

**Review of Room Booking Systems**  
**The University of Cambridge**

# Review of Room Booking Systems: The University of Cambridge

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## Executive Summary

The University wishes to gain a better understanding of current practices, processes, policies and systems used for teaching space management, in order to adopt a solution likely to achieve improved results in this area. The Teaching Space Utilisation Working Group, chaired by Professor Steve Young, Senior Pro-Vice-Chancellor, commissioned this Review to contribute to its work. The Reviewer is an external consultant familiar with international university best-practice in relation to room booking, timetabling, student service and administration, teaching support and space management, and has prepared this report in line with the working group's terms of reference.

During late September 2013, a series of discussions took place with members of the University - academic and academic-related staff in a sample of schools, faculties and departments, together with others from the Unified Administrative Service, colleges and students.

The discussions confirmed that the departmental systems currently in place generally fulfil the basic requirements of individual departments, but are separate from the booking system used for centrally bookable rooms. The overall process of preparing the University timetable is inefficient, requiring many staff to re-enter data multiple times, in a number of separate documents and systems, in order to prepare the timetable for publication to students and staff. Multiple versions of the timetable are published, and these soon become unsynchronised.

In any situation where neither departmental rooms nor centrally bookable rooms are available or suitable at a particular time, there is no University-wide system that can provide staff with an indication of whether any suitable rooms exist nearby, nor whether such rooms are available at the time required. As a result, and although this is not a frequent exercise in most departments, when it occurs considerable effort is expended by staff to find suitable rooms beyond their own department, to see if they are free, to identify how to book them and access them.

The lack of transparent information presents a risk to University activities should the University need to respond to an urgent event – natural or accidental. The lack of information also presents a challenge to the conduct of University planning for new buildings, since information on room use and room requirements is widely distributed in a range of different forms (including single copies of hard-copy diaries) and not easily assembled.

From the review of current systems and processes, a set of system requirements for a room booking system has been developed. Many different room booking systems are available, and the report identifies five that best satisfy the University's requirements.

An estimate of what the University might need to spend on software is presented as a range of costs: much depends on the system selected, how it is implemented, and how it is integrated into existing systems. Further comment is provided on where management of the system should be located within the University structure, and how implementation might be effected. Some key issues to be reported to the wider University community are flagged.

# 1 Background

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The University of Cambridge is one of the world's pre-eminent institutions of learning, and has a long and prestigious record of research and teaching. It also stands out from other institutions around the world because of its confederated structure and method of operation: the independence of the 31 colleges and 150 schools, faculties, departments, institutes and centres reflects the high value placed on independent thought and academic freedom.

Within this framework of autonomy, the members of the University recognise the importance of cooperation and collaboration to achieve mutual aims of maintaining and strengthening the University's work. The tension between centralised operations and the independence of the University's constituent parts is widely acknowledged, and is reflected in the University's democratic governance processes. However the requirement to resource a range of activities centrally has resulted in such developments as the centrally-managed and shared lecture theatres.

Space is often regarded as a 'precious and finite resource' in universities. It is one in which all university members have an interest because, like other resources, space availability has an impact on how and how well they can do their job. Issues to do with the management and allocation of space can be contentious, robustly-debated and often resolved with a compromise grudgingly accepted by all.

At present, the University's teaching space utilisation appears poor by national standards, and amongst the lowest of the Russell Group universities. The figures are confirmed by the results of space surveys of lecture theatres which have been consistently low over recent years. Less is known about the utilisation of other room types.

A large proportion of the University's buildings are 'single-department' buildings. These form the bulk of the historic estate. More recently, buildings have been designed and built in a manner that enables them to be shared by one or more departments, or for the teaching and meeting spaces in one to be more easily accessed from another. There are divided views on this approach, but the sharing of resources, while it demands some compromises, also facilitates the delivery of a higher quality and greater area of shared space in a more economic manner.

One new approach in building design sees lecture theatre entrances located in such a way that students entering or leaving the lectures are not required to pass through the associated departmental space (although it remains easy to detour through if desired). This facilitates the shared use of such theatres without the problem of students 'outside' the department wandering through departmental space.

Over the next 20 years, the University will be engaged in a significant building program. It is for this reason that more information about the current use of teaching space is being sought. Data about the size of classes in relation to the size of teaching rooms will enable more appropriate and efficient spaces to be designed. Data about the desired location of classes of different sizes in relation to the teaching department will enable the location of more spaces of appropriate size being located in or adjacent to the department.

The University wishes to undertake a high-level study of current practices, processes, policies and systems used for the management of its teaching space, with a view to adopting a solution that will result in a range of improved outcomes in this area. The initial step was the formation of the Teaching Space Utilisation Working Group, chaired by Professor Steve Young, Senior Pro-Vice-Chancellor, responsible for Planning and Resources.

The Working Group commissioned this Review by engaging an external consultant familiar with international university best-practice in relation to room booking, timetabling, student service and administration, teaching support and space management. The consultant, John Pryzibilla of *Mosaic Space*, has a long career in academic-related roles in universities, and since 2001 has

been Executive Director of the *Mosaic Space* group of companies, with a focus on university space planning and management.

The membership of the Teaching Space Utilisation Working Group, and the Terms of Reference for the consultant, are attached as *Appendix 1*.

## 2 Review Process

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Information for this review was mainly sourced from members and staff of the University, through a series of meetings, most of them taking place in Cambridge during the period of September 16th - 27th, 2013. Some supplementary questions were answered by email or telephone in following weeks.

The series of meetings involved:

- academic and academic-related staff in a sample of schools, faculties and departments;
- staff in a sample of colleges;
- staff from key areas in the Unified Administrative Service, including Academic Division, Estate Management, Management Information Services, Planning and Resource Allocation, Registry's Office and Student Registry;
- staff responsible for current University systems;
- student representatives; and
- members of the Teaching Space Utilisation Working Group

The following staff and students generously and willingly contributed to the Review by sharing information and opinions:

Vicky Aldred	Faculty of English
Dr Kirsty Allen	Registry's Office
Arciris Garay Arevalo	School of Clinical Medicine
Craig Belcher	Student Registry, Academic Division
Dr Litsa Biggs	School of Clinical Medicine
Rebecca Burgess	Institute of Continuing Education
Dr Stephen Cowley	Department of Applied Maths and Theoretical Physics
Andrew Cox	Student Systems
Paul Dampier	Management Information Services Division
Silvana Dean	Faculty of Economics
Dr Tim Dickens	Department of Chemistry
Bob Dowling	Online Services. University Computing Service
Ian Du Quesnay	Bursar, Newnham College
Chris Edwards	Management Information Services Division
Dr Malcolm Edwards	Planning and Resource Allocation Office
Professor Sarah Franklin	Department of Sociology
Jenny Green	Records and Examinations, Academic Division
Catherine Hurley	Centre for Research in the Arts, Social Sciences and Humanities
Grahame Jenkins	Estates Management
Richard Jones	President, Cambridge University Graduate Union
Dr Mark Lillicrap	School of Clinical Medicine
Madeline McKerchar	Department of Engineering
John Norman	Cambridge University Library & Centre for Applied Research in Educational Technologies
Flick Osborn	President, Cambridge University Students Union
David Peet	Department of Physics
Hollie Preston	Institute of Continuing Education
Dr Mike Rose	Department of Applied Maths and Theoretical Physics
Dr Fiona Russell	School of the Biological Sciences
Dr Christof Schwiening	Department of Physiology, Development and Neuroscience
Dr Robin Walker	Bursar, Queens College
Tom Walston	Estates Management
Dave Wickett	Estates Management
Professor Steve Young	Senior Pro-Vice Chancellor
Nick Wilson	Planning and Resource Allocation Office

Particular appreciation is expressed to Chris Edwards of MISD who made the necessary practical arrangements for the Review.

Subsequent additional investigations involved:

- developing an appreciation of the potential solutions available to the University, viewing demonstrations of some software with which the reviewer was unfamiliar and reviewing the latest versions of some systems viewed previously;
- identifying the extent to which solutions adopted by other universities might 'translate' to the unique environment of the University; and
- considering the nature of current practices, processes and policy to identify any areas in which improvements might be considered in the immediate, or longer-term, future.

The final outcome of the process is this review report, which documents the process and outcomes of the review, the individuals and companies who contributed or were consulted and addresses the Terms of Reference.

The report reflects a high-level strategic approach to the issues and solutions, and does not attempt to present a comprehensive Business Requirements Specification for a software solution nor a detailed, exhaustive analysis of teaching space utilisation, room booking and resource scheduling at the University.

**NOTE:**

Mosaic Space sells a software product - *RUIS* (Room Utilisation Information System) – which could be part of the solution considered by the University. Every effort has been made to consider and present other alternatives in a neutral manner, however readers of the report should be aware of this potential conflict of interest.



### 3 Summary of Discussions

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The first of the Terms of Reference of the review was:

*Identify the current practices and processes within the University for Room Booking, Space Utilisation Management and Resource Scheduling. This will involve collection of data from various sources and meetings with University staff.*

As anticipated, a wide range of practices, processes and systems were presented by the departments, faculties and central units visited. In addition to what was directly observed, there was considerable reporting on practices and process in other areas of the University from staff who had previously worked in other areas, or had dealings with those areas in relation to room bookings: while such anecdotal reporting is less reliable, there was sufficient consistency in these reports to warrant taking them into consideration when preparing this summary.

The wide variety of approaches means that there is no consistent process or system across the institution for:

- identifying whether a room is in use or booked at any given time,
- requesting the use of a room,
- booking a room, or
- reporting on the overall usage of a room or set of rooms.

Some of the current processes, systems and issues are summarised below; a more-detailed description of the current approaches is presented in Section 6 below.

#### 3.1 Departmental Room Booking

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The rooms managed by a department vary in accordance with the department's size and discipline. Teaching and meeting rooms include lecture theatres, lecture / seminar rooms, tutorial / supervisory / small group / meeting space and specialist space appropriate to the discipline (e.g. experimental laboratories in the natural sciences, clinical spaces in the health sciences, computing facilities).

Rooms are used for timetabled teaching, other teaching activities (e.g. 'one-off' seminars, supervisory sessions), other academic activities (e.g. intra-departmental or inter-departmental seminars, presentations, inter-university events) and academic and administrative meetings. Peak usage of rooms generally occurs during term time, but rooms are used year-round.

Room management is sometimes the duty of an individual, and sometimes shared: most room managers are administrative or technical staff; although some academic staff are involved. Room bookings include timetabled classes, other teaching (e.g. supervisory support), departmental meetings and seminars, and – in some cases – events for other departments (e.g. teaching or meeting 'overflow').

Current departmental room management systems range from hard-copy books and diaries, through *Word* documents and *Excel* spread-sheets, to web-shared calendars (e.g. Google Calendar). Some departments use various SQL databases with a browser-enabled room booking front-end: the one most commonly encountered was *MRBS*, an open source solution using PHP and MySQL, and designed for booking meeting rooms.

The individual staff member's experience of the room booking process depends very much on whether the department's own rooms can fully accommodate all teaching and meeting peak-time requirements. If a department has a mix of room types and room capacities that fit with its student and class numbers, there are generally no room booking problems and a simple system can manage them.

However if rooms need to be found in other departments, a quite complex process may follow, involving a series of phone calls, emails and negotiations. There no single University-wide approach to the use of departmental rooms by other departments or external users - access

issues, safety concerns or utilisation issues can limit the capacity or willingness of departments to share their rooms with others. Further complexity is introduced by the possible need to provide AV or IT support for 'guest' users. Of the various web-based room booking systems, some are open to other departments, some restricted to members of the department, yet others to room managers only.

Underlying the issue of shared use of departmental space are quite valid concerns about locating the teaching of one department in the rooms of another. Apart from concerns about departmental 'identity'; there are also practical issues of security and safety. The significance of departmental space is explored further in Section 6, since consideration of this issue should play a part in the implementation of any central room booking system.

### ***3.2 Centrally Bookable Rooms and Other Rooms***

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Management of the common pool of 103 centrally bookable rooms is the primary responsibility of the Student Registry: during the Academic Terms, all bookings (both teaching and external) are managed by the Student Registry; outside term time, Student Registry ensures that bookings for examinations are maintained in parallel with external commercial demand for the rooms that is managed separately.

Demand for the centrally bookable rooms is unevenly spread across the academic term and the teaching week: the result is that there are overall low levels of room utilisation, while demand exceeds supply during the peak hours of 10:00am to 1:00pm in term time. As a result, allocating rooms for lectures becomes a more complicated, iterative and 'manual' process. Some lectures move to other (departmental) rooms, other lectures are re-scheduled at an earlier or later time – the degree of flexibility varies widely by department and faculty.

In addition to centrally bookable rooms and departmental rooms, a range of other rooms used for both teaching and meetings are situated in and around the University. Meeting and training rooms in University Administrative Offices are managed by a range of varying methods similar to those used in departments. College rooms were generally excluded from the review.

### ***3.3 Aggregation of Room Bookings into a Teaching Timetable***

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In general, the University maintains an overall pattern in the teaching day:

- lectures / large classes in the morning,
- laboratory teaching organised by departments in the afternoons,
- supervisory sessions organised by colleges in the afternoons,
- other student activities (e.g. sport) in the afternoons.

Because of the high levels of demand for certain spaces in peak times, teaching in some subjects runs from Monday to Saturday rather than Monday to Friday.

The preparation of the timetable requires a convoluted and inefficient process, with room bookings recorded on multiple systems, and the duplication of data entry into multiple systems and documents by different staff members. The risks of error make the process more stressful, and the range of timetable publications in multiple formats makes accurate maintenance of changes quite difficult.

### ***3.4 Current Processes and Other Issues***

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It can be argued that – overall – the current room booking processes and systems at the University are disjointed, fragmented, labour intensive and present challenges to more flexible room use and the improvement of space utilisation. At the same time, it must be acknowledged that the arrangements still support the University's research and teaching in a manner sufficient to enable it to maintain its current high standing in global university rankings.

The main points arising from discussions with staff were:

- The current mix of University room types and sizes is almost certainly wrong, but there is insufficient evidence to support better and more informed decisions about the number, type, size and distribution of teaching and meeting rooms across the University.
- University policy and practice contributes to uncertainty over lecture class sizes, and possibly contributes to a general pattern of 'over-booking' (and resulting low seat utilisation numbers). At the other end of the attendance spectrum, when overcrowding of lecture theatres occurs it presents an OH&S risk.
- The provision of supervisions to students is the responsibility of the colleges, and space is made available for some supervisions to take place within colleges. Others are scheduled in departmental space. Changing academic employment patterns – not all staff are members of colleges – and the use of graduate students as supervisors appears to be putting added pressure on supervisory space in departments.
- Other types of room for which demand may be growing are flexible student spaces and flat floor examination spaces, and these may need to be accommodated in planning for new buildings.
- The adoption of an indicative set of 'standard' teaching and meeting room fit-outs (audio-visual, computing, other equipment, etc.) may make the process of finding appropriate rooms much easier.
- Linked to many of the difficulties staff experience when searching for appropriate rooms (for teaching, meetings or events) are other issues:
  - accessible ancillary facilities (e.g. toilets adjoining lecture theatres; a foyer to accommodate students between lectures, or to house catering during out-of-term events);
  - restricted room access resulting from security concerns or safety considerations;
  - a desire to minimise student travel between classes due to safety concerns;
  - access for disabled students and staff.

#### 3.4.1 Risk management

Recently problems were experienced accommodating large lectures, linked to work commencing on refurbishment of the Babbage lecture theatre (that made it unavailable for teaching for 2 years). This raises the issue of how the University might manage if a similar room or set of rooms became unavailable at short notice. The experience of other universities is that use of a single room management system is a vital tool required to reduce the impact of accidents and disasters, natural or otherwise.

## 4 Room Booking System Requirements

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The second of the Terms of Reference of the review was:

*b. Document and map the requirements for a Room Booking solution at a level sufficient to determine if a software solution exists to meet the requirements. Pay particular attention to Usability and Organisational requirements.*

As a starting point, the Teaching Space Utilisation Working Group provided an example of what the group felt were the departments basic room booking requirements, which were:

- Login via Raven (Cambridge Authentication System)*
- Capture room facilities (e.g. projector)*
- Room capacity and available seating plans*
- Manage bookings not made by the Department*
- Assign room managers*
- Room notifications by email*
- Viewable on mobile devices*
- Automatic BST/GMT transfer*
- Local reporting of usage by different criteria*
- Differentiation of available space categories*
- Charging methods*
- Day by Day calendars for personal use and viewed on large displays*

The extensive discussions with members of the University helped clarify and extend some of these requirements, and also identified some additional requirements. These requirements are summarised below, with some discussed in further detail. (Please note that this is not a detailed Requirements Specification).

### 1. General Principles:

- 1.1. The system should support the culture and ethos of the University, permitting the variety of organisations and units that comprise the University to exercise independence and autonomy in control of their teaching and meeting rooms while also enabling the cooperative and shared use of facilities when desired.
- 1.2. The software supplier should have a university user base of sufficient size to ensure ongoing development of the software, and users should report satisfaction with the software operation and fitness for purpose.

The federal and democratic nature of the University means that all members may, have an opinion on any system selected: it is reasonable to expect that no single software solution will be unanimously regarded as “the best”, and the challenge of software implementation will be to persuade departments to adopt the new software.

One participant in discussions commented that *the software is not the problem requiring a solution – our structures and processes are*. The ‘right’ software will permit structures to continue to operate as required, but will also encourage changes in process to be adopted so that improved outcomes including, but not limited to, the improved efficiency of operations and room utilisation may be achieved.

A ‘test’ of whether a software solution satisfies this general principle might be its prior adoption by other universities in and outside the UK that are similar to the University.

### 2. Robust and Secure

- 2.1. The system should use a database design that facilitates data security, data backup and quick recovery.
- 2.2. The system should be secure, with a capacity to permit user authentication options including:
  - 2.2.1. secure login using the University’s IT Authentication System (Raven),
  - 2.2.2. secure login through the University’s LDAP authentication system.

- 2.3. The system should permit an additional level of user access permissions to be derived from the University's directory and identity management system (Lookup).

One of the potential 'holes' in the successful operation of any room booking system that restricts access to rooms on the basis of user status is the quality of the University's data in relation to how members of the University 'fit' within the component parts of the organisation. *Lookup* contains data on staff members, students and others: student details are exported from CAMSIS, staff details from the HR system are based on payroll, other details for visiting academics and adjuncts are loaded from information supplied by departments. The data has become more accurate since the system began to 'drive' the telephone directory, but additional data cleansing may be required.

Completion of the current project to build a robust University-wide LDAP may cause these requirements to be varied.

### 3. Comprehensive and Flexible

- 3.1. The system should be able to store records about rooms. Each will have a unique ID, and other room data may include:
  - 3.1.1. Location attributes (precinct, building, floor level),
  - 3.1.2. Room Management (central, departmental, charging regime, etc.),
  - 3.1.3. Room capacity and area,
  - 3.1.4. Room Type or Layout (theatre, computer lab, flat floor, flexible, etc.),
  - 3.1.5. Room Attributes – configurable, to include such values as:
    - 3.1.5.1. Audio-visual facilities (projectors, screens, video capture, etc.),
    - 3.1.5.2. IT services (computer type, networking, etc.),
    - 3.1.5.3. Teaching support (boards, other fixed equipment, etc.),
    - 3.1.5.4. Fit-out (seating type, lighting, etc.),
    - 3.1.5.5. Catering arrangements,
  - 3.1.6. Room images (photo(s), layout plan(s), way-finding information, etc.).
- 3.2. The system should have the capacity to represent 'flexible' spaces (e.g. one large room with an operable wall can also be 2 small rooms; one room can be one room type for part of the year, and another room type at another part of the year; one room can have multiple furniture layouts with varying capacities).
- 3.3. The system should be able to record free form text about a room, so that additional information to potential users can be displayed (e.g. "room close to building entrance: noisy at lunch times").
- 3.4. Users should be able to search for rooms based on the values in these fields.
- 3.5. Users should be able to search for rooms that meet a certain criteria or search for such rooms that are free at a particular time (.i.e. "search for room" and "search for time").

Synchronisation with MICAD data, so that room booking information can be linked to space data, would be an implementation and maintenance task. Estate Management is working on room codes and other room data at present: the existing coding scheme does not adequately represent the range of space types and room uses in the University.

Another key attribute required for room searches includes 'geographic' information. For room booking purposes, this cannot normally be extracted from a GIS. For example: two teaching rooms can be at opposite ends of the same building, so the nearest room to one may be in an adjacent building; two rooms could be located on opposite sides of the same laneway, but the only access points could be separated by a much greater distance.

### 4. Useable and Flexible

- 4.1. User access to the system should permit both simplified access for ad hoc room booking tasks, and more extensive access for 'power' / high-volume users to records events requiring additional information.
  - 4.1.1. Simplified access should be accessible via a web-browser.
  - 4.1.2. Simplified access screens should be intuitive and require no training to use, although online 'help screens' should be available if required.

- 4.1.3. Simplified access should be accessible via mobile devices (possibly including smart phones).
- 4.1.4. More extensive access screens may require access via an installed desktop client application; web browser-based access is preferred.

*In relation to viewing room booking systems on mobile devices:*

The capacity to view and use a web page on a mobile device can depend on the complexity of the web page. For room booking systems, there is always a tension between configuring them to provide a large number of options to the user (search by multiple attributes, display comprehensive room information, record complex room booking patterns) and configuring them for clean and easy-to-use screens. Most are easily translatable on to mobile tablet devices, the smartphone version can be difficult to use – screen size limitations can demand a large number of screens to replace a single complex screen. This is equally true whether using a web-page or a mobile app: the ratios between screen size and finger size (for data entry) present key challenges.

Discussions raised the question: *How important is it that the room booking system uses the university style design?* Most suppliers have pages that can easily incorporate a client logo, however the university web-style may not be compatible with a complex room booking screen.

## **5. Bookings Management, Room Management and Workflow**

- 5.1. The system should have the capacity to record events of the sort that normally occur at a university. These include:
  - 5.1.1. Events that recur on multiple days of the week,
  - 5.1.2. Events that recur on multiple weeks of the year,
  - 5.1.3. Events of different durations,
  - 5.1.4. Events of different types, where the type is selectable from a defined list.
- 5.2. Users should have the capacity to export details of their booking(s) in a format suitable for loading into a personal calendar.
- 5.3. The system should be able to record bookings of different status, with the capacity to distinguish between confirmed bookings and booking requests.
- 5.4. The system should have the capacity to record, and link to a booking as required, information about the teaching program (paper or subject, class type, etc.) for which the booking is made.
- 5.5. The process of permitting, accepting or rejecting 'double-bookings' in a room is configurable at system level, and possibly at individual room level.
- 5.6. The process of room management can be configured on the basis of each individual room.
  - 5.6.1. The ability of a user to see an individual room (or bookings in the room) should be configurable based on the individual user, and the department managing the room.
  - 5.6.2. The ability of a user to make bookings of a particular status in individual rooms should be configurable based on the individual user, and the department managing the room.
  - 5.6.3. Responsibility for approving booking requests for a particular room can be assigned to one or more users. The process of room booking management is supported by:
    - 5.6.3.1. An email-based workflow management system,
    - 5.6.3.2. Email confirmation of room bookings to both 'clients' (booking owner) and 'room managers',
    - 5.6.3.3. Records of unapproved and/or cancelled bookings are retained.

A key requirement of any University-wide system is the capacity for the system to support the devolved management and control of the use of individual rooms. This is a basic system attribute that is necessary for departments that currently have internal room booking systems – however rudimentary – that already provide such independence and autonomy.

Significant aspects of such management and control are the ability to determine if:

- a room is displayed to users outside the department,
- a room can be found by a room search by users outside the department,
- users outside the department can book the room, or merely request a booking in the room.

Arrangements regarding departmental control of some local rooms at the University can also be found at other universities. Accordingly, most of the systems designed for university use take account of this factor, and provide configuration arrangements that enable multiple individuals to be assigned room management responsibilities on an individual room basis.

Whether such control settings are updated at a local level, or set at a central point on the advice of departments, is less critical. However in addition to the functionality being present in the software it should be supported by formal policy.

## 6. Charging for and Reporting on Bookings

- 6.1. The system can record whether a booking is made on a 'free' or 'chargeable' basis.
  - 6.1.1. The process of room charging permits a recording of multiple charging and discount regimes and rates.
  - 6.1.2. Additional charges may be made based on the provision of additional services, details of which must be recorded against the booking.
  - 6.1.3. Details of chargeable bookings can be exported with applicable charges for processing in a finance system.
  - 6.1.4. Chargeable bookings can be invoiced directly from the application.
- 6.2. The system can provide a range of pre-configured reports to export, in print or spreadsheet-readable format, details of room bookings.
  - 6.2.1. The selection of room(s), booking(s), week, day and/or time period(s) for reports can be user-determined.
- 6.3. Users can set up additional reports, or configure existing reports, as required.

The process of processing room charging within a room booking system may not be as easily implemented as might first be imagined. The wide variety of variables that have an impact on the fee to be charged include:

- charging schema and rate levels differing between departments,
- charges and rate levels varying between hours of the day, days of the week and weeks of the year,
- individual bookings 'crossing over' boundaries between two charging schema
- great variation in the mix of additional services required, and the need to specify the details of those to justify different charges (how many hot or cold drinks per head, what sort of food will be supplied, etc.)

The systems that best support such complex charging regimes are event management systems, designed primarily to meet the needs of commercial hire venues and less likely to fulfil other system requirements. Even many of them might struggle to handle the wide variation in charging regimes and methodologies used in the University. When selecting a room booking system, this element of the specification should probably be treated as a 'would be nice to have' element rather than as an 'absolutely essential' function of the system.

## 7. Reporting Room Use and Room Utilisation

- 7.1. The system can provide user-configurable browser or screen-presentation reports to display a summary of room bookings (in one or a group of rooms) suitable for large-screen display in foyers or corridors outside the room(s).
  - 7.1.1. The selection of room(s) and week, day and/or time period(s) for display can be user-determined.
- 7.2. The system can provide user-configurable reports or exports for use as hard-copy room diaries.
- 7.3. The system can report and analyse room utilisation, with reports user-configured and filtered by a range of elements.

- 7.3.1. The utilisation reports generated can meet the requirements of the University's HESA Utilisation reporting requirements.
- 7.3.2. The utilisation reports provide an analysis of room utilisation that can contribute to space planning projects.

## **8. Interfacing with other systems**

- 8.1. The system provides an application programming interface (API) that facilitates integration and/or synchronisation with the University's existing systems including those used for timetable reporting, space management, and the promotion of public events.

One element of the original 'example' basic room booking requirements is "automatic BST/GMT transfer". This attribute of events, which allows the event to 'move' in time according to the time zone of the individual is almost exclusively associated with personal calendaring systems. The room booking systems which the University will be considering assume that rooms won't be shifting between time zones, and that events will not change time when summer time begins or ends – i.e. a 9:00 lecture remains a 9:00 lecture, summer or winter notwithstanding.



## 5 Potential Software Solutions

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The fifth of the Terms of Reference of the review was:

e. Identify currently available software solutions and match them to the requirements. Propose the most fit for purpose solution (if one exists) for the University.

### 5.1 Current MICAD System

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Management of room bookings in the centrally bookable rooms is the primary application of the system currently maintained by Estate Management. The current *MICAD* system has been purchased to fulfil the University's requirements for a CAD-based space management database system.

The room booking system is an 'add-on' module linked to the University space database: currently the process of moving the system from *Planon* to *MICAD* is nearly complete. Because of the tight coupling between the space database and CAD building and room drawings, such a move is non-trivial: once complete, *MICAD*'s Room Utilisation Module (RUM) will be managing the bookings for the centrally bookable rooms. Because the system has a web front-end, it can be rolled out to enable any member of the University to request any bookable room - requests still need approval from the room manager.

Estate Management is of the view that, although they supplied the *MICAD* RUM as a service to replace the pre-existing *Planon* system for existing University users, they are not committed to retaining the system. For the primary functions of Estate Management, development of the core *MICAD* system is the primary goal.

Although the system has been well-implemented, and is an improvement on the earlier *Planon* system, there are a number of concerns in relation to extending *MICAD* to become the primary room booking solution for the University.

#### Strategic Concern

A particular issue of concern is that RUM, the room booking module of *MICAD*, is used by a relatively small number of *MICAD* clients. At present the University of Cambridge is the only university making use of the module; and other users are largely concentrated in the healthcare sector. The development and maintenance of commercial computer software is strongly influenced by the needs of the main clients – this means that the university may be in a relatively weak position when its priorities for software development are assessed against the needs of other *MICAD* clients.

The extent to which the needs of the University will be different and distinct from those of a health service provider is uncertain, but there is a distinct risk that the software might be modified in ways that don't meet the university's needs. Strategically, maintenance of the *MICAD* Room Utilisation Module does not make sense unless a number of other universities start to use the module; with the number of other software options available to them at the present time, this is unlikely.

#### Structural Design Issue

There is an issue related to the difference between the primary function of a space database (such as *MICAD*) and the primary function of a room booking system.

It is, of course, important that there is "alignment" of the information about teaching rooms held in a University's space database with that held in the University's room booking system. Elements in common should include the coding scheme and individual room numbers, room names, the department tasked with responsibility for the management of the space and information about some room attributes including the maximum capacity of a room (consistent with public safety and access requirements). However in normal circumstances it is best that a room booking system is able to accommodate room data in a much more flexible manner than a space database does, or is designed to support.

Put simply, the space database is designed to be an inventory of an organisation's buildings and rooms, linked to CAD drawings of all buildings, that enable the management of the estate and the preparation of accurate reports on its state. Reports can be generated for a number of different purposes, and from a range of perspectives, and the accuracy of the data in relation to the drawings can be critical where building plans are involved.

When rooms are refurbished, the process of keeping room data in a CAD-based system up-to-date is understandably more laborious than the process of updating a comparable room booking system. The space database update may require loading CAD plans for the entire building, or at least the entire floor, as well as possibly revisiting the data on individual rooms so that the plans accurately represent the changes that have occurred. By contrast, the process of changing rooms on a room booking system (not linked to CAD plans) is much simpler and can be completed quickly and easily. This means that the non-CAD system is much more flexible and responsive to the needs of a changing institution.

Further, other data elements on the two types of systems may be related, but do not – and may never - match exactly. For example:

- the range of room types or room usage types normally used on university space systems is generally far more complex than is required for the purposes of room booking;
- the set of room attributes maintained on a space database does not necessarily match with those used to inform the processes of room searching and room allocation on a room booking system.

Finally, it may be necessary to represent multiple instances of a room on a room booking system when only one instance of the room can be recorded on the space database at any one time. For example:

*The decision has been taken to convert a general purpose 35-seat classroom to a 20-seat computer laboratory. The room will need to be used as a classroom during Michaelmas Term. Refurbishment will start at the end of term, and will be complete just in time for the beginning of Lent Term.*

*On the space database, the room will remain "a classroom" until several weeks into Lent Term, when "as built" CAD plans are delivered to the University by the contractor.*

*On the room booking system, there will be two "rooms" – a 35-seat classroom (available for Michaelmas, unavailable afterwards) and a 20 seat computer lab (not available until Lent Term). This means that during summer, when the timetable is being prepared, system users searching for classrooms can locate the instance of the room available in Michaelmas while others searching for computer labs will find the other instance of the room.*

### **Other Issues**

Several other issues were also raised in relation to MICAD:

- The software currently lacks the capacity to configure user access room control at departmental level,
- The web interface only works properly on one browser version (*Internet Explorer*),
- Because the software is built on the space database, it displays entire floors from building plans: while these may assist way-finding, they also expose the location of 'sensitive' rooms to all users.

Because of this range of issues, although the MICAD RUM meets the University's present needs for the management of centrally bookable rooms, and may even be required to expand to cover additional departmental rooms in the near future, it is not recommended as the long-term solution for room booking software.

## 5.2 Types of Room Booking Systems

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There are a number of room booking systems available – both commercial and ‘free-to-use’. These can general be grouped into the categories discussed below.

### 5.2.1 Calendaring (and Meeting Scheduling) Systems

The development of networked calendaring systems was originally driven by the need of large organisations to provide staff with shared diaries and the ability to more easily schedule meetings. Software such as *Lotus Notes*, *Microsoft Exchange / Microsoft Outlook* and *Novell GroupWise* were the original leading commercial products. Later developments included *iCal*, *Mozilla Sunbird* and *Google Calendar*.

The use of an individual calendar to represent the diary of a shared resource (departmental vehicle, meeting room, etc.) was a logical development – the meeting scheduling capacity of the systems could then not only find a free time in the diaries of a group of people, but also a free time in a room where the meeting could be held. The widespread use of such systems supported the development of web interfaces and mobile applications, so that individuals could access their diary while away from the office.

Some departments use a calendaring system such as *Google Calendar* to record departmental room bookings. *MRBS*, the room booking system used in a number of departments, is an open source code / PHP / MySQL development that was initially based on the software code for the calendaring system *WebCalendar*. Much of the code has changed, but the root calendaring nature of the application is apparent.

Calendaring-based systems have clear advantages from the perspective of ease of-use, and a number support the required authentication method(s). What is generally lacking is complex searching, workflow-related capacity, department-based authentication, presentation of room images, filtered reporting and data export, since these were never part of the requirements for the maintenance of the personal diaries of individual people.

### Commissioned (MRBS-based) System Development

During discussions, a number of staff suggested that *the University should build its own system*, and some suggested that *MRBS*, with its open source code, could form the basis of such a development.

While that idea may be appealing, particularly to the many staff who enjoy programming, it is not a recommended path. The best of the commercial room booking systems currently available have benefited from years of development based on feedback from past users, and have features that the University may not see an immediate use for but may well meet future requirements. An in-house development would require on-going programming support, and the real annualised system cost is unlikely to be less than the cost of commercial software.

### 5.2.2 Access Control Systems

Access control systems have grown out of the requirements of large organisations to provide shared and flexible staff workspaces that are also secure and efficiently utilised. They are most often used to manage office meeting rooms as well as ‘hot-desk’-equipped open plan offices.

Access is often controlled by smart / swipe / proximity card reader readers, with cards issued to an individual member of the organisation; access may be restricted based on the role and organisational unit of the individual. The system is used not only for booking the space, but also for monitoring such use. Frequently touchscreen panels at each room, display the room diary and also permit on-site booking when the room is free, or if a room hasn’t been occupied within the first 10 to 15 minutes of a booking.

One of the systems with the largest user base is *Condeco*, which is in use at MediaCity UK including in the University of Salford's teaching space there.

Because of its utilisation analysis module, *Condeco* is of particular interest. *Condeco Sense* uses Wi-Fi enabled infrared sensors, which can be placed under every desk, to provide real-time feedback of space occupancy. The web-enabled reporting system is good, with user control of filters and report settings. However the weakness of the system in relation to the University's requirements are its orientation towards meeting rooms and desk spaces and limitations on the use of room attributes (apart from site, building and size) to find rooms.

### 5.2.3 Events Management (and Property Management) Systems

Systems developed for events management purposes have a room booking function which is ancillary to a range of other functions associated with the organisation of an event.

The other functions include customer relationship management, management of audio-visual and catering facilities, temporary staffing, room setup and pull-down, etc. Room information frequently includes records of the room layout for a range of meeting room styles and uses. The finance module will include the capacity to handle a very wide range of charging schema and rates, all linked to room, equipment and staff hours. Conference management functionality may include delegate registration, accommodation and tours management, etc. A web interface will generally provide a delegate registration function. A module to manage student accommodation generally forms part of the products marketed to universities.

Unsurprisingly, it is this sort of system that is currently used by many of the University colleges. Kinetic Solutions currently licence their *Kx* software to 10 of the colleges (all use *Kx Conferencing*, 4 also use *Kx Student*). Other Cambridge users of *Kx* are the University Centre, Cambridge University Press and the Møller Centre.

A related group of software products – generally described as Property Management Systems – are oriented towards the accommodation-booking needs of hotels and B&Bs, with some specifically developed for the needs of student accommodation management.

The primary focus of all these systems is the task of managing a venue that is used for external hire, and managing the sometimes complex events that take place in the venue.

### 5.2.4 University (and School) Room Optimisation Systems

A number of commercial software products have been developed to address the room booking needs of universities. Some are relatively basic room booking solutions. Others – mostly North American products – provide both manual and automated room allocation processes, designed not only to optimise space utilisation but also to ensure that the most popular classes are guaranteed the larger rooms. Yet others provide algorithm-based timetabling solutions in addition to more basic room booking functions.

Several attributes distinguish the university-market software from the other types of booking solutions described above, including:

- The capacity for the system to allocate, or the user to search for, rooms taking into account a wider range of types and attributes,
- Recording of meeting patterns that reflect the sort of patterns within days and weeks that is a feature of most university teaching,
- The presence of a second structure of academic programs and subjects that allow the room bookings to be linked to the structure of teaching delivered in a university,
- The capacity to record bookings as 'classes', to link teaching or supervisory staff to a room booking, to link equipment requirements to room bookings, etc.,
- The capacity to identify clashes not only of room bookings but also of teaching staff and either student cohorts or individual students in programs and subjects,

- The requirement to allow distributed resource management by departments.

Not all of these attributes are what the university requires at present, but it is highly likely that the University and some departments will find that the capacity of a system that ‘understands’ university teaching will provide additional benefits beyond simple room booking.

All the leading software products in this market offer both a desktop client / server solution, and have also added web and mobile interfaces which provide simpler interfaces for a sub-set of product functions: particularly *ad hoc* room booking, teaching bookings, and timetable display.

None neatly match all the requirements the University has expressed during the recent discussions, but the review process has identified five options below that should satisfy most of the University’s needs. With the establishment of appropriate processes and possibly additional interfaces or customisations during implementation the licencing of any of these would be preferable to commencing in-house implementation of a software solution.

Members of the University have clearly expressed unhappiness with the idea of implementing a timetable system: there is a view that to do so would be to forgo departmental independence to some degree. The same applies to a system that runs automated room allocation. There is a practical problem with ignoring such systems, since they also deliver the best room booking systems that meet the University’s requirements. However there is no need to implement any automated scheduling and allocation functionality in a software package – many universities have purchased such systems and then run them as advanced room booking solutions for decades.

### **5.3 Software Systems Considered and Reviewed**

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In order to provide advice on which software system might be most appropriate for the University’s room booking system, a number of available systems were reviewed. In some cases, demonstrations of new or existing components were arranged.

From over 200 possible systems identified – of various types – most were immediately ruled out, and 40 were briefly considered before being ruled out. Further information was collected on 21 systems. Of those, some were already known to the reviewer and some had been used directly; demonstrations were arranged from 7 of the most likely software providers. Of those, two were ruled out, leaving five potential suppliers.

The demonstrations were not of the entire system available, but of key aspects of the room booking solution relevant to the University’s current requirements. Some of the software demonstrations included *beta* versions of software scheduled for release prior to December: all of the *beta* versions appeared to be mature and fully-functional.

A full list of the final systems considered, and the method of review, is attached as Appendix 3.

### **5.4 The ‘Top Five’ Systems**

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From the commercial software products available, five potential solutions that would be most likely to satisfy the University’s room booking requirements have been identified. Each of the five software systems has:

- a Windows desktop application with back-end database server, permitting multiple simultaneous users;
- a browser-based module that can be used for room bookings, and is largely intuitive (with the capacity to use online resources to support users wanting to undertake complex booking processes, and with the capacity for ‘branding’ the browser with the University logo);
- the capacity to be used as a manually-controlled room booking system, despite also having the capacity to allocate resources using an automated process if required;
- a range of university clients,
- continuous software development to better meet the needs of those clients;

- the capacity to assign the management of individual rooms to departments, so that local resource management by one or more room administrators is supported;
- a workflow process to manage room booking requests.

Although the systems reflect a range of different approaches to the automation process, this issue has not been considered in relation to the identification of the possible solution.

Not all systems offer a mobile-specific interface but, as discussed above under system requirement #4, this may not be such a significant requirement.

All the companies have expressed willingness to customise the authentication and role management interfaces to meet the University's requirements, but this may involve additional costs which vary between suppliers.

The systems are listed below in alphabetical order, rather than in any priority order. Where there are particular issues or strengths in relation to the requirement specifications, they are flagged against the general requirement heading.

#### 5.4.1 CELCAT Roombooker Live / CELCAT

CELCAT (Corbett Engineering Limited) released the first version of their software in 1989. More recently, CELCAT introduced *CELCAT Timetabler Live*, which is the browser-based interface to the core product. *CELCAT Roombooker Live* is being released at the end of November 2013, but the company is currently able to demonstrate a *beta* version. To satisfy its requirements, the University would need to implement *Roombooker*, *Timetabler Live* and *Timetabler*.

A range of other modules are also available to provide timetable publication, and calendar output for staff and students. Other functions such as attendance recording, automated scheduling, staff pay claims and automated scheduling are available but not of current interest.

In relation to the requirement specifications in Section 4:

##### *General Principles*

The software supports multiple users and distributed room management, while facilitating cooperative use when required.

The product is licenced by ~400 institutions in 30 countries. Although many of the software users are FE colleges or university faculties rather than entire institutions, there are a significant number of universities with the product. In assessing reference sites, it would be vital to ensure that only users of current or recent versions are approached, since some users have kept using early, though outdated, versions that met their more-limited requirements.

##### *Robust and Secure*

The software doesn't have a Shibboleth authentication module, although the LDAP solution may be sufficient depending on developments at the University.

##### *Comprehensive and Flexible*

The *Roombooker Live* room usage screen provides an overview to assist room administrators in the selection of rooms for events.

*Roombooker Live* enables a range of options for searching for rooms by multiple criteria

##### *Useable and Flexible*

Most room management functions can be managed entirely within the browser interface *Roombooker Live*, meaning that use of the Windows client is largely restricted to system administration use.

There is no mobile-specific version: the web-based version works fine on a tablet but no smart-phone version has been developed yet.

*Bookings Management, Room Management and Workflow*

*Roombooker* provides an easy-to-use process to book a multi-week event into different rooms in different weeks if one single room is not available in all weeks.

Granular access permissions can be assigned on a role and individual staff basis.

Bookings can be easily exported to personal calendars.

A range of reports are available in the system for operational reporting.

*Charging for and Reporting on Bookings*

CELCAAT has a more complex and complete charging module than the other available software products.

*Reporting Room Use and Room Utilisation*

CELCAAT uses *RUIS* (Room Utilisation Information System) for utilisation reporting and analysis.

*Interfacing with other systems*

Current systems with which CELCAAT can interface include *KxConferencing*.

#### 5.4.2 CMISGo Rooms / Facility CMIS

The origin of *Facility CMIS* was in an administrative system designed for both school and university use. By the early 2000's, software development was compromised by the conflicting requirements of both schools and university / FE users. A 'split' into two separate products: *Progresso* for schools, and *CMIS* for universities / FE, and ongoing software development occurring after purchase of the company by Advanced Computer Software Group, has resulted in significant product improvements and new developments.

A new API built in 2011 / 2012 led to a growing group of new modules – including browser and mobile solutions – appearing from early 2013. Branded *CMISGo*, a group of web, SMS, Mobile and *Microsoft Live* interfaces for student and staff system access have been delivered. *CMISGo Rooms* is being released shortly, and the company is currently able to demonstrate a *beta* version.

In relation to the Requirement Specifications in Section 4:

*General Principles*

The software supports multiple users and distributed room management, while facilitating cooperative use when required.

The software is used mainly in the UK, with ~40 client institutions. The company won the most-recent UK university tender for timetabling software.

*Robust and Secure*

While the database is well-structured, some data objects are 'configurable', which means that some users store data at different 'levels' within the database structure. The issue only became a 'problem' when *CMISGo* was delivered, and a set of 'standard' data element locations is being identified: this should not be a problem for new purchasers.

Modules to support all authentication requirements are available.

<i>Comprehensive and Flexible</i>	<p>There is extensive configurability of room access and event booking constraints (e.g. maximum hours or weeks that a user can book) on a role and individual staff basis.</p> <p>The room searching process permits both 'search by time' and 'search by room'.</p>
<i>Useable and Flexible</i>	<p><i>CMISGo Rooms</i> has a clean 'look and feel' using 'tabs' and a room booking 'wizard' to guide users through the process.</p> <p>Other portal properties (e.g. terminology) are easily configurable.</p> <p>It also has a web styling for mobile devices, and is smart-phone enabled.</p>
<i>Bookings Management, Room Management and Workflow</i>	<p>Currently <i>CMISGo Rooms</i> has no controls over who can view rooms, but this could be a future modification. Apart from this, controls in relation to booking / request rights are easily configurable using the web interface.</p> <p>In many other ways, <i>CMISGo</i> is one of the solutions that best addresses this requirement.</p>
<i>Charging for and Reporting on Bookings</i>	<p>Room charges can be recorded. The solution provided is relatively basic.</p>
<i>Reporting Room Use and Room Utilisation</i>	<p>A range of reports are available in the system for operational reporting.</p> <p><i>CMIS</i> uses <i>RUIS</i> (Room Utilisation Information System) for utilisation reporting and analysis.</p>
<i>Interfacing with other systems</i>	<p>In the past <i>CMIS</i> had no proper API, and interfaces with other systems were not well-developed. Recent development of an API has resulted in the rapid in-house development of <i>CMISGo</i>, a group of web, SMS, Mobile and <i>Microsoft Live</i> interfaces. The company is encouraging client to develop and share additional modules using the API.</p>

### 5.4.3 Optime Portal / EventMAP

*EventMAP* is the most recently created, and possibly the most rapidly changing, of the university room booking products. Although the software currently has a small user base, the links retained to university research groups mean that the company's scheduling and optimisation algorithms are more 'up-to-date' than those of some competitors.

Possibly the biggest potential drawback of the solution is that the small company is supporting a wide range of software and consulting solutions.

In relation to the Requirement Specifications in Section 4:

<i>General Principles</i>	<p>The software supports multiple users and distributed room management, while facilitating cooperative use when required.</p> <p>The company's software grew out of cooperation between departments at Queen's University and the University of Nottingham, and still retains close links to research groups at the two universities.</p>
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The company's standing as a new entry in the market means that their user base is not as large as the others listed here.

The smaller user base means that the University could have a greater role in driving the product direction. At the same time, the smaller user base could potentially result in less user-feedback driving software development.

*Robust and Secure*

The system does not yet support Shibboleth authentication, although the LDAP solution may be sufficient depending on developments at the University.

*Comprehensive and Flexible*

Some University search requirements (e.g. by equipment criteria) have not yet been added to the portal.

The room searching process permits both 'search by time' and 'search by room'.

*Useable and Flexible*

The system delivers a pleasant 'look and feel' with its web interface.

No mobile-specific browser access has yet been developed.

*Bookings Management, Room Management and Workflow*

Roles-based user permissions, and other portal properties, are easily configurable.

A range of reports are available in the system for operational reporting.

Recording complex event repeat patterns is easier than with other solutions.

*Charging for and Reporting on Bookings*

Management of room charging has not yet been added to the portal.

*Reporting Room Use and Room Utilisation*

A good utilisation reporting and analysis module can be included in the core system. In addition, the company provides additional software and consulting services (REMAP) oriented towards university planning.

*Interfacing with other systems*

The company can deliver customised interfaces to a range of other systems.

#### 5.4.4 25Live / Resource 25 / X25

CollegeNET, with the *Series25* suite of products for university classroom management, is a market-leading software supplier in North America. Most UK universities would not consider using the software because they are specifically looking for timetabling automation capacity: because the University merely requires a room booking functionality, the software is of greater interest.

In relation to the Requirement Specifications in Section 4:

*General Principles*

The software supports multiple users and distributed room management, while facilitating cooperative use when required.

With over 1,000 users worldwide, this software has the largest user base. Operating for 35 years, the company is able to deliver a comprehensive set of user-responsive modules. At the same time,

there are currently no UK users of the software, which might have implications for support and localisation. The US / North American cultural orientation of the software may present a risk of inherent assumptions about university operations affecting the software processes in an unanticipated manner.

<i>Robust and Secure</i>	High levels of security (due partly to the integration of an eCommerce facility, which was not considered in this review) with data object level security; the software supports both Shibboleth and LDAP authentication.
<i>Comprehensive and Flexible</i>	<p>The system can be configured in a range of ways, permitting customisable search settings.</p> <p>The room searching process permits both 'search by time' and 'search by room'</p>
<i>Useable and Flexible</i>	<p>The browser screen is user-configurable.</p> <p>Many of the web pages are quite 'busy', sacrificing clarity in order to present comprehensive information: this reduces the capacity of use by mobile devices, although large tablets could access the system.</p>
<i>Bookings Management, Room Management and Workflow</i>	<p>User permissions determine who can view, request and/or book individual rooms.</p> <p>A range of reports are available in the system for operational reporting.</p>
<i>Charging for and Reporting on Bookings</i>	The charging function is well-designed, permitting a range of ancillary services to be charged in addition to room charges. (The company can provide an e-Commerce solution to facilitate the charging process).
<i>Reporting Room Use and Room Utilisation</i>	The utilisation reporting and analysis module is probably the most complete available, although some elements of the report are dependent on extensive data being loaded in advance from other systems (such as <i>PeopleSoft</i> ).
<i>Interfacing with other systems</i>	A wide range of established interfaces are available, but most relate to US software solutions.

#### 5.4.5 Web Room Booker / Scientia Enterprise (Syllabus Plus)

Scientia is a Cambridge-based software company which has been licencing its *Syllabus Plus* timetabling software to universities since 1990. It is widely used internationally, with a proactive user base, which has resulted in system developments designed to meet the differing needs of higher education institutions operating in various countries and cultures.

The University currently uses *Syllabus Plus Exam Scheduler* in its exam management process.

In relation to the Requirement Specifications in Section 4:

<i>General Principles</i>	<p>The software supports multiple users and distributed room management, while facilitating cooperative use when required.</p> <p>The software is currently the most widely-used web room booking</p>
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system in the UK, with 130 institutions world-wide.

*Robust and Secure*

The software originated as a 'standalone' desktop product which – as a 'fat client' – still forms part of the software solution; as a result, the original database was a transactional system, rather than a standard design: as the system grew, this caused significant problems. The system architecture is continuing to grow and change, but remains quite complex and 'non-standard': a solution is anticipated within the next three years. In the meantime, the system works, but requires more configuration and 'care' than other solutions.

Existing 'plug-ins' to permit all authentication requirements are available.

*Comprehensive and Flexible*

The system can be configured in a range of ways, permitting customisable search settings.

The room searching process permits 'search by time', but 'search by room' is not yet enabled.

*Useable and Flexible*

While the web client permits all types of bookings and requests to be made, confirmations of room booking requests can only be approved by use of the Windows desktop application (all other solutions permit management of this process through the web client).

A web styling for mobile devices, and is smart-phone enabled

*Bookings Management, Room Management and Workflow*

Like other solutions, the system has role-based allocation of user 'rights', including some capacity to limit the view of individual rooms.

User rights and access management requires use of the core system, and can be quite complex.

A wide range of reports are available in the system for operational reporting.

*Charging for and Reporting on Bookings*

Room charges can be recorded. The solution provided is relatively basic.

*Reporting Room Use and Room Utilisation*

The software has a small set of utilisation reports as part of its Scientia Enterprise reporting module, and is gradually adding additional reports.

A small number of Scientia clients also use *RUIS* (Room Utilisation Information System) for utilisation reporting and analysis.

*Interfacing with other systems*

Current systems with which Syllabus Plus can interface include *KxConferencing*.

*SPDA* (Syllabus Plus Data Adapter) is a separate module that facilitates database-to-database data transfer.

A COM object model has been constructed, but there are some peculiarities with the model design linked to the core system architecture logic.

## 5.5 Utilisation Data and Room Utilisation Systems

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### NOTE:

*Mosaic Space sells a software product - RUIS (Room Utilisation Information System) – which could be part of the solution considered by the University. Every effort has been made to consider and present other alternatives in a neutral manner, however readers of the report should be aware of this potential conflict of interest.*

The third and fourth of the Terms of Reference of the review were:

- c. *Understand how a Room Booking solution would need to be extensible to undertake Space Utilisation Management and Resource Scheduling.*
- d. *Advise on the best use of the data collected by usage monitors in conjunction with any software solution.*

These are discussed at this point because, although space utilisation is a key driver of the project, the approach to reporting and analysing utilisation data varies between the solutions and this relates to a software product that is provided by Mosaic Space.

Two of the five solutions provide in-built room utilisation reporting and analysis:

- X25 from Collegenet is the best available, but is reliant on the data contained in Series25.
- EventMAP currently contains a utilisation reporting tool within the core software product, and this could be ported to Optime Portal at little or no cost.

Both systems permit easy on-screen user-customisation of report filters.

*Scientia Enterprise* provides a number of utilisation reports from its reporting database. Additional reports can be produced, and / or customised, but this requires the contribution of specialist skills.

A fourth solution is provided in *RUIS* from Mosaic Space. This software product has been designed to import and analyse data not only from room booking software but also from classroom surveys, attendance monitoring systems, student information systems and – potentially – people counting systems. Two of the five suppliers (Advanced Learning and CELCAT) recommend it as the utilisation system for their users. *Syllabus Plus* institutions are currently the largest group of users, but it is also used by universities using *Infosilem*, *Student One* and in-house student and timetable management systems. Dedicated Data Translation Interfaces (DTIs) have been built for three software products, and a DTI for loading 'people counter' data would be constructed should the University decide to acquire the software.

*RUIS* is server-based software with a browser interface. It is primarily designed for use by university-wide space planners and classroom managers: because most institutions have only 1 – 4 staff requiring RUIS access, and the data is not particularly sensitive, the username / password security is basic.

### 5.5.1 The Use of Room Utilisation Data

The University is required to report statistics on the utilisation of teaching space to HESA (Higher Education Statistics Agency) and has, in the past, employed the traditional method of classroom surveys to collect this data. The sample of teaching rooms has been the centrally bookable rooms. Currently a program is under way to install 'people counters' in 23 of these rooms and, should this trial be successful, use of counters could be extended to the remainder of the centrally bookable rooms.

At present, no University funding is directly attached to the statistics of classroom utilisation. However HEFCE has flagged that institutions seeking capital grants will in future be required to demonstrate a commitment to improving space utilisation.

For many universities, data on room bookings is used to enhance the picture presented by classroom surveys. Once the extent of 'over-booking', or 'under-booking', is identified the use of room booking data has permitted analysis of room use across the entire year rather than just in the teaching week. The introduction of people counters will make possible a 'whole year' comparison,

and give the university the opportunity to gain a greater understanding of its classroom utilisation – including its peaks and troughs.

Comparisons of booked use and sampled use can be used in two ways. In some universities, an hour-by-hour comparison is undertaken in order to identify ‘offending’ departments who fail to use a booked room: a charge or fine can then be levied on them for ‘wasting’ resources. During discussions, several staff suggested the adoption of this approach at the University.

From the experience of the reviewer, a superior approach is to identify the ‘big picture’ of under- or over-booking, within the context of overall utilisation levels, in order to identify how the mix of rooms can better meet the requirements of the teaching departments, and also whether there are measures other than the punitive that can encourage more efficient use of space.

## 6 Current Process Details, New System Costs and Implementation

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The implementation of a new room booking system is not without costs. The likely range of system and implementation costs, as well as possible approaches to system governance, management and implementation, are discussed below. First, however, is a more-detailed report on the current processes and systems that were briefly summarised in Section 3.

The approaches reported below reflect the range of practices, processes and systems presented by the departments, faculties and central units visited, or reported as practice and process in other areas. As reported in Section 3, there is considerable inconsistency in the process or system used in different areas of the University to book or manage a room.

### 6.1 Current Processes: Departmental Room Booking

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Each department has a range of rooms that can be used for teaching and meetings: these generally include lecture theatres, lecture or seminar rooms, tutorial / supervisory / small group space, and specialist space appropriate to the discipline (e.g. experimental laboratories in the natural sciences, clinical spaces in the health sciences, computing facilities).

The management of such spaces is assigned to one or more members of staff. Generally these are administrative staff, but in some departments academic staff may also perform a role.

The bookings made in departmental rooms can generally be differentiated as:

- Timetabled teaching
- Other teaching activity – non-timetabled (e.g. supervisory support)
- Departmental meetings and seminars – including some events open to other University staff or the general public
- Events for other departments – teaching or meeting ‘overflow’

Some departments are able to fully accommodate all teaching and meeting requirements within departmental rooms; others have a requirement for additional space, provided by the central lecture theatres and sometimes sourced from other departments.

The systems used to manage room bookings differ considerably between departments. They variously include:

- Hard-copy books and diaries, including hard-copy booking forms
- Word documents
- Excel spread-sheets
- Custom-built Access and SQL databases
- Commercial software solutions
- Distributed or Web-enabled Calendar systems (e.g. Microsoft Outlook; a Google Calendar set up for each room)
- Web-enabled SQL databases with a customised Room booking ‘front-end’:  
MRBS, an Open Source solution using PHP and MySQL, and designed for booking meeting rooms, appears to be the most common system;  
Calcium Calendar from Brown Bear Software is another in use.

At present, MRBS is common to a number of departments and appears to be the current ‘system-of-choice’ due to its relative ease of use, and the capacity to configure the system to permit three levels of user role: ‘administer’, ‘book/request’ and ‘view’.

For some departments, the current approach works well. If a department has a mix of room types and room capacities that fit with its student and class numbers, there are generally no room booking problems.

It is relatively easy for a small and simple booking system to handle a small number of rooms. The need to record and search for rooms by their attributes is less significant when all or most

departmental rooms (their capacity, attributes, and equipment) are generally 'known' to departmental users. Even for new users, there are a number of people who can be approached for information or room choice suggestions.

Only when departments have an inappropriate room 'mix, or insufficient space at peak time, are problems encountered. With student numbers changing over time, this is not an infrequent occurrence, and several staff keenly recalled the process of 'finding' another room. Typically, this involves:

- 'phone your friends' – call or email one or two staff in other departments who have helped you in the past, or owe a favour because you have helped them;
- If this fails, send more emails describing the sort of room / capacity being sought, to see if anyone knows where there might be another such room in the University;
- once a room has been found, call or email to find out who administers the room, and ask whether it is free when you need it;
- if it is free, approval will be required for another department to make use of the room – this may need to be negotiated between two academic colleagues from the different departments who know each other;
- once a room has been identified and booked, negotiate further arrangements over which department will provide AV equipment and computing support, and what needs to be done to arrange staff and/or student access to the room.

There are some further variations depending on the type of activity being booked.

#### 6.1.1 Timetabled Classes

A common complaint in relation to room bookings for timetable classes was about the necessity to re-key data about classes into multiple systems for various purposes: to request central lecture theatres, to provide timetable data to staff and students, and to provide data for the main "Lecture List" timetable.

All such doubling up of data entry introduces the risk of error. The complexity and labour intensity of the process also reduces the likelihood that updates of the various systems will occur, leading to one or more records being out of sync. In at least one department, students are told to ignore the Lecture List and instead rely on the departmental timetable alone.

Some systems and processes, such as those of the Department of Engineering, are relatively complex and well-developed, with a departmental class information database driving not only a web room booking system but also a student-view timetable. However even in that department, as in most departments and faculties, considerable manual processing and duplicated data entry is required to complete all the stages associated with booking rooms for timetabled classes.

#### 6.1.2 Other Teaching Activities

"Timetabled classes" in the section above refers to both lectures and other larger classes (laboratory teaching, computer lab sessions, structured seminar series, etc.) most of which occur on a regular basis through the weeks of term. "Other teaching activities" refers to one-off or occasional events that are not supervisory sessions but are held in support of the main stream of timetable classes. The only thing that distinguishes them from other departmental events such as meetings and seminars is the department's desire that the departmental or subject timetable for students includes the teaching activities (so that students know when and where they are taking place).

In all other respects these teaching activities are the same as meetings and departmental seminars – simple *ad hoc* events which require a room booking.

### 6.1.3 Other Departmental Events

Departmental meetings and seminars may be one-off *ad hoc* events, or may follow regular patterns – across the term, but also extending beyond teaching terms and across the entire calendar year.

Information about these bookings may need to be provided to other systems for staff calendars, but they are not published in the timetable. In addition, they often require additional facilities: specialist audio-visual support, catering, etc. If they are the department's own events the facilities are provided from within departmental resources and there is no charge to the user, but there may be a need to make arrangements with, or pay a fee to, another part of the university or an external service provider.

With current systems, those arrangements will all take place outside the room booking system.

### 6.1.4 Sharing Use of Departmental Rooms

There is no single University-wide approach to the use of departmental rooms by other departments or external users.

In some departments, access issues or safety concerns (teaching and meeting rooms surrounded by laboratories creating safety issues) may mean that use by others is refused outright. Other departments consider that they have sufficient space for their own activities and no others, or that empty rooms should be kept clear to provide flexibility should departmental need arise. Still others are concerned about the behaviour or attributes of students from other departments.

Some departments accept the occasional 'external' room booking, and have implemented no system to recoup costs. This may be from a general commitment to the common good, or because the cost of such a system might exceed the costs likely to be recouped from the bookings.

In other cases, charges for rooms, additional AV support and linked catering are clearly defined and systematically collected.

Amongst those departments using web-based systems, some are open for members of other departments to request rooms, others are restricted to members of the department, yet others are restricted to room manager use.

Departments such as Clinical Medicine at the Addenbrooke's site share a mix of spaces that are 'owned' or funded variously by the University and the NHS: some are booked on a University system, others on an NHS system.

### 6.1.5 The Significance of Departmental Space

The principal lesson from this description of the wide variety of approaches to booking departmental space is that any centrally-managed room booking system will need to have the flexibility to permit multiple approaches to room management and access.

Some proponents of centralised room management in universities argue that all teaching space should be centrally managed and controlled. Yet even in highly-centralised institutions, the attitudes of academic staff and students result in a high, if not exclusive, concentration of classes taking place in the 'home' of the department doing the teaching.

Departmental identity is a frequently undervalued aspect of room allocation in universities. Every academic department has a unique culture and set of values that differentiates it from the other academic disciplines at the same institution, and from comparable departments in other institutions. That culture is subtly reflected in the manner in which the department arranges its space, the way in which the department's members customise their personal offices and labs, and the fit-out and 'decoration' of shared community space, as well as the corridors, open spaces and sometimes even external walls of the department's building.



The customisation of departmental space will normally involve not only notices about departmental activities but also publicity for other activities that reflect the interests of current members. The results of the research activities of the department – represented by posters prepared by postgraduate students and postdoctoral fellows – will stand alongside records or photographs of significant departmental achievement, examples of historic publications or prizes, or – in the case of science departments – examples of historic experiments.

Departmental identity is important for several reasons. In particular:

- it reinforces to students the overall academic success of the department and its members, and encourages students to participate more fully in the academic life of the department by their engagement in learning and, for later year students, encourages them to consider undertaking further study in the department;
- its expression communicates to students the overall import of the study that they are doing, even if they are at the very beginning of such scholarship.

The value of departmental identity is frequently expressed by academic staff, who are more conscious of its significance. However it should also be noted that surveys of students about their experience in University, and about the scheduling of their classes, also reflects the value they place on teaching in a discipline taking place in the ‘home’ of that discipline.

There are, of course, more prosaic reasons for accommodating departmental teaching in departmental rooms. These include:

- for staff – the ability to have classes close to their office means reduced travel times, the ability to access departmental resources, the opportunity to return to the office between classes, etc.;
- for students – the convenience of posting assignments in the department before or after classes, and easier access to make appointments or consult staff.

It is very clear that the sense of departmental identity is highly-valued by the departments of the University, and is reflected in attitudes towards the use of departmental rooms, although none of those consulted coherently argued the views expressed above.

Many staff expressed a very strong preference for containing all their teaching within their own department, and an equally strong preference not to use the rooms of other departments unless ‘absolutely necessary’. Many also expressed a fear that a new room booking system would encourage the use of ‘their’ rooms by staff from other departments – failing to appreciate that the other departments had an equally strong preference for use of their own rooms (except when ‘absolutely necessary’).

Consideration of this issue should play a part in the implementation of any central room booking system.

## **6.2 Current Processes: Centrally Bookable Rooms**

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The common pool of centrally bookable rooms has expanded to encompass 103 rooms, although at present the pool is reduced due to building works affecting some sites. Responsibility for the management of room bookings in these rooms is the primary responsibility of the Student Registry: during the Academic Terms, all bookings (both teaching and external) are managed by the Student Registry; outside term time, Student Registry ensures that bookings for examinations are maintained while there is also external commercial demand for the rooms.

Demand for use of the centrally bookable rooms is not evenly spread across the academic term or the teaching week: during the peak hours of 10:00am to 1:00pm demand exceeds supply. Some lectures move to other (departmental) rooms, other lectures are re-scheduled at an earlier or later time – the degree of flexibility varies widely by department and faculty. The process of finalising the schedule and room bookings is an iterative one, manually controlled, that runs in parallel with the gradual collection of room requests from the departments.

### 6.2.1 Utilisation of Centrally Bookable Rooms

As noted above, the University currently reports low levels of room utilisation. To provide more information about the use of rooms, 'people counters' are being installed in 23 of the centrally bookable rooms to trial this new method of measuring the use of rooms.

## 6.3 Current Processes: Other Rooms

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In addition to centrally bookable rooms and departmental rooms, a range of other rooms used for both teaching and meetings are situated in and around the University.

The majority of these are located in the colleges, and are outside the scope of this report. However their use arose naturally in discussions about the organisation of teaching rooms bookings. Unlike most other universities, where the colleges primarily fulfil the role of student residences, with sometime minimal student learning support, the University's colleges exercise academic oversight of students from selection and throughout their student career. College rooms are mainly used for supervisory sessions although, as discussed elsewhere, rooms in departments and faculties are often used for supervisions in later years when specialist support is in a discipline is required.

All of the colleges maintain their own room booking systems. Because college space (accommodation, catering facilities and meeting rooms) is frequently rented out between terms for external uses, the focus of a number of these booking systems is on events management. *Kinetic Solutions*, a provider of conference and accommodation management software, is the primary supplier of room booking systems for the colleges: one third of the colleges use one or more modules of their *Kx* system, as does the University Centre.

Madingley Hall and the Institute of Continuing Education currently use a different event management system from *Priava*: they reported some dissatisfaction with the system and support, and are currently assessing other options, including *Kx*.

It should be noted that each college separately licences their commercial software. An issue that should be raised at an early stage of discussion with potential providers is a head agreement, and software discounts, that facilitate use of the chosen solution by all parts of the university community.

Aside from colleges, a number of University Administrative Offices have meeting rooms and training rooms that are managed in a manner similar to departmental shared space: on a variety of different systems, all locally managed. There would be advantages to having these on the same room booking system.

*Utilisation Levels:* It was noted in many discussions that the low level of room utilisation arises in part from the structure of the teaching day, with lecture room use largely restricted to the mornings with afternoons free for supervisions in colleges. Another issue flagged during discussions was the use of college teaching space for general university classes, with comments that the University appeared to almost 'stand alone' on this: the comment was made that *the University of Oxford college facilities appear to be more frequently used for centrally timetabled classes [than at the University of Cambridge]*; an alternative view was that there was already pressure on college space that would limit its availability for this purpose. There would be issues of charges for room use and AV and computer support, as well as the possible 'lost' income from external sources that are linked to this issue, which goes beyond the scope of this review, but it is an issue that the University may wish to consider as it moves towards improving space utilisation levels.

*Space for student societies:* Another issue raised during discussions, beyond the scope of the review but related to it, was the availability of university-wide accessible space for use by university-wide student societies. Sporting groups are often well-established with good facilities, but other student interest areas are not as well supported. The availability of University space for use by societies was an interest of the Student Union.

## **6.4 Current Processes: Aggregation of Room Bookings into a Teaching Timetable**

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In general, the University maintains an overall pattern in the teaching day:

- lectures / large classes in the morning,
- laboratory teaching organised by departments in the afternoons,
- supervisory sessions organised by colleges in the afternoons,
- other student activities (e.g. sport) in the afternoons.

Because of the high levels of demand for certain spaces in peak times, teaching in some subjects runs from Monday to Saturday rather than Monday to Friday.

The preparation of the timetable involves the following process:

1. Before room bookings for teaching can occur, the departmental teaching timetable needs to be established. In some departments, the 'rollover' of the previous year's timetable occurs by copying the previous *Microsoft Word* or *Excel* document, and beginning manual editing. In other departments, a database or even a small locally-implemented timetabling system is used. In yet other departments, staff members are arranging pieces of paper on the floor to create a timetable; or arranging paper squares on a printed grid background.
2. Once the timetable is initially established, two separate booking processes occur – one for departmental rooms, one for centrally bookable rooms. In each case, data is normally re-keyed from other documents or system output, to meet the formatting requirements of the different systems.
3. Should the best room not be available at the scheduled time, attempts are made to rehouse the class in a different space. If this is unsuccessful, a timetable change may be required – this may have an impact on the schedule of other classes, requiring changes in previous room booking requests.
4. Once all room bookings are confirmed, a "final" timetable is established and recorded by:
  - a. (normally) re-keying the data required by the Lecture List and sending that for central publication, and
  - b. using a wide range of approaches and formats, preparing a timetable of lectures, laboratory/practical sessions and other classes for internal purposes.
5. Timetables are published in the form of the Lecture List, on the new "Timetables" web-site (currently in *beta* form), on departmental and faculty web-sites (as web-pages or PDF documents), and displayed outside some rooms to reflect room bookings.
6. Timetable changes which require a change of teaching room booking may occur, but will not necessarily be changed on all timetable outputs.

## **6.5 Current Processes: Some Reflections**

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It can be argued that – overall – the current room booking processes and systems at the University are disjointed, fragmented, labour intensive and present challenges to more flexible room use and the improvement of space utilisation. At the same time, it must be acknowledged that the arrangements still support the University's research and teaching in a manner sufficient to enable it to maintain its current high standing in global university rankings.

However several issues related to room booking are reported below, as identified in discussions with staff.

### 6.5.1 Mix of Room Types and Sizes

Many people expressed the view that the current mix of University room types and sizes was almost certainly wrong. This provides additional evidence in support of this review: that the University needs to assemble more complete data about room utilisation in order to make better and more informed decisions about the number, type, size and distribution of teaching and meeting rooms across the University. The comments below are based on anecdotal evidence, rather than detailed data analysis.

#### **Lecture Theatres**

The problem of finding the right mix of lecture room capacities to accommodate lectures will always be slightly harder at the University than at many other institutions because, in most subjects, lecture attendance is elective and students may well select a paper after the related lecture series has commenced. (It was reported that only in clinical medicine and engineering was attendance at lectures compulsory). As a result, and in the further absence of detailed records of numbers attending in earlier years, the prediction of lecture size is a less-than-precise science. The logical response is to book a lecture theatre 'slightly larger' than the expected lecture size, and some staff shared their formula for calculating this. However this is one of the practices that contributes to lower utilisation statistics.

At the same time, there are some subjects where the popularity of the paper and/or compulsory attendance result in class sizes so large that they exceed the capacity of some of the larger lecture theatres. The overcrowding of lecture theatres, when it occurs, presents an OH&S risk. When no large lecture theatre can accommodate a single class for a subject, a video link may be established between the largest available lecture theatre and another room.

There were no reports of departments being unable to accommodate student numbers for any teaching, however there were reports of the difficulties associated with finding teaching rooms when student numbers in subjects increased rapidly from one year to the next. One comment made was that *it is relatively easy to find 150 - 200 seat lecture theatres, much harder to find larger theatres, or small to mid-size rooms.*

#### **Space suitable for supervisions**

It is clearly understood that the provision of supervisions to students is the responsibility of the colleges, however the administrative arrangements vary. Supervision sizes vary from individual sessions, to small groups of two or three, and to larger small groups of six or more. Colleges provide space for such supervisions to be held within the college, however the number and availability of such spaces varies from college to college.

This issue is partly 'out of scope' for this Review, which did not extend to college space. However the involvement of departments in arranging supervisors and groups on behalf of the colleges in areas related to their discipline means that the supervision may be provided by a staff member or graduate student from a different college, or from someone not a college member. Sometimes departments have space suitable for supervisions, but again the number and availability of such spaces varies from department to department.

Although many supervisions can also be held in University office space, a particular problem is experienced by postgraduate students without access to a room or office of suitable size, and the lack of transparency of current room booking systems makes it difficult for such supervisors to identify space that is appropriate and available. It was reported that this is the single most frequent cause of complaint to the Graduate Union, but the absence of any data on small group rooms makes it difficult to identify the extent of the problem, and whether the solution is more small-group rooms or merely a more transparent room booking system.

The need for small group space has also risen in line with increases in the number of graduate students.

### **Other space types**

Concern was expressed by some staff in regard to planning in relation to computer labs, and the increasing use of laptops and mobile devices. Staff were aware of the introduction of more flexible student spaces – equipped with power, and Wi-Fi access – in other universities and expressed concern that the provision of equivalent facilities is apparently not being coordinated at the University.

Another concern related to the provision of flat floor examination space. This is a disappearing space type in many universities, due to changes in contemporary building styles. The University appears to be experiencing a growth in demand for examinations, and provision of adequate space may need to be factored into planning for new buildings.

#### **6.5.2 Multiple data entry**

The need to re-key data on different systems and into different documents, sometimes involving several different staff members, and sometimes being re-keyed up to five times, is inefficient, frustrates staff, increases the risk of errors occurring due to incorrect data error, and makes it harder for room booking changes to be ‘published’ to staff and students.

#### **6.5.3 Teaching Room Fit-out**

The University appears not to have adopted a ‘standard’ for the provision of support facilities (audio-visual, computing, other equipment, etc.) in lecture theatres, smaller classrooms and meeting rooms. Because the fit-out of many rooms is at the discretion of the department or faculty, such a public standard need only be indicative, not prescriptive, yet might encourage greater consistency of teaching space quality.

The presence of ‘standard’ facilities would be a useful searchable attribute on a new room booking system. Many universities have a set of standards that make it much easier for staff to identify suitable teaching space. One participant expressed the view that *a smaller number of shared lecture theatres that were well-maintained would be preferable to a larger number of rooms in a poor state of repair*, however the view was also expressed that *a lot of the centrally managed spaces are not nice or well-maintained*.

#### **Facilities Adjacent to Teaching Rooms**

Several staff members commented on the importance of having accessible ancillary facilities (e.g. toilets adjoining lecture theatres; a foyer to accommodate students between lectures, or to house catering during out-of-term events). One person reported that the scheduling of an after-hours event in one lecture theatre was a problem because the nearest toilet facilities were in an area of the building that was locked at that hour.

#### **6.5.4 Restricted Room Access**

Over time, security concerns have resulted in more areas being located behind doors that can only be accessed through some form of access control, including staff reception desks (in hours) and card reader systems at other times. This increase in room access issues affects the extent to which rooms can be shared, and the ability of both teaching staff and students (either within or outside a department) being able to easily access a room is an attribute that should form an element of the room search on a new room booking system.

#### **6.5.5 Student Safety**

One of the problems resulting from the difficulty of accommodating lectures in the current mix of lecture theatres, particularly at peak times, is that lectures had to be more widely distributed than in the past. This presents additional risks, to both students and the general public, caused by students rushing between different lecture venues by bicycle or on foot. In discussions, the hope was expressed that planning for new buildings and refurbishments would ensure not only a new mix of rooms that provided a ‘fit’ with the mix of lecture sizes but also that these would be

distributed across the University in a pattern that located rooms of appropriate sizes closer to where the demand was.

The point was also made that there is an increasing awareness of the need to ensure the safety of students at the University, and this should include ensuring that classes are not scheduled in rooms where the risks are greater, or where students are required to travel through areas where such rooms are found (e.g. laboratories using hazardous substances).

#### 6.5.6 Room 'Visibility' on Booking System

Within the context of a discussion about a University-wide room booking system, a number of concerns were expressed about what information might be presented to staff and/or students outside individual departments. In summary, the issues were:

- If building plans (as distinct from room layouts) are displayed on the system, they may reveal details of other building features that are 'sensitive'. These include such locations as
  - store-rooms for hazardous chemical, biological or radio-active materials
  - rooms housing live animals
  - rooms where confidential medical or veterinary files or material may be kept or discussed
- The presence of some rooms on a room booking system might encourage staff to request bookings that would automatically be refused if:
  - the room should not be accessed except by staff or students who have completed appropriate OH&S training (e.g. because the room contains, or adjoins space that contains, hazardous materials), or
  - the room is behind an access control system, and admitting large numbers of students or staff from other departments could present logistical problems.

#### 6.5.7 Risk management

Recently, work commenced on refurbishment of the Babbage lecture theatre making it unavailable for teaching for 2 years. Since it is one of the largest lecture theatres at the University, arrangements to accommodate the lectures normally scheduled there was a major problem. The exercise, which ran over eight months, involved setting up a temporary system to track information about other spaces that might be utilised. The investigations ran over several months of enquiry, confirmation and follow-up. Subsequently there were extended multi-party negotiations, involving discussions of such matters as 'add-on' costs for audio-visual provision, security and access arrangements. In the absence of a single room booking system, the process was extended and made more difficult because the staff involved could only see information about the space they managed: they had to talk to each department individually to (1) identify the space the department had, and (2) identify when it might be available.

This experience, reported by several staff, raised the issue of how the University might manage if a similar room or set of rooms became unavailable at short notice. Universities are not immune from the impact of accidents and disasters, natural or otherwise. The last two decades have seen institutions affected by earthquakes (California State University Northridge, and the University of Canterbury, in Christchurch, New Zealand). Natural flooding affected the University of Southampton, and the University of Adelaide lost a significant proportion of its teaching rooms on a single day when a major water main burst slightly uphill from the main campus. In each case, faster recovery of the university teaching program was made possible because of centralised room allocation systems.

Other more prosaic events could easily have an impact requiring closure of significant teaching spaces: accidents such as fire, chemical or biological 'spills', or overflow of a waste water system on a higher floor in a building. In each case it might be necessary to re-accommodate teaching at relatively short notice. The current mix of systems and processes does not facilitate such a process.

## 6.6 System Costs and Implementation

The sixth and final term of reference was:

- f. Present indicative license and implementation costs as well as identifying any practical or cultural considerations.*

### 6.6.1 The cost of the room booking system

The report identifies five possible systems that in general, if not in every specific, meet the University's requirements for a room booking system. Until a more detailed analysis is done, a more precise cost of a new system cannot be determined.

There are a number of factors that make direct comparisons between system costs difficult. Some software is already licenced in part by a department of the University, and extension across the entire institution may involve reduced costs. Some software is licenced on an annual basis; some is licenced with a combination of one-off fee and annual maintenance. All solutions will require local customisation to a greater or lesser extent, some of which may employ consultants.

From estimates supplied by the potential suppliers, and from other sources, the costs range from:

<b>Cost Element</b>	<b>Low</b>	<b>High</b>
Annualised Licence and Maintenance Fees (calculated on the basis of a 7 year life cycle)	11,000	36,000
Consultancy for implementation	10,000	50,000

The implementation would also demand the involvement of staff (additional resources) from within the Unified Administrative Service:

- Academic Division (to change processes, documentation, etc. in relation to booking procedures for centrally bookable rooms),
- Estate Management (to transfer and convert data from MICAD),
- Management Information Services (to contribute to the building of interfaces and authentication processes, project manage the implementation, coordinate system testing, etc.),
- Planning and Resource Allocation (to revise HESA reporting processes)

These resources are un-costed in this report.

One issue that should be raised at an early stage of discussion with any potential provider is the process of facilitating use of the chosen solution by all parts of the university community. Software use by legally autonomous institutes may not be covered by the supplier's standard contract, and a head agreement with licence discounts may be required.

### Governance

A specific Implementation Plan will be required once the software has been selected. Input from the successful supplier will be critical because of their intimate product knowledge. However the particular nature of the University means that their 'standard' implementation methodology – with a focus on automated timetabling or allocation – is not appropriate.

An implementation team would necessarily engage with multiple stakeholders to ensure the software is configured to best fit the University requirements. The Teaching Space Utilisation Working Group should anticipate an ongoing role to steer the project: past experience at other universities suggests that at least two years should elapse before the implementation's final signoff, so that the institution has had the chance to use the software over two full years of the academic year cycle and fully test its operational capacity.

### Locus of System Management

The introduction of a new room booking system will require a further decision regarding where such a system should be hosted (in an administrative sense). Because the system would not be

tightly-coupled to MICAD, there is no technical requirement for Estate Management to take responsibility for it. For the sake of continuity, however, that remains an option.

At many universities, there is discussion about where responsibility for the room booking system and processes should sit. Some argue that, because the system deals primarily with a space resource – rooms – it should be managed by Facilities Management / Estate Management.

Another argument is that, because the primary use of the room booking system is to manage the use of rooms that are used for teaching and academic purposes, the logical locus of responsibility is with that part of the central administrative function that is responsible for reporting the timetable, managing academic processes or supporting improvements in teaching and learning practice.

Occasionally, room booking system management is located within a commercial arm of a university which is charged with maximising income from room rental outside teaching hours. A fourth option has been to locate the system within a university's computing service.

Neither of the third or fourth options are regarded as best practice, but the first two options are almost equally popular choices. In almost all cases, key users of the system are to be found in both areas. In some universities, a sub-unit with responsibility for coordinating management of, and planning for, the provision and equipping of teaching space is located within the parent unit.

### **System Management Roles**

The rate of change of software and communication technology is high, and if the University is to achieve the best value-for-money from its investment in a new room booking system it is advisable for a system manager to be appointed.

The system manager would be expected to fulfil the following roles:

- liaise with MISD to monitor ongoing system operation, backup, maintenance and optimal performance;
- ensure user training materials, including browser-based help and self-training materials, are up to date with respect to both software and processes;
- maintain a relationship with the supplier and the software user group to ensure the University's development priorities are heard and to learn from other users;
- liaise with others in the University to facilitate the ongoing maintenance and improvement of interfaces so that timetable information is available to meet the needs of staff and students;
- providing specialised advice to all members of the University on how the system or processes might be adapted to meet new requirements.

One element of the discussions with members of the University was a sense of disquiet that a new room booking system might be so complex as to demand completion of a new round of training courses.

The recommended systems all have a browser-based interface that most end-users will be able to use intuitively. The provision of online help and self-training materials should meet the needs of all other end-users wanting to perform simple booking tasks.

There will be a very small group of key users who will require a proficiency in the software that will require formal training. Users wanting to know the best way of undertaking particular complex tasks may need their questions answered from central staff. Finally, some key departmental users may require training in the booking of timetabled classes if data from the system is to be used to drive other systems and processes: depending on the chosen system, this may require use of a desktop product or an additional set of more-complex browser windows.

### **System Rollout**

The nature of the University means departments, faculties and schools could not be required to use a new room booking system to manage their own rooms: many have an existing system that meets their immediate needs and, through customisation and familiarity, is useable for most



purposes. Many contrast their local solution with the complexity and relative difficulty of the Planon and MICAD solutions.

However, for the purpose of collecting data on teaching space bookings, the best outcome is for as many departments as possible to use the system, even if their rooms are hidden to most users. Once new software is selected, system configuration is the key to encouraging departmental adoption.

The best way to 'introduce' the system to most departments is to use it for booking of timetabled classes into the centrally bookable rooms. This will require a change of process, and careful configuration so that departments can enter room requirements on the system without 'locking out' other departments from high-demand time-slots. If this is set up properly, it will be much easier for many departments to construct and record their whole mix of timetabled lectures and other classes on one system that includes both centrally bookable rooms and their own departmental rooms.

Further, the ability to record timetable details linked to room bookings on a single system will facilitate the process of reporting timetabled classes and exporting timetable data to other systems.

The existence of a range of adequate departmental systems, together with distrust of an 'unproven' new system and reluctance to adopt a centralised process, mean that the staged rollout of the system is almost pre-ordained. This has implications for the resourcing of a central system management staff that have the capacity to encourage more widespread use of the system over time.

### **Persuasion**

One incentive for use of a central room booking system - canvassed in several discussions – was the use of resourcing benefits or discounts to give financial reward to those departments that place their rooms on the new system.

Another advantage of the single system to be communicated to departments is that it reduces the University's exposure of risk, and could permit 'super-users' – in case of dire emergency – to work with the information needed to manage particularly demanding challenges such as the last-minute re-allocation of teaching spaces.

The final issue of significance that should be communicated to members of the University is that the University increasingly will be required to make decisions based on the more efficient use of rooms – and that the system will support that process without placing an additional burden on staff to collect or assemble data from other records.

## 7 Appendices

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Appendix 1: TSUWG Membership | Review Terms of Reference

Appendix 2: Potential Software Suppliers

Appendix 3: Software Systems Considered and Reviewed

## Appendix 1: TSUWG Membership | Review Terms of Reference

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### Teaching Space Utilisation Working Group Membership

Professor Steve Young	Senior Pro-Vice Chancellor
Dr Stephen Cowley	Department of Applied Maths and Theoretical Physics
Dr Malcolm Edwards	Planning and Resource Allocation Office
John Norman	Cambridge University Library & Centre for Applied Research in Educational Technologies
David Peet	Department of Physics
Tom Walston	Estates Management
Nick Wilson	Planning and Resource Allocation Office
Chris Edwards	Management Information Services Division

### Review Terms of Reference

The Terms of Reference for the study will be as follows:

- a. Identify the current practices and processes within the University for Room Booking, Space Utilisation Management and Resource Scheduling. This will involve collection of data from various sources and meetings with University staff.
- b. Document and map the requirements for a Room Booking solution at a level sufficient to determine if a software solution exists to meet the requirements. Pay particular attention to Usability and Organisational requirements.
- c. Understand how a Room Booking solution would need to be extensible to undertake Space Utilisation Management and Resource Scheduling.
- d. Advise on the best use of the data collected by usage monitors in conjunction with any software solution.
- e. Identify currently available software solutions and match them to the requirements. Propose the most fit for purpose solution (if one exists) for the University.
- f. Present indicative license and implementation costs as well as identifying any practical or cultural considerations.

The study must undertake sufficient work to complete these Terms of Reference but a detailed, exhaustive analysis of Teaching Space Utilisation, Room Booking and Resource Scheduling at the University of Cambridge is not what is expected.

The deliverable should be a report in Microsoft Word and PDF format and a Microsoft PowerPoint presentation. The Consultants chosen will be required to sign a Non-Disclosure Agreement (NDA).

### Example Departments Basic Room Booking Requirements

- Login via Raven (Cambridge Authentication System)
- Capture room facilities (e.g. projector)
- Room capacity and available seating plans
- Manage bookings not made by the Department
- Assign room managers
- Room notifications by email
- Viewable on mobile devices
- Automatic BST/GMT transfer
- Local reporting of usage by different criteria
- Differentiation of available space categories
- Charging methods
- Day by Day calendars for personal use and viewed on large displays

## Appendix 2: Potential Software Suppliers

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'Top five' recommended solutions (alphabetical order):

### **CELCAT Roombooker / Timetabler Live / Timetabler**

*Main Contact Point* CELCAT (Corbett Engineering Limited)

*Address* 21-23 Mercia Village  
Torwood Close  
Westwood Business Park  
Coventry  
CV4 8HX

*Telephone* 024 7646 9930

*email* info@celcat.com.

*Web* www.celcat.com

#### *Direct Contact*

*Tim Dix* Account Manager

*Mobile* 07967 751304

*Telephone* 024 7646 9930

*email* t.dix@celcat.com

### **CMISGo Rooms / Facility CMIS**

*Main Contact Point* Advanced Learning

*Address* Salisbury House  
Stephensons Way  
Wyvern Business Park  
Derby  
DE21 6BF

*Telephone* 08456 888 500 / 01332 660 555

*email* learning.enquiries@advancedcomputersoftware.com

*Web* www.progressomis.com

#### *Direct Contacts*

*Leigh Roberts* Sales and Marketing

*Mobile* 078 8038 8734

*email* leigh.roberts@advancedcomputersoftware.com

*Gill Robotham* Product Manager

*Mobile* 077 1819 3306

*email* gill.robotham@advancedcomputersoftware.com

### **Optime Portal / EventMap**

*Main Contact Point* EVENTMAP Limited  
Address Level 1, The Warehouse  
7 James Street South  
Belfast  
Northern Ireland BT2 8DN  
Telephone 028 9023 6558  
email info@eventmapsolutions.com  
Web http://www.eventmap-uk.com

#### *Direct Contact*

Barry McCollum Director  
email B.McCollum@qub.ac.uk  
Mobile 077 2089 2839

### **25Live / Resource 25 / X25**

*Main Contact Point* CollegeNET, Inc  
Address 805 SW Broadway  
Suite 1600  
Portland, OR 97205  
USA  
Telephone +1 503 973 5200  
email sales@collegenet.com  
Web corp.collegenet.com

#### *Direct Contacts*

Bruce Sylva Sales Manager  
email bruce@collegenet.com  
Mobile +1 503 973-5254

### **Web Room Booker / Scientia Enterprise (Syllabus Plus)**

*Main Contact Point* Scientia Knowledge Computing  
Address CPC1 Capital Park  
Fulbourn  
Cambridge CB21 5XE  
Telephone 01223 884 949  
email info@scientia.com  
Web www.scientia.com

#### *Direct Contacts*

David Duffett Web Room Booker Product Manager  
email David\_Duffett@scientia.com

**RUIS (Room Utilisation Information System)**

*Main Contact Point*                    Mosaic EU Ltd (Mosaic Space)  
Address                                    Level 17 Dashwood House  
    69 Old Broad St  
    London EC2M 1QS  
  
Telephone                                0207 256 4289  
email                                        enquiries@mosaic-space.co.uk  
Web                                         www.ruisv2.net

*Direct Contacts*

John Pryzibilla                         Executive Director  
email                                        john@mosaic-space.co.uk  
Mobile                                      077 4751 0219

## Appendix 3: Software Systems Considered and Reviewed

The table below summarises the systems taken into consideration during the review.

Software / Specific Modules	Supplier	Review Process
<i>25Live, Resource 25 and X25</i>	CollegeNET	Live demonstration of current system.
<i>Astra Schedule and Platinum Analytics</i>	Ad Astra Information Systems	Previously seen; reviewed recent company documents.
<i>CABS Chamberlain</i>	Business Careware	Previously seen; reviewed recent company documents.
<i>CalendarWiz</i>	CalendarWiz LLC	Reviewed recent company documents.
<i>CELCAT Roombooker and Timetabler Live</i>	CELCAT (Corbett Engineering Limited)	Previously seen. Live demonstration of pre-release new version.
<i>CMISGo Rooms and Facility CMIS</i>	Advanced Learning	Previously seen. Live demonstration of pre-release version of <i>CMISGo Rooms</i> .
<i>Condeco and Condeco Sense</i>		Live demonstration of current system.
<i>EMS</i>	Dean Evans & Associates	Reviewed recent Event Management Systems documents.
<i>Events Perfect / Priava</i>	Priava	<i>Events Perfect</i> previously seen; reviewed recent company documents.
<i>Google Calendar</i>	Google	Previously seen and currently used.
<i>Calendar (previously iCal)</i>	Apple Inc.	Previously seen and used.
<i>KxConferencing</i>	Kinetic Solutions	Previously seen; live demonstration of current system.
<i>MICAD</i>	MICAD	Live demonstration of current system at the University.
<i>Microsoft Outlook</i>	Microsoft	Previously seen and used.
<i>Mozilla Sunbird</i>	Mozilla	Previously seen and used.
<i>MRBS</i>	Open Source system, via SourceForge	Live demonstration of multiple instances in departments at the University.
<i>Optime Portal and EventMAP</i>	EventMAP Solutions	Other company software previously seen; live demonstration of current <i>Optime Portal</i> .
<i>Room Service</i>	Occam Systems	Reviewed recent company documents.
<i>Sentry Isis Room Booking System</i>	Telepen Solutions	Reviewed recent company documents.
<i>Ungerboeck Software</i>	Ungerboeck Software International	Reviewed recent company documents.
<i>Web Room Booker and Scientia Enterprise</i>	Scientia	<i>Scientia Enterprise</i> and <i>Syllabus Plus</i> previously seen; live demonstration of latest version of <i>Web Room Booker</i> .