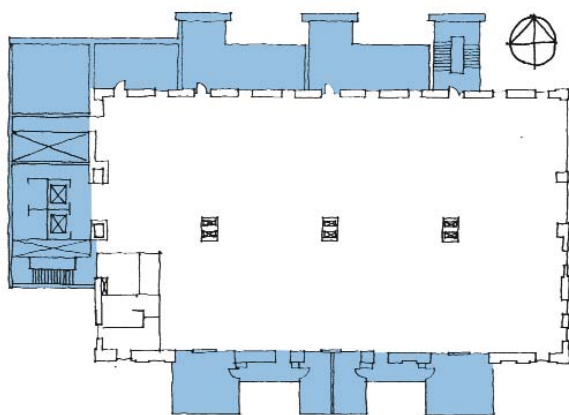


Diagram: AMA



Photo: Andrew Weekes

The library contains open study areas, work rooms for quiet or group study, operation areas for learning support, IT provision, a vending area and ancillary support facilities as well as 120,000 volumes arranged over four storeys and 5,000 m².

A major element of all the current projects on the Brayford Pool campus is the use of space models to predict needs. The importance of flexibility has also been stressed, resulting in a particularly space efficient campus. The GCW refurbishment was designed for future expansion, with phase two already planned, and provisions made on site for the future extension.

The development of the new library with pedestrian links to Brayford Wharf East will complete accessibility throughout the campus, linking all developments and campus entrances.

Design process

The university has been engaged in a major campus development programme since 1996, when the first building was erected on this site. In relation to the GCW, the university intends to link the development with the remainder of the campus and the city as a whole.

In 2001, as part of a review of the university's strategy (which HEFCE supported through the Restructuring and Collaboration Fund), Rick Mather Architects undertook a review of the

Brayford Pool campus. The motivation for this was twofold:

- the rationalisation of the university's provision in Hull (in partnership with the University of Hull, Hull College and HEFCE) relocating elements of the Hull-based provision onto the Lincoln site
- the need to improve the facilities of the site for the purpose of creating a greater 'student identity'.

The original learning resources building had the disadvantage of also being a faculty building. It was recognised that this mixed use was not suitable for an expanding campus and that specialist buildings for faculties and services were needed.

As the GCW project was approved, the university estates committee assigned a client group including the director of information and learning services as chair, representatives from the estates department, clients of the building, and associated staff. In the early design phase, the client group visited other universities with similar facilities such as Sheffield Hallam, Dublin City, Loughborough and the Open University. This allowed the client group to see what was available in terms of design, and to learn from

The extensions to the old grains warehouse

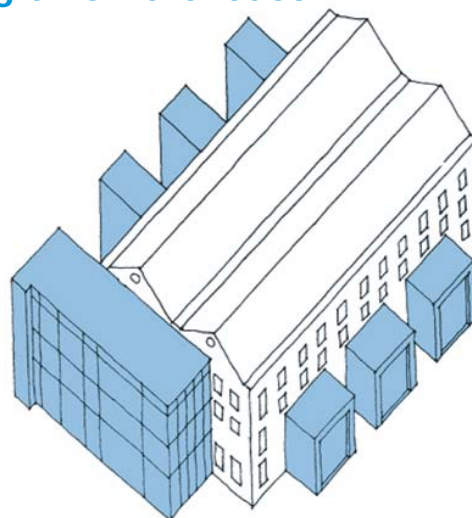


Diagram: AMA

the successes and pitfalls of some relatively new and innovative buildings.

The University of Lincoln funded the project with grant assistance from HEFCE.

Evaluation

The project has been successful in that it was delivered both on time and on budget.

The university is planning a formal post-occupancy review, to be chaired by the director of information and learning services, following a suitable period of operation.

The GCW is now partially using wireless technology and has the ability to be fully wireless in the future.

The building is space efficient as a result of the interior design layout for stacks, study spaces and computer points.

The simple mechanical service systems have produced a building with efficient operating costs. Efficient use of space is achieved by the use of compact study desks and the latest computing technology with minimal furniture footprint areas.

The GCW is well used and has become a bustling part of the campus. It meets the needs of

Making use of structural columns by turning them into computer clusters



Photo: AMA

users and enhances the image of the university. It is a successful reuse of a derelict warehouse building and has incorporated the need for future expansion in its design.

The University of Lincoln has a very space efficient campus, which is being developed with a planned average of 6.5 m² per student FTE as a target.

In 2005 the Great Central Warehouse was awarded a gold in building conservation and a silver in regeneration by the Royal Institution of Chartered Surveyors (RICS). The judges made very positive comments regarding the project: 'This important building was in serious danger due to neglect, vandalism, misuse and theft, and has now been restored to become a focal point of the university campus. The new use of the building, as a library, does not appear at all contrived and the intensity of use and its popularity make the conservation even more worthwhile. The technical restoration work and the retention of original features have been carefully combined with the requirements of a hi-tech work and study environment'.

Quiet and group study rooms located in the reconstructed loading bays



Photo: AMA

Self-issue and return desks improve efficiency



Photo: AMA

Great Central Warehouse, University of Lincoln

Location and type of site:	Urban, new campus
Type of build:	Refurbishment
Completion date:	2004
Team responsible:	UL Architects University of Lincoln
Student FTE campus:	6,200
Building use:	Learning resource centre
Cost total (year):	£5,000,000 (2004) – not including fit-out costs, fees or VAT
Cost/GIA:	£962/m ²
Area GIA:	5,063 m ²
Area NIA:	4,323 m ² (85% of GIA)
Area NUA:	3,665 m ² (72% of GIA)

Appendix: Area definitions

Five definitions of floor area are used in construction projects in HEIs: gross external area (GEA); gross internal area (GIA); net internal area (NIA); net usable area (NUA); and balance area. It is imperative that any area stated is qualified by one of these definitions. The following guidance and Figure 11 are derived from the 'RICS Code of Measuring Practice: A Guide for Surveyors and Valuers' 5th edition, and the Estates Management Statistics Data Definitions.

GEA – gross external area (for planning applications)

The area of a building measured externally at each floor level, **including** all spaces within the building, and perimeter wall thicknesses, external projections, loading bays and garages. It **excludes** open-sided balconies, fire escapes, canopies, and roof terraces.

GIA – gross internal area (for building costs estimation)

The area of a building measured to the internal face of the perimeter walls at each floor level. It **includes** all spaces within the building, internal structure, walls and partitions, loading bays and garages. It **excludes** perimeter wall thicknesses and external projections, external balconies and voids over atria.

NIA – net internal area (equivalent of net lettable area)

The area within a building that comprises usable areas and primary horizontal circulation. It **includes** all usable spaces, kitchens and built-in units and cupboards that occupy usable areas, and horizontal circulation. It **excludes** common entrance halls, atria, landings and balconies; toilets, toilet lobbies, bathrooms and cleaners' rooms; plant spaces (lift rooms, plant rooms, risers, duct rooms, tank rooms and fuel stores); vertical circulation (stairwells, lift-wells and associated lobbies); internal structure (structural walls, columns, piers etc); and loading bays and garages.

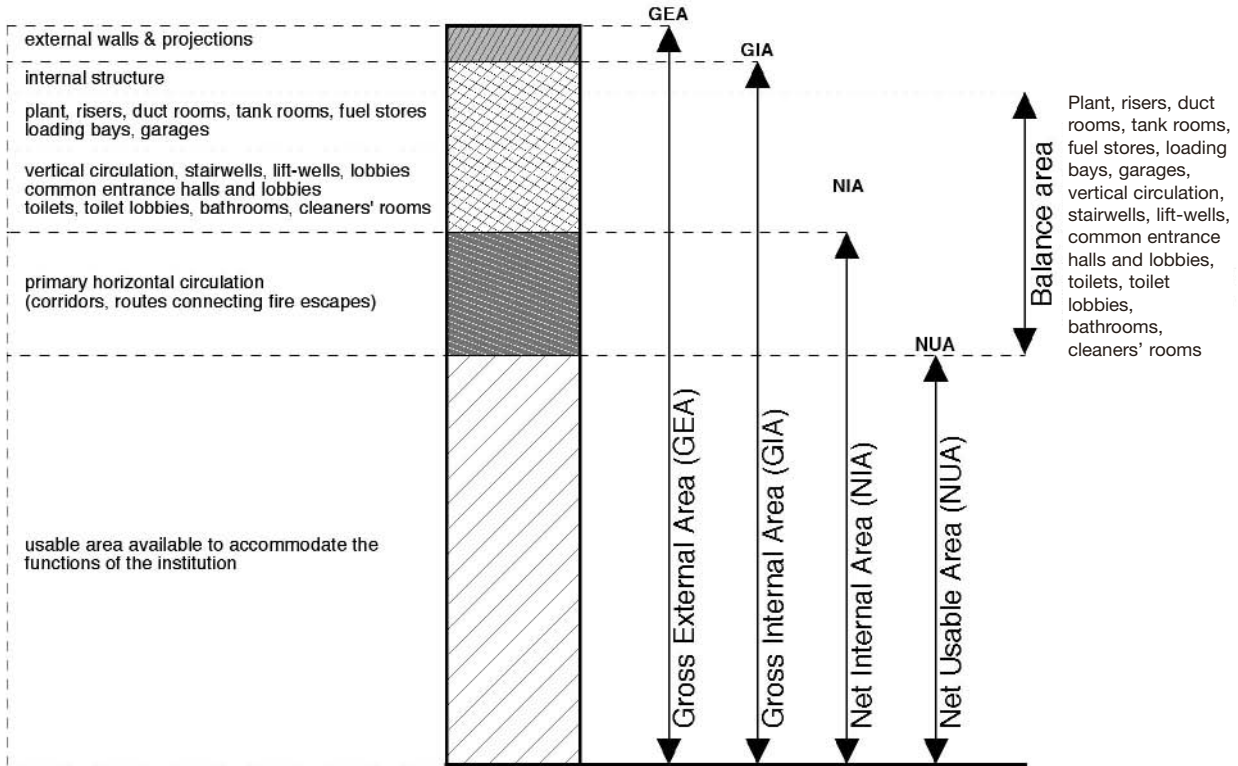
NUA – net usable area (area available in rooms for people to use)

The area within a building available for people to use. It **excludes** primary horizontal circulation (major horizontal routes that link fire escapes) in addition to all of the above.

Balance area (areas to enable the building to function)

The floor area planned to enable the building to function. It **includes** stairwells; entrance lobbies; atria and foyers where the function is solely or primarily for circulation; lifts and lift lobbies; lavatories and toilet lobbies; cloakrooms; cleaners' stores and cupboards; plant rooms, tank rooms, boiler houses, calorifier chambers and fuel stores; loading bays and ducts, that otherwise are included with gross internal area. It **includes** primary horizontal circulation, fire corridors and smoke lobbies that otherwise are included within net internal area. It **excludes** everything that is net usable area.

Figure 11 Diagram illustrating area definitions



Source: AMA derived from 'RICS code of Measuring Practice: A Guide for Surveyors and Valuers 5th edition' and Estates Management Statistics Data Definitions

List of abbreviations

AMA	Alexi Marmot Associates
CLASP	Consortium of Local Authorities Special Programme
CMIS	Central management information services (software)
CPD	Continuing professional development
DDA	Disability Discrimination Act
EMBS	Estates Management and Building Services department
EMS	Estate Management Statistics
FTE	Full-time equivalent
GCW	Great Central Warehouse, University of Lincoln
GEA	Gross external area
GIA	Gross internal area
GMP	Guaranteed maximum price
HE	Higher education
HEDQF	Higher Education Design Quality Forum
HEI	Higher education institution
HLC	Harrison Learning Centre, University of Wolverhampton
JCT	Joint Contracts Tribunal
JIF	Joint Infrastructure Fund
M&E	Mechanical and electrical
NIA	Net internal area
NUA	Net usable area
OJEU	Official Journal of the European Union
PCFC	Polytechnics and Colleges Funding Council
POE	Post-occupancy evaluation
RICS	Royal Institution of Chartered Surveyors
SAF	Sir Alexander Fleming Building
SHU	Sheffield Hallam University
SMG	UK Higher Education Space Management Group
SMP	Space Management Project
UGC	University Grants Committee
YSJ	York St. John University College

