learning, spaces and technology
exploring the concept

Phil Poole &
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JISC

Canterbury
Christ Church
University

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1:
Introduction

This publication is aimed at anyone who has, or may be, engaged in creating, managing or supporting a large-scale learning space.

It is not simply an account of the jointly funded JISC/CCCU iBorrow Project at Canterbury Christ Church University. Rather, it draws on our experience within the project to look and reflect on the issues surrounding the phenomenon of large-scale learning centres which have been a feature of estate development within UK Higher Education for more than a decade.

Higher education institutions (HEIs) work within a context where students arrive at their university with an expectation of access to high quality facilities for living, learning and recreation. The tripling of tuition fees from 2012 will exacerbate the pressure from students who see themselves as 'consumers'. HEFCE's support for university capital investments is unlikely to be a feature of the coming decade in the way it was in the last. Expensive projects will need to be funded largely from surplus on income and will have to convert into student satisfaction ratings, student numbers, and efficiencies in providing services, as well as being iconic buildings.

The JISC-funded Evaluating Learning Spaces (JELS) project (Pearshouse et al., 2009) undertook a meta-study of evaluations conducted on learning space projects in HE. It concluded that the HE sector was spending millions of pounds on library and learning centres but making decisions based on a lack of a clear rationale and objectives and a paucity of information derived from previous evaluations. The report suggested that evaluations needed to focus on the impact of new spaces on learning, rather than simply recording satisfaction of users and stakeholders.

> *Our initial investigations showed that although institutions were keen to advertise new or innovative learning spaces, the practice of evaluating such spaces was not made readily visible and was thus harder to identify or track. A key finding to emerge from the study was that if evaluations were undertaken they occurred as part of an internal institutional process, typically prompted as part of a student satisfaction survey, of which the outputs were not ordinarily deemed to be for external consumption.*
>
> *(Pearshouse et al., 2009)*

Library entrance, March 2008

Augustine House entrance, September 2009

IT Open Access area, March 2008

Augustine House IT enabled learning spaces

The spaces

Libraries as 'learning spaces' is not a new concept as they have always been so, but allowing students to configure the spaces within a library is relatively recent. How do planners create the right balance between books on open shelving and providing exciting flexible learning spaces under the control of students? How much noise should we tolerate (what will students expect)?

> " *On the noise levels, we are encouraging users to self police this and also have roving staff reminding users on the upper floors that there are many places in the building for conversation where they can go if they do need to talk and this is now working well.* "
>
> (Watson, 2006)

The technology

Traditional library spaces have offered fixed desktop PCs, often organised into discreet areas of the library. The rationale for this could have been to provide support, to minimise noise in the rest of the space or simply the availability of spaces.

Fixed computing resources, provided by the university, have become integrated into book space. The rapid growth and affordability of laptop computers mean that many students now bring their own computing resources into the library.

More recently the spectacular increase in students' ownership of smart phones has opened up the possibility of all students having access to digital library resources and learning materials, via their own phone. However, are learning centres culturally ready for mobile devices, even when they ring and are answered? The librarians (and many students) have a dilemma about the switch from traditional library etiquette to the troublesome features of new learning centres (see Chapter 3).

With students increasingly choosing to provide their own computing resources, via their own laptop or smart phone, they require the ability to connect to the university network via wireless or cable. Universities have responded with WiFi provision and some have explored small-scale laptop loan schemes (see Chapter 15).

Learning in HE

The Transforming and Enhancing the Student Experience Through Pedagogy (TESEP) project (JISC, 2007) argued that widening participation has challenged the efficacy of the traditional lecture-seminar model of teaching to meet the needs of a diverse range of learner attributes. Non-traditional students arrive with a range of expertise and skills and expect to be able to learn at times and places which fit with their lifestyles and prior experience.

Additionally, graduate employability has increasingly required a wide range of student attributes that go beyond simple mastery of the prescribed disciplinary knowledge and skills. HE teachers (not lecturers) are changing their learning and teaching strategies because of their dissatisfaction with the passivity and effectiveness of traditional models. Increasingly, they are adopting the role of facilitator, placing the emphasis on learners engaging in active learning approaches which include group-based tasks.

Learners expect a range of services from their university to support their learning but also guidance and support on matters such as finance, accommodation, health and well-being, accessibility and, for some, additional help with core academic skills. For all students there is a changing range of information skills to master, access to new technologies, and a multiplicity of student services. The complexity of student needs often requires a group of service professionals from a number of service providers. How do institutions effectively provide those services at the point of need without placing barriers in the way of students either in time or place?

Our projects:

iBorrow

We undertook iBorrow as an eighteen month project which ran from September 2008 to March 2010, jointly funded by the Canterbury Christ Church University and the JISC Institutional Innovation Programme. The project emerged within an ambitious institutional programme at CCCU to provide a new purpose built, large-scale library and learning support centre called Augustine House, enclosing some 12,500 square metres of space.

In November 2009, two hundred iBorrow notebooks were introduced into the new Library and Student Services Centre as part of an innovative self-service scheme that would make student ICT provision easier than borrowing a book. Eighteen months later, almost unanimously, students assert that the introduction of the iBorrow notebooks had increased the flexibility of working and studying options in Augustine House, as opposed to in the old library, due largely to their portability and availability.

Augustine House

The experience of designing the new centre and the technology within it provided an opportunity to research a number of features we encountered when undertaking a large-scale institutional innovation. The contributors to this book all had a significant role in the developments and have drawn on these to provide a resource which highlights the issues, identifies possible alternatives and evaluates solutions which we hope will be useful to colleagues engaged in their own learning space innovations. The contributors offer their own perspectives as academics, planners, designers, IT and student services providers, librarians and learning and teaching developers. Our joint ambition was to create a fusion of space, technology and learning strategies which would significantly enhance the students' learning experience.

www.jiscinfonet.ac.uk/Resources/external-resources/sfc-spaces-for-learning

> " *… learning space should be able to motivate learners and promote learning as an activity, support collaborative as well as formal practice, provide a personalised and inclusive environment, and be flexible in the face of changing needs …* "
>
> *JISC (2006)*

Responding to change

Changes within our working environment or working practices can be a major source of stress or, alternatively, a source of stimulation which can enhance professional life. Management have a responsibility to prepare staff for change and there is ample advice on managing the process. However, as Michael Fullan (1993) reminds us, "You can't mandate what matters".

Technology rich innovations can often fail to deliver on the expectations set out for them. There is always a temptation to look for uses for new technologies in familiar learning and teaching contexts. The emphasis on technology as the 'driver' for change can lead to technology being used in a supplementary way rather than a transformational one.

The TESEP (JISC, 2007) approach placed the emphasis on pedagogy as the 'driver' and technology as the 'enabler'. Practitioners are encouraged to introduce e-approaches whilst changing the pedagogy underpinning their practices. For example, introducing an interactive whiteboard into the practice of teachers without a supporting change in learning and teaching strategies will almost inevitably see it used in an instructivist way, as if it were an overhead projector, whiteboard or chalk board. The only thing that changes is the technology not the practice and the learning experience.

The Augustine House/iBorrow projects sought to investigate if a better alignment of the spaces, the technology and pedagogy could encourage active learning and enhance the student learning experience. Gibbs (2010) highlights that student engagement is a significant factor in determining the quality of outcomes within learning experiences. Therefore learner engagement within the learning space and their use of the technology is likely to be key to its success.

The diagram below contends that misalignment can result in primary objectives not being achieved. Subsequent evaluation of the projects reported in this publication has shown that alignment between space and technology can have a significant impact on the learning experience. However, the link to changes in academics' approach to learning and teaching strategies as they encounter new spaces, is more elusive.
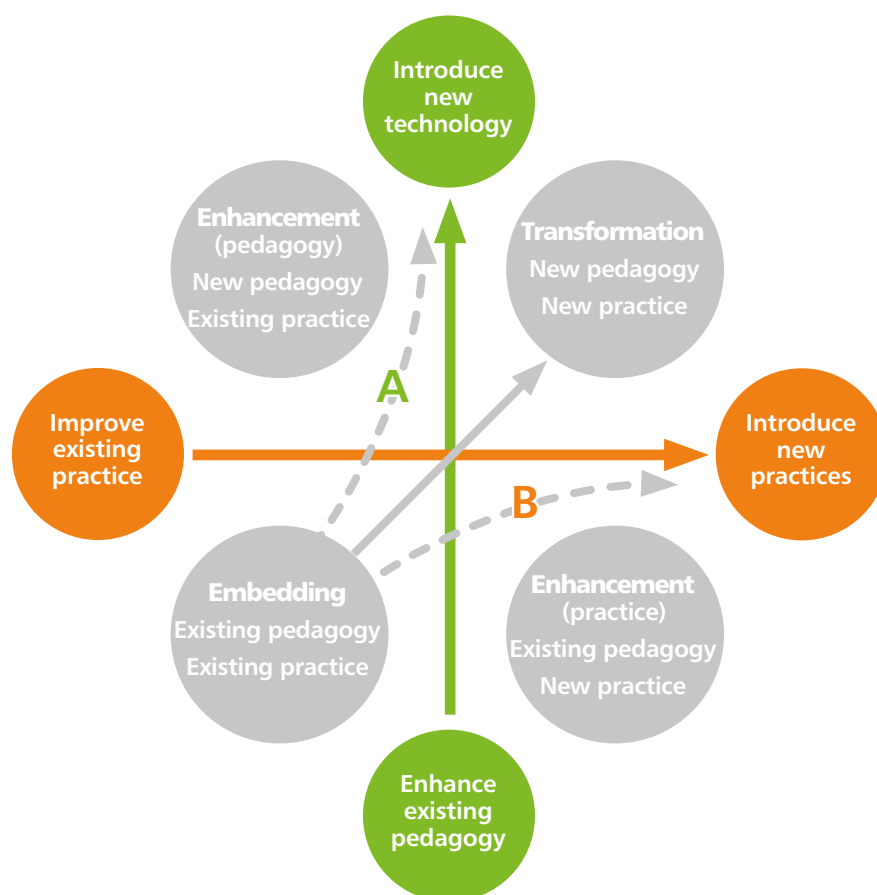
Each of the following chapters aims to identify the critical success factors which supported our innovation and provide a focus for reflection at an individual or team level. We have also made the decision to recount some of the less than successful aspects as an aid to colleagues avoiding similar errors.

2:
The institutional perspective

This reflection on our progress to date, and plans for the future, attempts to provide an honest and open account of our experience. Some of the features we set out to establish proved to be effective, others less so. Some issues arose which we could not have predicted. Two years of operation have allowed us to gather data and begin to evaluate the extent to which we achieved our objectives. The outcomes of these evaluations are challenging, but we anticipated that we would not be able to guarantee satisfaction since we are dealing with the diverse needs of over 15,000 staff and students. What we are pleased about is that we anticipated the need for a continuous change when designing the building and that as we observe and understand it in use we will be able to make the necessary adjustments, without too much disruption and expense. The experience of disseminating our practice through consultancy and receiving visitors, through the JISC and SCONUL network and from our own students and staff, has been formative in developing this publication. We hope you find it useful in your endeavours.

The University estate

Over the 50 years of its existence on the Canterbury campus the University's library resources had grown to over 280,000 physical items. The University had undergone a four-fold increase in student numbers in the last decade, taking in new disciplines and developing programmes to meet the needs of employers and students. The tight physical constraints of a walled city centre campus and the planning restraints associated with our proximity to a World Heritage Site, had placed a strain on our ability to incrementally develop the existing library and IT resources required by growing student numbers and the diversity of programmes. In preceding years we consistently heard from students about the lack of books, study space and IT resources. (Not a unique problem for us at Canterbury, as the NSS survey continues to show). However, against sector benchmarks, such as the SCONUL and UCISA surveys, we were under-resourced in these two key areas.

We pride ourselves, not least being an Anglican Foundation, on the quality of the care and support we provided for students, both pastoral and academic. Possibly because of the rapid growth, or the changing needs of our student body, our aspirations and the effort and resources invested in the quality of the

students' experience appeared not to be reflected in the NSS feedback. Our own internal surveys highlighted not only issues with the physical resources but also their experience of the range of student services we provided. The key issue with the services was not the quality of the help and guidance itself but the ease and speed of access to the information required. At the inception of the project student services had 15 different student helpdesks, and the students were finding they were being 'bounced' around these until they found the right fit to their problem.

Library resources are a major investment for all HE institutions and student services a significant factor in student satisfaction and retention. In response to the identified need for enhancement of our existing library and IT resources a Learning Centre Working Party was established to make proposals for a major estate development in Canterbury. It was chaired by the Pro Vice Chancellor (Learning and Quality). The Working Party identified two key areas of development for the University, a technology rich learning centre/library and an integrated philosophy for the delivery of services to students. As the project proceeded a Student Services Review in 2008, led by an external

consultant, and an HEA Change Academy Project, contributed to the detailed proposals.

Beyond the overall aspiration to provide library resources that met, and would continue to meet, student's future requirements, in the course of the group's work a broader set of diverse aims emerged:

- Develop a 'state of the art' Library and Learning Centre which offers services to students and staff across the campus network

- Provide a high quality and dynamically resourced venue for the services provided to students

- Provide a 'flagship' site for the University in the City of Canterbury

- Offer a major facility for the University and civic use

- Support the University's commitment to environmental sustainability

Sustainability is also an issue for the infrastructure and staffing resources. Although much has been written and researched about learning centres, much of it seems more art than science and based on little more than common sense and casual observation, with empirical data in short supply.

The concept

Our journey towards finding a vision for the building relied significantly on the generosity of colleagues within a number of HEIs who had already been though the process of developing large-scale library/learning centres or learning spaces to open their doors for us to visit. For members of the Working Party to be able to physically experience other HEIs designs in operation was a seminal experience, allowing the group to develop a shared vision through discussion of the environments they saw and to reflect on the honest and open responses from the people who managed them.

Emerging themes from the visits:

- Integrated services from a user's perspective
- Integrated learning 'space' – all spaces multifunctional
- Inclusion of social space – usually a coffee bar
- A mix of different learning zones
- At least one area with 24/7 access
- Self-service and self-help
- Using space to create the ambience

An internal analysis of our existing student service provision showed it was focused on the service provider, rather than the service receiver, the 'client'. The client's needs often transcended departmental boundaries, demonstrating the need for a more integrated approach which put the client at the centre of the provision. We deconstructed student services into three key elements in order to establish the most appropriate delivery mechanisms.

1. The physical resources: books, journals, ICT
2. The learning spaces: individual, group or social
3. The support network: human, physical and virtual

Internally, agreeing the vision involved the full panoply of strategies developed by the University: the Learning and Teaching Strategy, Information Strategy, Estates Strategy and HR Strategy. A staff survey, a roadshow around the campus network and a student forum all provided perspectives from eventual users.

As the final design brief developed it attempted to encompass the following design principles:

- Flexible – to accommodate current and evolving pedagogies
- Future proofed – to enable space to be reallocated and reconfigured
- Maximise student access to the learning environment
- Integrate previously discrete campus functions (student services)
- Self regulating, promoting a sense of ownership of the facilities, resources and environment
- Zoned – for sound, library resources and social-individual space
- Accommodate group rooms, bookable by students and open plan spaces for flexible use by students
- Design for comfort, safety and functionality
- Information technology rich and technologically reliable

These and other criteria were identified by Radcliffe (2008) as emerging from the work of a number of studies on learning spaces against which our experience at Canterbury mapped remarkably well.

Teaching and learning

The University's Learning and Teaching Strategy had committed us to "enhancing the range and quality of the learning facilities and services we offer to students, particularly through the strategic use of learning technology". It also aspired to "explore how innovative spaces for learning, which link technology with conventional resources, can allow for students and staff to experience teaching and learning within cutting edge facilities" (CCCU, 2006).

Augustine House was designed to be a 'state of the art Library and Student Services Centre' which provides flexible and adaptable learning spaces, supported by appropriate technology-resources, to meet the needs of the University's diverse student groups. In common with with some other universities, approximately half the students are 18-25 year olds who have joined from schools or colleges. We recognise the challenge that the interactive and highly socialised nature of students that Prensky (2001) identified as "digital natives" may present. The likelihood is that they would be less inclined to spend a significant amount of their education in large lecture halls, preferring more flexible, informal spaces (Johnson & Lomas, 2005).

However, as an institution committed to widening participation, we also have a body of students for whom the digital world is still an alien place. For example mature students on our vocational professional programmes are a heterogeneous mix of highly experienced IT users and many who are still novice users. We were mindful of Bennett, Maton & Kervin (2008) who cautioned that the predicted impact of the 'digital native' upon educational foundations is largely based upon 'common-sense' assumptions and rhetoric, which lack significant empirical research to substantiate these claims. Our challenge was to engage both these groups as we move forward with an enhancement agenda that seeks to develop learning and teaching through the use of learning technologies.
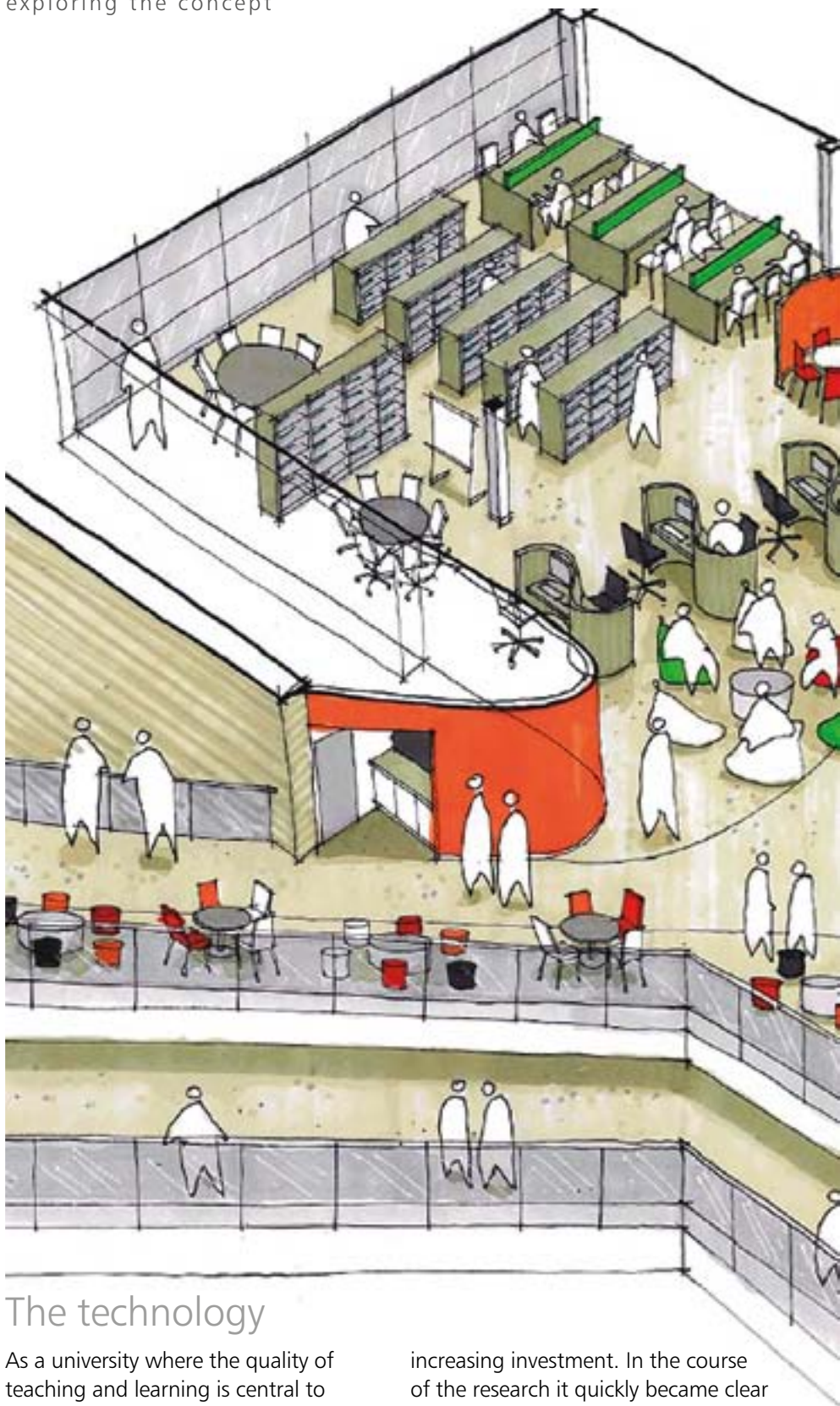
The technology

As a university where the quality of teaching and learning is central to our mission, e-Learning will play a key role in achieving our strategic aims. Augustine House is the largest single estate development that the University has ever embarked upon and it undertook substantial research prior to making final decisions.

The cost benefits of investment in technology enhanced learning are not easy to establish but our strategic planning required a clear sense of the advantages stemming from continually increasing investment. In the course of the research it quickly became clear that some of the questions about students' activities within learning centres, which the planning process raised, did not find authoritative answers. For example, what would be the most effective configuration of mobile and fixed ICT devices within such a large-scale learning centre? What will the balance be between personally-owned and institutional hardware, between mobile and fixed use, standing or seated use?
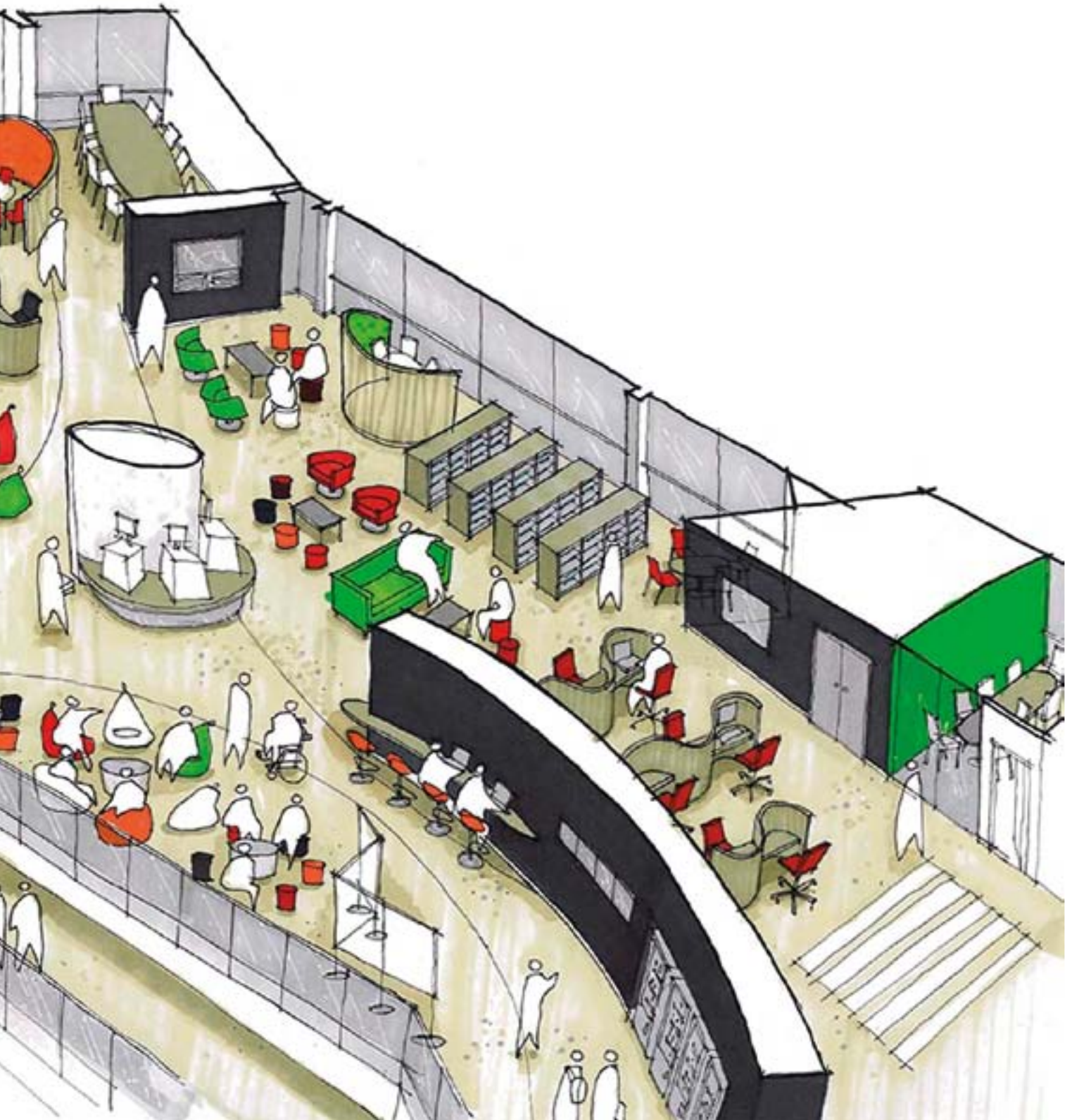
Summary

The final design represented a significant shift in the primary focus. The project had originated in the need for more library spaces, suitably equipped with IT facilities, i.e. a resource. In the design phase the focus moved significantly toward being 'student-led', beyond simply a resource, towards a place for students to be inspired, supported and where they could find the right place to learn whatever their preferences. The ability for the building to 'flex' to students' changing needs became something of a mantra, against which much of the internal design was tested.

3:
The library story

In 2003, as a response to increasing demands from students and staff and the limitations for service development within the existing library space, the University established the Learning Centre Working Party tasked to develop a vision for upgrading the facilities, study spaces and environment in order to deliver a 21st century service. Equally, it was important to ensure that the final design provided a high level of flexibility which would allow this service to be reconfigured in response to future changes in the learning and teaching requirements within the University.

Using experience from the sector

Planning during a period of great uncertainty over the future directions for HE, made the new library hard to envision, but publications such as *Spaces for learning: a review of learning spaces in further and higher education* (Alexi Marmot Associates, 2006) and *Designing spaces for effective learning* (JISC, 2006) provided a regional and national picture of anticipated demands and expectations of learning spaces in the future and fed ideas into the development of a new library.

An early action for the Working Party was for individual members to undertake a number of visits to other UK HE libraries and learning centres to gather ideas as a stimulus for thinking. These visits included Sheffield Hallam University, Lincoln University, University of Teesside, University College Winchester, University of Hertfordshire, University of Gloucestershire and Glasgow Caledonian University.

The stock

Whilst the project had ambitions to develop new learning opportunities, we also recognised the need to deliver the full range of library services that were already offered. In particular this would mean providing space to house the totality of the physical library resources (over 280,000 physical items) required to support students working on the Canterbury Campus. Although there has been considerable increased investment in electronic resources, such as databases and e-journals, students still want to use paper-based books and print journals. These physical resources require considerable space requirements and created a potential conflict with the aspiration for open, flexible study spaces.

A visit to the Saltire Centre at Glasgow Caledonian University showed the potential of using high density mobile shelving within public spaces. Around 35% of the total stock at Christ Church is borrowed on a regular basis, with the remainder used for browsing and infrequent borrowing. We took the decision to split the library stock into two parts: one area for regularly borrowed materials, which would be located on open shelving at a low level to maintain an open feeling on each library floor; with the less borrowed material located in user accessible compact shelving, providing high density stock storage in a relatively small space. As a result of this decision the number of potential study seats across the library increased to over 1,000, compared to less than 500 in the old library building.

The technology

The old library had a concentration of fixed PCs in one room; the only computing outside of this was provided as a wireless service for students' own laptops. The configuration which emerged for computing technology in Augustine House was to combine fixed wired desktop machines, supplemented by iBorrow netbooks, using the ubiquitous wireless networking available on a self-service basis throughout the building. Mobile AV equipment would also allow users to create personalised learning spaces that can be reconfigured again and again depending on users' study needs.

Loans

In order to extend access to book loan services the University made significant investment in self-service technology to allow students to borrow and return physical library stock themselves. Self-issue machines are provided on every floor of the building, with a large self-return sorter located on the ground floor close to the main entrance. In November 2010 over 85% of all loan and return transactions were directed through this self-service technology which is available beyond the staffed library service hours. It has also released staff time to deal with more complex questions and problems as well as supporting users in accessing the wide range of physical and electronic library resources.

The Librarian's dilemma

Changes in the design and use of library spaces necessarily requires a change of attitudes, and even values, and raises such questions as:

- Is what librarians want compatible with what students want?
- How well do we understand what students want?
- Do we equip every reader space with a fixed PC?

Increasingly students are bringing their own laptops and want to connect to University networks and printing. The growing use of mobile smart phones offers students access to the internet but at the same time they are used to make calls. Cafe spaces within the library perimeter means that food and drinks are used in conjunction with books. What protocols will students naturally observe in the library? What library rules are appropriate?
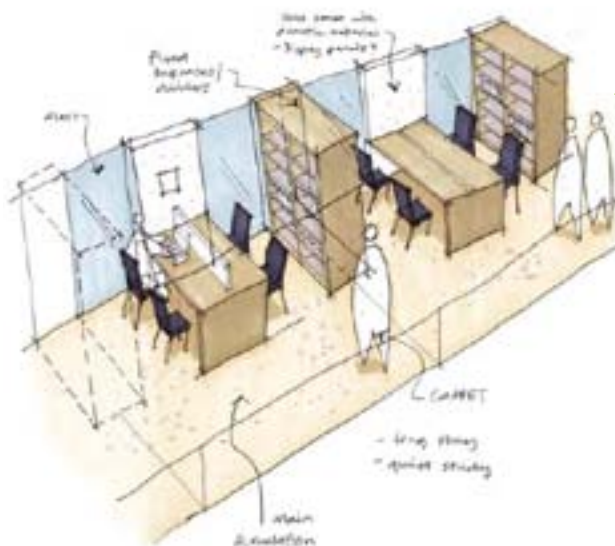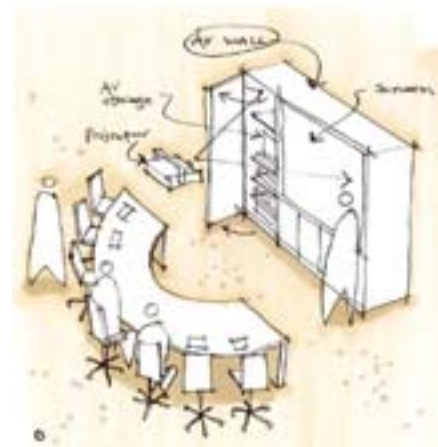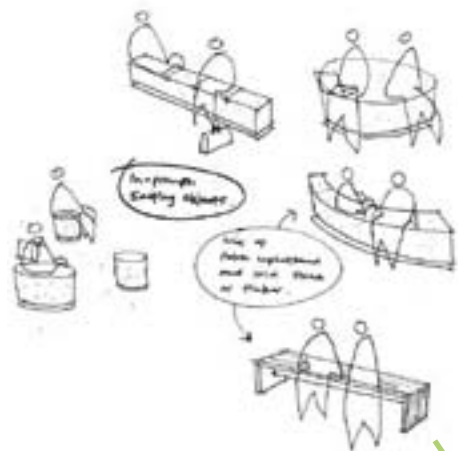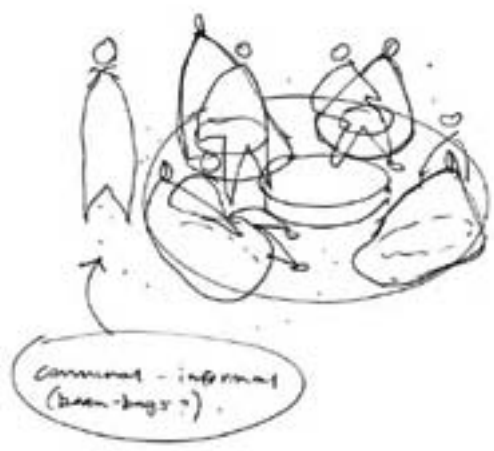
Space to study

The concept was to develop flexible spaces, where physical resources with rows of books and computers would not dominate, but rather that the space should focus on supporting users' study and learning needs. This was something that the old library building could not support, as there was little space for group study of any kind, and no flexible space to support social learning.
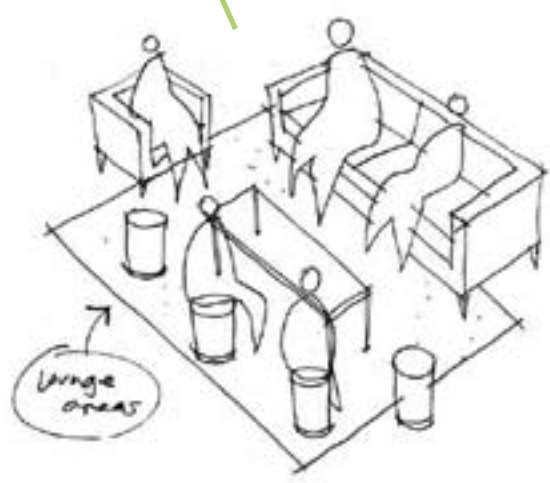
On the top floor is a quiet zone, with traditional study-type furniture, that supports quiet, contemplative, individual study. Different types of zones are provided on each of the other floors, ranging from interactive spaces with access to technologies such as whiteboards, large touch-screen computers and iBorrow notebooks, to bookable group study rooms.

Many of the spaces are flexible and user-centred, capable of being configured and re-configured by users as they see fit, offering something for everyone looking to study within the building.

The purpose of space within the library and how space is used to support the learning process was paramount. We were convinced that the space we would ultimately develop needed to be imaginative, would meet the needs of groups as well as individuals and inspire the learners and the learning that happened in it.

We wanted to create a library that:

- Provides quiet study zones for individual study
- Social space where students can interact
- Group rooms for collaborative groupwork
- Informal learning spaces e.g. cafes
- Ability to reconfigure spaces and resources to meet learner's needs
- Self guided services and support for autonomous learners
- A secure perimeter for an open library accessible by the community

All of these elements had to be represented in the development of a clear vision and project brief for the new library within Augustine House.

EAST WING

Zoning Table

No.	Zone	Learning Activity	Seating Arrangements	Tools & Equipment
1	Individual Reflective	Individual / Contemplative	Study seating with individual desks for concentrative work	iBorrow netbooks.
2	Group Reflective	Group Study / Contemplative	Study desk & chairs – in groups.	iBorrow netbooks.
3	Enclosed Collaborative	Group work developing projects or presentations	Movable tables and chairs	Shared viewing – white board, flip-chart, and plasma screens. iBorrow netbooks.
4	Semi-enclosed Collaborative	Small group / team discussions and problem solving	Movable tables and chairs	Shared viewing – white board, flip-chart, and plasma screens. iBorrow netbooks. Fixed IT.
5	Open Lounge Collaborative	View visual or sound stimulations as a group	Flexible seating - lounge seating, tables and chairs	Seating supports range of everyday activities, from catching up on lectures, feedback after taught sessions, 1-2-1 conversations with other students or lecturer to student conversations
6	Flexible Interactive	Access and manipulate range of learning resources	Wide mix of movable and fixed furniture styles from other zones	Shared viewing – white board, flip-chart, and plasma screens.
7	Stand-up	Quick and Short Access – e.g. OPAC and email	Stand-up furniture	Fixed IT
8	Support	Information about building and activities. Self issue machine, printed guides, digital signage / noticing		Floor plans, leaflet racks, self-issue machine, plasma screen, phone to i-zone desk
9	Printer Copier			Printer-copier, power and network access, phone to i-zone desk, guillotine and binder. Paper store?
10	Café	Semi-formal to Informal small group / team discussions and problem solving	Wide mix of movable and fixed furniture styles from other zones	Shared viewing – plasma screens. iBorrow netbooks. Fixed IT. Coffee and cakes.
11	External (e.g. Atrium, corridors, terraces)	Semi-formal to Informal small group / team discussions and problem solving	Flexible seating - lounge seating, tables and chairs	
12	Distributed Network	Access and manipulate range of data, information and learning resources. Communicating and socialising with peers and tutor remotely	Wide mix of movable and fixed furniture styles from other zones	iBorrow netbooks. Blogs. Wikis. VLE. Text / Audio / Video Conferencing. Forums. Social Networking Sites. Email. Text Messaging.

Security

Theft or accidental removal of the laptops was a major concern. Like any academic library Augustine House has periphery security gates which alarm when an un-issued book passes through. This is based on small passive tape tags in each book. We have tagged all of the iBorrow devices with three pieces of the same tape. Two are on the device itself fixed at right angles to maximise detection, and another on the battery in case anyone tries to remove just that (eg as a spare for their own netbook).

We have also publicised widely that the iBorrows do not work outside the building. By not having a hard disk and just a very small solid state disk, technically-adept students realise that they would need to spend both money and effort to make them work. Finally, due to their low purchase price they are of little interest to professional thieves who are looking for high-value easy-to-sell items. After two years of operation we have not lost a single laptop!

ZONE 8:
-Self issue machine
-Info and guides

Zone 5:
Open lounge collaborative

ZONE 2:
- Group study/ contemplative
- Photocopier

ZONE 9:
- Printer/copier

collaborative

22500

16010

104
Female
WC

105
Elec

106
Comms

Riser

108
Male
WC

Photocopier

5770

104b
Water Fountain
& Vending

104a

107
All Facility
WC

109
Cleaner's
Store

109a

Trolleys

Guillotene/
Binder

Display/info
wall

DDA

18072

Display
/info
wall

112
Compact Book Storage 4097

Self-issue

113
KITCHEN
STORE
Storage

114/DDA

114
Lobby

DDA

115
STAIRCASE

Display /
LCD screen

110
Group Study
Room

111
Meeting
Room

Stand up
Fixed
I.T point

Display / LCD screen

9790

125
Bridge

ZONE 4:
-Semi enclosed
collaborative

ZONE 3:
-Enclosed
collaborative

Void to below

116
Bridge

Void to below

Conclusion

What has worked, what has not? – identifiable changes

Meeting the differing study and learning needs for different users was a key objective in creating the learning environments within Augustine House – a challenge that we believe has been met.

Augustine House is a building and a library which focuses on the needs of its users – primarily students and staff within the institution, by providing space for study, interaction, conversation and learning. It offers a full range of library services in a state of the art, purpose-built building, plus a whole lot more! The iBorrow technology made a significant contribution to the way students use the spaces provided, by opening up the potential of study zones through the provision of flexible, mobile IT.

Between March and May 2010 a series of six focus groups were run in order to obtain feedback from students on their views of the building and particularly their impression and experience of using the new library.

Inevitable conflicts emerged between users seeking different spaces for different study needs, with the undergraduate participants appreciating the social aspects of the building more than the post graduate participants, who favoured a more traditional library environment for the most part.

> *If you are researching you can sit on a sofa or at a desk ... you can make your own space. There is a nice etiquette.*

> *Overall the feedback from students was positive, with an appreciation for the design of the spaces they were able to work in and the staff support that was provided within the building. There was a feeling that the library is definitely a student space that can be used and configured to suit their needs.*

4:
Putting students first

The mounting number of national surveys, reports and forums, including the National Student Survey, the NUS Student Experience Report, the Sodexo University Lifestyle Survey and the National Student Forum, reflect the growing interest in understanding the student experience, not only in academic areas, but increasingly in facilities and service provision. Even if somewhat controversial, an emphasis on students as customers (consumers) of HE (Hill, 1995; 1994 Group, 2007) has sharpened awareness of a potential 'value for money' issue. The pressure on the HE sector to deliver high quality services which are perceived to contribute positively to the student experience is likely to increase with the rise in fees (Foskett et al., 2006).

From its inception the Augustine House project team recognised that delivering the physical environment of Augustine House was only part of creating a supportive environment which would engage students. It was recognised that a critical part of the development would be to enhance services available to students in a way that would align with their needs and expectations. Our research led us towards an integrated services model.

The problem

Following a rapid period of expansion the original Canterbury campus had become part of a network of five campuses dispersed across Kent. Fifteen student service help points were identified at the Canterbury campus alone! These were found to be contributing to student 'bounce' with students being referred from one service to another, often without resolution. They were also very inefficient in terms of staffing.

Putting students first: developing the strategy

The respective heads of student services departments, led by the Pro Vice-Chancellor (Students), worked to develop a shared vision of how service delivery would be 'fit for the future'.

> The key features for future service delivery were that it should offer
>
> " *an excellent, adaptable and comprehensive student-centred, personalised service, which could be accessed from any location.* "

Values that reflect

Respect
Professionalism
Fairness & inclusivity
Priority for the student
Empowerment of the student
Sensitivity and genuine concern
Desire to see the student succeed
Willingness to listen to the student voice
Commitment to service and willingness to help

Knowledge that shows

Expertise
Enquiring mind
Holistic approach
Clarity of thought
Progressive development
Problem-solving approach
Lateral and creative thinking
Awareness of different strategies & solutions

Skills that demonstrate

Reliability
Consistency
Effectiveness
Team-working
Reflective practice
Welcoming approach
Realism in addressing issues
Empathy with the students' needs
Ability to see a job through to its conclusion

All services that relate to, or impact upon, the student experience were to be involved. The focus was to be on the 'whole student' and their entire experience of the University. The emphasis was to shift firmly to the student and focus on their journey.

Service delivery was to be seamless from student perspective, regardless of the number and range of services accessed. The service delivery model was to be a cohesive one, without unnecessary divisions between aspects of the services.

It was decided that a review of existing service delivery would be the appropriate platform from which to develop the integrated services model. An internal review team, led by an external consultant, had a twelve week period of intensive research and engagement with students and staff. Key business processes were mapped and data was gathered and analysed.

It was recognised that such a development would involve significant change in working practices and systems, culture and structure for all the departments. Colleagues in the departments undertook a major change programme to centralise the University's student-facing services. To support this change, a bid was made to the Higher Education Academy to participate in their Change Academy programme. The successful bid allowed for the further development of the 'Student First' model and for the Change Academy team, including the then President of the Student Union, to work alongside heads of departments in embedding changes in working practices to deliver the integrated services model. This unique opportunity allowed the team time to think and reflect together, with the support of a facilitator, in a way that would not have been easy to achieve otherwise.

'The Student Journey'
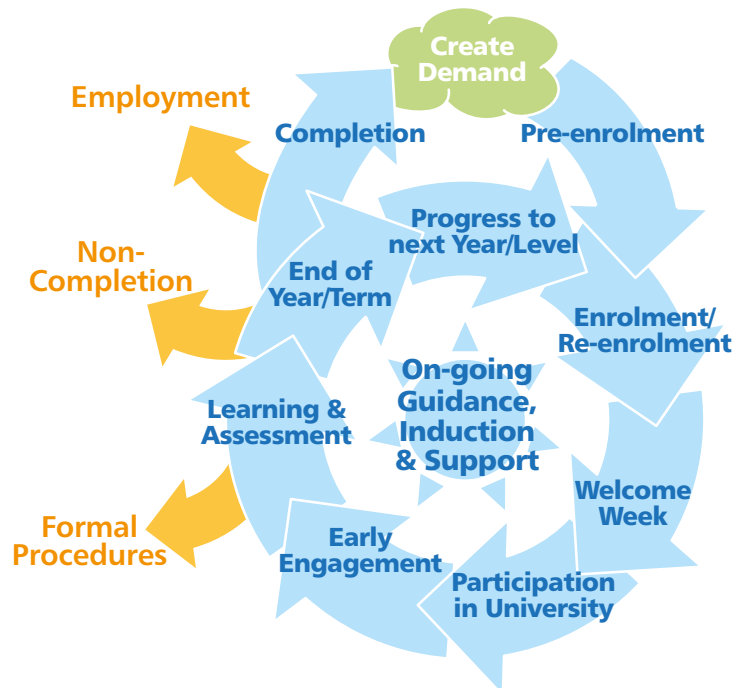
Integrated Student Services

These initiatives resulted in the development of a new department, Integrated Support Services (ISS), which currently supports the work of and collaborates with the following departments:
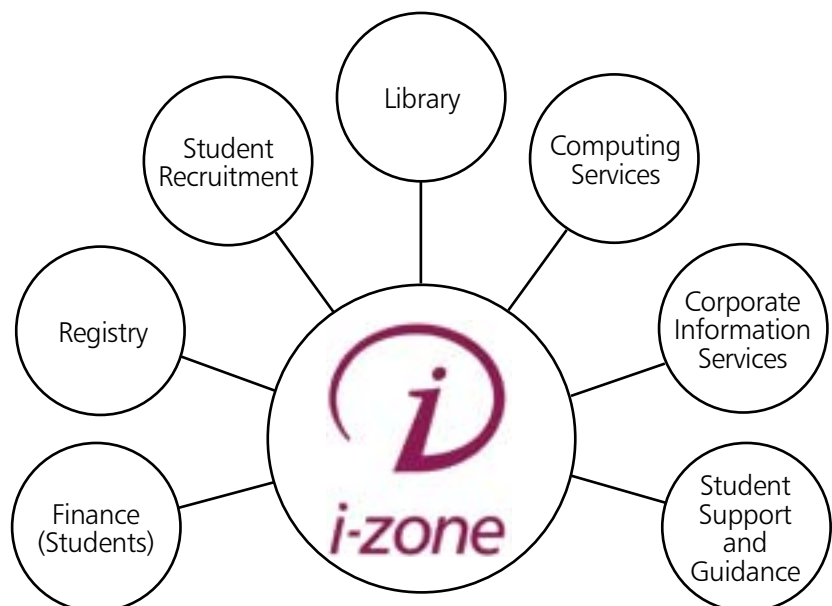
Seven student facing departments with some 250 staff were moved and co-located in Augustine House. ISS provides first and second line enquiry handling services for these departments and aims to resolve 75% of enquiries at first touch. ISS also acts as a gateway to more specialist support offered by departments, including referring those queries or problems which it is unable to resolve.

Developing the student interface

Individual department help desks and contacts were phased out and an enquiry driven 'one-stop help desk' was opened at three of the campuses. Working with the Marketing Department, the i-zone brand was formulated for the new ISS.

Supportive technology

The number of enquiries to be handled by the i-zone required supportive technology, linking student facing departments with Computing and Corporate Information Services departments. Three new major systems were implemented:

1

A call logging/enquiry management system (Sostenuto's Sunrise)

The call logging system provides a professional, transparent work management system for recording and progress tracking of all enquiries, with inbuilt accountability and monitoring. Students and staff are able to track progress on enquiries and automated messages are sent to users on the opening and closing of a call. There are now some 300 registered members of staff who routinely use the system. Relevant information from existing systems, such as Agresso, QL, etc., can be automatically pulled into a call. The call logging system operates on the basis of a queue system which allows work flow to be managed across teams and departments. Calls which the i-zone can resolve are logged to the departments, some directly to the relevant queue or to a triage queue, subject to the department's requirements. The system allows for all calls made for an individual user to be reviewed, allowing for both the history and pattern of calls to be considered. An interface with the estates management system, Plan-on, is in development.

2

A knowledge data base

The knowledge database allows staff and students to resolve their own queries by posing a free text question supported by a FAQ interface (Ask the i-zone). Appropriate FAQs have been developed and are routinely reviewed, updated and extended. In September 2009 the knowledge database self-service facility received 11,171 questions whilst there were 15,738 enquires in September 2010.

3

A call-centre type VOIP telephony system

The new VOIP telephony system allows for monitoring of calls in real time against staff availability. Historical reporting allows for monitoring and is key to future workforce planning.

Changing practices

The i-zone team has had to radically change their working practices and to develop new and more complex knowledge and customer service skills. This was particularly important as the service shifted from more technical service delivery required in the support of computing enquiries to the more personal support of, for example, an enquiry around student support and guidance. The other departments' teams have also had to establish new ways of working as students no longer access them directly.

Monitoring performance

Critical to the enhancement of service delivery is the managing of what can be measured. Management information from the system is used to monitor performance and user satisfaction in a number of ways. Reporting from the call logging system, knowledge database and the telephony system is used to monitor service delivery and for performance management of staff. This information allows for the delivery of a flexible staffing model with the right resources in right place at the right time to handle the fluctuating volume of student enquiries in particular. Quality audits of calls logged and telephone calls are performed routinely. User feedback is collated and used to develop the service further.

Service level agreements (SLAs) were developed with five different categories; Emergency, Urgent, Routine, Project and Complaints. Heads of departments and queue managers receive warning e-mails prior to a call breaching and on breach. Automated reports on calls logged and breaches of the SLAs are circulated to key stakeholders on a monthly basis. At present the SLAs work on the basis of what the departments consider to be a reasonable time to complete work associated with the call. An automated survey of user's views on how the call has been handled is being built into the system.

Statistics for the first full academic year of service delivery are:

Support Level	Service	September 2009 – August 2010
First Level	'Ask the i-zone'	61,010 questions asked
Second Level	i-zone service	96,015 calls logged by the i-zone team
Third Level	expert assistance from specialist teams	24,395 calls escalated by the i-zone team to specialists

When comparing figures for September 2009 and September 2010, the number of enquires via e-mail, telephone and the desk, increased from 8,346 to 18,039. Calls resolved at first touch have risen from 64% to 75% in the same period.

What do users think of the integrated student services?

Six focus groups were conducted in order to obtain feedback from students on their experience of the building, the library and services on offer. Across all of the groups comments about being able to go to one place for assistance were positive. There also generally seemed to be a good understanding of what the i-zone does and how it refers calls on to departments when it cannot resolve the issue. Mention was made of queuing at the very busy beginning of the academic year.

Comments included:

" *There is less 'bounce' (because the) i-zone own the problem* "

(1st year)

" *Great to have one place to go to* "

(Post graduate taught)

" *If they can't help they will know someone who can* "

(Part time under graduate)

Conclusion

The co-location of service departments in Augustine House, the establishment of the i-zone across campuses, the implementation of the call logging/query management system, knowledge database, and telephony system were all significant developments in evaluating, delivering and monitoring a professional integrated student service which places the student at the centre of what we do. The engagement of the Students' Union and other student groups from its inception helped to ensure that the student voice continued to be heard in support of a 'student first' approach.

It is reassuring to see that from our early work in 2003 and 2004 the services have developed in a way in keeping with what is articulated in the National Student Forum *Annual Report* (2010) with respect to what students expect of 'a student-centred university' which places the student 'at the heart of service design' and 'joins up the dots'.

5:
The iBorrow project

The iBorrow project, funded by JISC and match-funded by the University, provided 200 thin-client notebook computers for students and staff to borrow and use within Augustine House 'as easily as picking a book from a shelf'.

The use of location-aware technology in conjunction with other data has allowed collection of information on how students use virtual and electronic resources as individuals or within a group context.

The iBorrow project was spurred by the coincidence of the opportunity of a call for funding from JISC under the 'Institutional Innovation Programme' and an immediate need to provide high quality, innovative student IT. More particularly, it arose from the realisation that bringing together service needs, some technical development work and the research interests of staff interested in understanding the learning process might yield a project that would provide not only a highly-attractive facility (in itself fully justifying Christ Church's own substantial financial and manpower contributions to the project) but also put in place an infrastructure that could be the basis for collection of data that could be used for building management and in the longer term might yield insights into the use that students make of learning centres.

From very early in the design process, it had become clear that providing a substantial proportion of the necessary IT facilities at Augustine House through portable rather than desktop computers would be highly desirable. As well as the potential energy savings offered (as much through reduced building air-conditioning requirements as from savings in the power used by the devices themselves), avoiding significant numbers of fixed PC stations would facilitate the type of flexible learning spaces – allowing students to work in ways and places of their choosing – that the design team envisaged.

Although in the longer term it seemed certain that as costs declined many, perhaps most, of the mobile devices would be personal laptops and smart phones brought into the building by students themselves, there were concerns that in the shorter term many of the University's student population were part time or returning to HE and unlikely to be able to afford their own laptop. There were also good pragmatic reasons of convenience and software provision (including licensing considerations) for ensuring that a large number of identically-configured loan laptops were available.

It also became very clear during the design process that there was little or no empirical data on just how students use learning spaces and therefore how they might need to be configured. Obvious questions about the likely uptake of provision and the disposition of spaces did not seem to have ready answers, at least in the public domain. The team realised that a large and well-used laptop loan scheme, using the latest WiFi positioning software to track location, would be able to gather significant amounts of data. Analysis of this might reveal some useful insights into the patterns of usage and help to inform future learning space design.

Unfortunately, the existing laptop loan schemes at other universities which the team studied, appeared to have had significant administrative overhead and operational burden. Such schemes had often relied on staff issuing and collecting laptops and were often for fixed (and usually short) periods. Typically, they may have had fines for late return, had only a few laptops available and at least one university demanded a £50 credit card deposit. All of this seemed unnecessarily complex and bureaucratic in a building designed around self-service and flexibility. It was also clear that manual administration of a loan scheme holding perhaps several hundred laptops would have a massive staff overhead. Traditional laptop loan schemes rely on recording and knowing who has taken each device to ensure it is returned. With all operating system and applications installed on each laptop there is also a need to constantly check that nothing has been corrupted or changed – either deliberately or accidentally.

The team wanted the loan system to be entirely self-service – so that borrowing a laptop to use within the building was no more complicated than borrowing a book. This meant that the laptops had to be robust and the system and software locked down so that they would always work. The plan was to combine a 'thin' laptop with application virtualisation to create a far more robust system.

The University's project proposal for iBorrow was fortunate to secure JISC approval for a two year project from September 2008 and grant funding of £300,000 to match the University's own anticipated £300,000 contribution. (In the event, the University slightly increased its contribution to allow the project to deliver its full objectives).

iBorrow
laptop borrowing scheme

The iBorrow project had two main goals:

1

To make available 200 laptop computers for self-service loan for use within the new Library and Student Services Centre. With the creation of flexible learning spaces containing different types of furniture these would allow students to work in ways and places of their choosing.

2

To use WiFi positional tracking and anonymous user data to collect a range of empirical information relating to how mobile technologies are being used within a learning centre. To then analyse this data to determine how a diverse student corpus (incorporating mature, part-time, work-based cohorts) engage and interact with different spaces and technologies as part of their learning within the building.

Delivery of these goals would be also provide a test-bed for exploring the effectiveness of thin-client technology on low cost netbooks and the potential of location-awareness systems to track their use.

The project timescale allowed data to be gathered over a period of about six months, to provide information to support intelligent building management and control. Combined with additional data (group/cohort, application use and group activity) the project provided primary data on the use of laptops in learning spaces yielding information such as the user 'footprint', patterns of use and user satisfaction. The data from location tracking combined with other information on users and traditional data gathering will be used to answer demographic and pedagogic questions about students' use of technology within the learning spaces.

As usual for this type of grant, the project's formal objectives combined these goals (primarily benefiting CCCU itself) with internal and external evaluation work and dissemination activities to benefit the wider HE community.

Project goals and objectives (from Project Initiation Document)

Goals	Objectives
iBorrow will enable the University to offer thin-client notebooks with 'no-fuss' access to a full range of software and learning resources.	Students will be able to borrow a thin-client notebook PC for use with the Augustine House. From the thin-client PC, students will be able to access the internet, and standard University networked applications.
The project will provide a large-scale demonstrator of the use of tracking software and location-aware technology to aid the configuration of facilities within flexible learning spaces.	Exploiting knowledge gained by other UK HEIs participating in the JANET(UK) Mobile IP programme of trials, the University will select a method of geo-locating WiFi clients within the Centre. Deploy and test the geo-location tool. Develop recording systems to gather data of spatial, temporal and type of use.
iBorrow will provide an insight into the way students use flexible learning spaces.	Tracking software will provide an overview of demographic related when and where students are working on in the Centre (when using IT). Case studies, in association with tutor champions, will explore how pedagogic strategies influence student learning activity within Augustine House.
iBorrow will provide the sector with evaluation and findings from the project.	The sector will be invited to events to see iBorrow in action and critically discuss its potential. An evaluation of user views will provide an insight to the benefits, issues and usages of large-scale use of thin-client notebooks. An implementation report will outline the technical aspects of the design, configuration, roll-out and management of the service. A project report will detail evaluation findings, issues, benefits and lessons learned.

Delivery of the project's objectives required four main strands of work overseen by specific members of the project team:

1 The service roll-out

2 Evaluation, Purchase and Deployment

3 Data Analysis

4 Evaluation and Dissemination

Thin-client notebooks able to provide a suite of applications, support web browsing, office applications and access to selected University IT resources approximating to the basic student profile. (This is described in Chapter 6 and in the project's technical report).

Evaluation, purchase and subsequent deployment of location awareness software. (This is described in the project's technical report).

Analysis of the data emerging from location tracking software and evidence from staff and students on their use of the laptops collected using standard research techniques. (This is described in Chapter 8).

Evaluation and review of the project by outside experts (see Chapters 16 and 17), a conference and continued liaison with others in HE (described in Chapter 15), the project reports and publications such as this one.

6:
The solution

To deliver the iBorrow service required technical work on three fronts: the selection and integration of a suitable client notebook, the configuration of the necessary servers to support them and the design and installation of the wireless infrastructure and access points.

Developing the iBorrow notebook

The iBorrow team faced the task of sourcing a suitable mobile client that would be robust enough for the student environment and able to provide a full suite of academic applications (including the internet) by using WiFi (EduRoam) and thin-client technology.

The aim was to make the client as 'thin' as possible so that only a minimum operating system (OS) would reside on the laptop, ideally held on a solid state disk (SSD). All application software would be driven by the data centre. Thus ideally, an iBorrow notebook, not having software on it, no Internet Explorer and no antivirus program, should not require maintenance. Its OS would solely provide a client session from the terminal server.

Various dedicated thin client laptops were tested but at the time none were ideal for the purpose. They also needed specialist servers and could not always be easily upgraded. The team therefore decided to look at the small netbooks based on the Atom processor which were cheap, light and had good battery life.

After evaluating several devices an ASUS 1000 was chosen – in part because it came with an SSD which meant that the laptop would be physically robust as well. Other attractions were its long battery life (around six hours), lightweight and just one moving part, a small fan. Unfortunately, the SSD version was discontinued shortly after the selection was made and the team was therefore obliged to buy a 160GB hard disk version of ASUS 1000H and then swap out the hard disk for a small 8GB SSD. Some of the additional cost of this was defrayed by rehousing the surplus hard disks in external USB caddies and selling them in the University bookshop!

Although the University had migrated all student PCs to Windows Vista, this would not run on the Atom chipset so instead a very lean version of Windows Fundamentals for Legacy PCs (WinFLP) was engineered, which (just) fitted into the 8GB SSD.

At 'power-on' a local account is automatically logged on, and a shell entry in the registry launches a custom script. This script automatically gains a connection via a Remote Desktop Protocol (RDP) client to Microsoft Terminal Server 2008. The laptop uses a stored digital certificate to authenticate to the secure wireless system (Eduroam).

Server configuration

Once connected to the Terminal Server (TS) the student logs in as usual using their normal Active Directory account and is provided with a full student desktop. We already store all profile data on the student's network storage area so the experience was identical to using a normal fixed PC. In order to reduce the installation complexity on the TS, we used Microsoft App-V to stream the applications. This lowers maintenance costs and makes it easy to update applications, or even deliver multiple versions of the same application. It also means that the TS image is simpler and allows us to rapidly scale up the TS farm as required to meet demand.

To provide a seamless experience, the team developed a programme to pass information on the netbook battery life to the TS session so it could be displayed. They also developed a programme to automatically log off from the TS when the netbook lid was closed – this prevents another user being given access to a student's files and email. Finally, USB functionality is passed through to the TS via RDP, so that media devices or memory sticks work as expected. The wireless software was not compatible with our desired choice of a 64-bit OS, thus a 32-bit OS was used. CPU and memory requirements were met by VMWare ESX Infrastructure and the 200GB storage requirements were met by allocation from a storage area network (SAN).

Physical deployment

The iBorrow laptops are deployed in cabinets of 20, with a charger on each shelf. There are 10 cabinets, distributed evenly throughout the building. A device is simply pulled out, disconnected from the power cable and taken away to use. Any device can be returned to any cabinet and is simply plugged back in to recharge for the next user. We have observed students gathering up netbooks left around and returning them, but any left lying on tables are collected by security staff at the end of each day and put back in the cabinets. This also allows us to check that none have been lost or stolen.

Wireless implementation

Designing an appropriate wireless infra-structure also proved to be a challenge. Not only would it need to provide pervasive and reliable WiFi connectivity for hundreds of client devices, but it would be providing the location sensing to provide real-time tracking data. The building's architecture also posed challenges of its own to wireless designers: a building comprising two main structures (east and west wings) each including over thirty concrete piles rising over the full four storeys to the glass-roofed atrium. Furthermore, the aesthetic design offered few options for mounting: eventually it was decided to fix the access points directly to the concrete piles.

An early decision was taken to work with Cisco, the University's established suppliers of wireless equipment, with whom the in-house team had over the years established good links and an in-depth understanding of their products.

The installed system comprises 120 Cisco 1242AG access points working on both 2.4GHz and 5GHz WiFi bands, controlled by four separate Cisco WLC4402 wireless access point controllers. A central Wireless Control System (WCS) controller provides overall management and location tracking, and runs on a virtualised RedHat Linux 5.0 Enterprise server.

The high number of access points allows a physical and logical split of functions, with (as a slight simplification) those at the core of the building providing the connectivity and those at the edges providing location sensing.

The accuracy of location sensing would depend upon accurate calibration.

Creating a calibration model and performing calibration steps proved extremely problematic. Issues were encountered with Vista, mixing autonomous and managed access points on the same map and non-Cisco Wireless Network Cards. Calibration also proved to be quite sensitive to the furnishings and configuration of the spaces.

Wireless topology overview
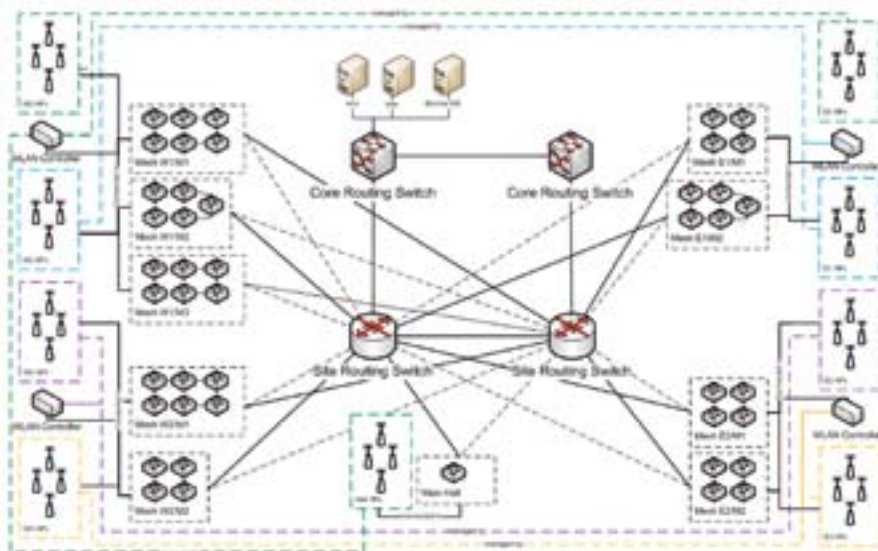
Elements not shown in the diagram that are relevant include:

- All access points, WLAN controller Management Interfaces and WLAN Controller AP Manager Interfaces are on the same subnet
- All access points are allocated IPs (statically assigned) via DHCP
- Wireless Client Networks are configured to failover between the physical WLAN Controller Interfaces
- Lower data rates (1Mbps, 2Mbps, 5.5Mbps) were disabled in the WLAN configuration
- Dynamic RRM is used throughout
- WLAN Controller DHCP Proxying is used for Client IP assignment

In practice, the wireless network infrastructure has proved robust and resilient with good connectivity. Location tracking, however, has proved to be slightly disappointing. Manufacturers (it would be unfair to pick out Cisco) tend to cite impressive resolution figures which would imply a device could be confidently located within a metre or so, derived (one suspects) from tests conducted in the ideal circumstances of a large empty warehouse. The realities of the technology's performance in a large multi-storey learning centre, with radio-challenging architecture, a great deal of installed IT, many big book stacks, large numbers of people moving about and a huge variety of mobile devices from many different manufacturers with varying adherence to standards has proved well short of the claims. Resolution is normally accurate enough to place a user in a particular zone or room, and therefore good enough for the aims of the project, but there are still occasional (presumably anomalous) location fixes that would place the users hovering in free space well outside the perimeter walls or performing aerobatics high in the atrium.

Conclusion

The project has delivered significant benefits to students. The overall capital costs were very reasonable and, with netbooks becoming increasingly popular, replacement costs should remain low. Importantly, the iBorrow concept is easily repeatable by any other institutions who want to gain the same benefits. It could be deployed in any bounded large learning centre as long as some sort of perimeter tag alarm system is available.

We chose inexpensive ASUS netbooks and used almost exclusively Microsoft technologies for the virtualisation and Cisco for wireless networking and location sensing, as these were those with which we had experience and the academic licence costs were reasonable. However, the concept could be replicated using many different netbook and application virtualisation methods, for example the University of Northumbria's rather different approach, described later in Chapter 9.

7:
Value for money: virtualisation

Of all the challenges facing universities at present, the most common and difficult is to achieve 'more with less'. 'More' is continually demanded to meet the increasing expectations of students and staff for study and research facilities (particularly IT related), while 'less' encompasses both shrinking budgets and increasingly limited and thinly-stretched staff resources. Value for Money (VFM) has become, for most managers in HE, the over-riding consideration. However, VFM must consider the whole scenario for costs and benefits. Costs include not only capital and recurrent budget expenditure but the consequential support and maintenance. Benefits will include not only obvious features and facilities but perhaps the opportunity to reduce or eliminate expensive support headaches.

Virtualisation can take several forms:

- Virtual servers: multiple servers are installed on a single hardware server.

- Virtual desktop: where a fully-functional desktop operating system (OS) is provided from a centralised (and maybe virtual) server to a 'thin' client device running simple display software.

- Virtual applications: where the display from application software is supplied to a (perhaps virtual) desktop from a central applications server where the software actually runs.

Virtualisation

Virtualisation is increasingly seen as an essential part of the toolkit for achieving VFM in IT projects. The iBorrow project demonstrated several aspects of this:

- Performance improvements can be made quickly and (comparatively) inexpensively by adding additional servers. When iBorrow found that the initial Terminal Services configuration was underpowered, additional virtual servers could be added quickly straightforwardly.

- Virtualisation can deliver energy (and hence carbon) savings. Low power netbooks combined with a few back-end servers are much more energy efficient than providing desktops of similar capability. Studies suggest savings of 50 to 80%. (JISC, 2009)

- Software updates and fixes can be deployed without handling the client systems. More generally, essentially all administration is performed remotely.

- Longer replacement cycles for the client netbooks: they do not need to track the increasing demands of client applications, only to continue to provide an acceptably fast virtual desktop.

Data centre

LDAP Server

Application Streaming Server

RDP/PCoIP/ICA Server

Desktop environment

Centralised User Account

Application Virtualisation

Operating System Virtualisation
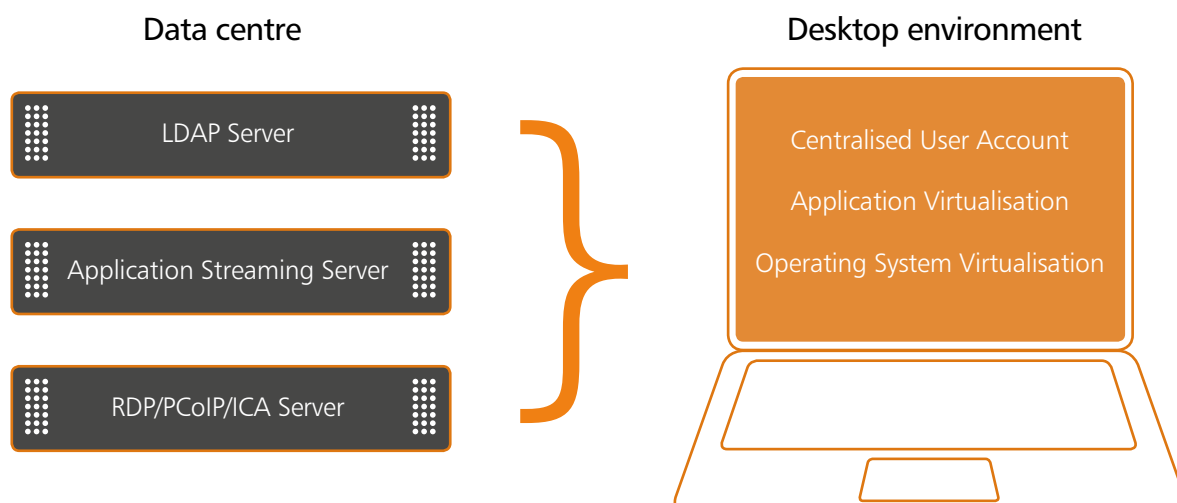
Current thinking towards desktop delivery is that of dividing it into three components: the user account, the application suite and the OS. All of these can be delivered from a centralised data centre.

Where there used to be one system, the PC, that delivered all three on a local basis, gradually over the last two decades emerging standards (e.g. LDAP, TCPIP, RDP, HTML) have divorced the three components away from the 'box on the desk' and placed them in a separate 'data centre'.

Currently the most frequently used of these standards is the Lightweight Directory Access Protocol (LDAP) which provides a user identity, password and preferences from a central store, allowing a user account to be used on any networked PC within the enterprise.

What has not always followed the user is a specific OS or its application suite. To enable this consistency a typical scenario would be that all PCs are identically cloned across the campus from a master copy with the same OS and application suite. However, such cloning is high maintenance, inflexible and not always possible. It would be far better to place applications and OS away from the PC into the data centre so that any maintenance or upgrading can be done in one central depository rather than on hundreds of individual PCs.

In a virtualised system a user logs in (e.g. to the iBorrow laptop) and the same desktop appears with the same applications, whichever laptop is used. The desktop and applications are not actually held within the PC but delivered through specialist network protocols from a server in the data centre. It is in this sense that the desktop is not 'real' but 'virtualised'.

iBorrow screen samples
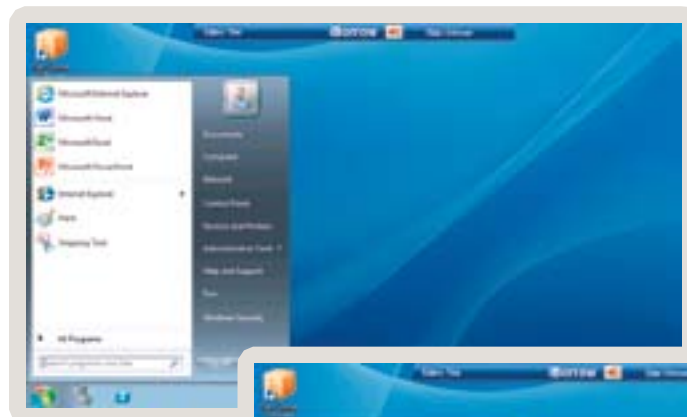
With 200 laptops to run and maintain, full virtualisation was an obvious choice for the iBorrow netbooks. For other applications partial virtualisation may be attractive, e.g. an OPAC kiosk where all that is required on the desktop is a web interface. It is possible to buy thin clients with embedded software browsers (usually Firefox). Alternatively, full-function desktop PCs running applications virtually may be desirable for ease of maintenance, configuration or licensing reasons.

Virtualisation is not a panacea. Whereas standalone fat-client PCs can be relied upon to deliver media intensive applications, allow external peripherals to operate and deliver a media display to monitor and speakers, with virtualisation these resources are now dependent on servers and network (and wireless) performance. High specification network equipment, specialist storage and significant processing power are required to provide an equivalent full media experience to the end user.

Virtualisation licensing can be very expensive. Microsoft, with its Software Assurance Scheme, provides licensing cheaply to HE, but other third party software can prove very expensive. For example in the iBorrow project, a Citrix educational client licence with data centre connectivity would have almost doubled the price of a typical client PC. Citrix or VMWare offer the most advanced technologies for delivering the full, media rich, desktop, but on price alone this would have precluded a total virtualisation solution.

Products such as Citrix or VMWare offer the ability to backup a PC through 'snapshots' (very useful for developers/programmers) and the chance to deliver hundreds of desktops from a single source to a client whilst guaranteeing disk, memory and CPU resources. The ability to deliver such a guaranteed service is not available with cheaper solutions. However, Microsoft's

Terminal Services is cheaper and easier to configure and maintain. Whilst performance cannot be guaranteed, and additional users will lead to a reduction in performance, for the iBorrow project where the focus was not on streaming media, the service could tolerate users having a slight degradation in performance.

Application virtualisation

As with most universities the application suite at CCCU is big (well over 400 applications) and delivering these conventionally is challenging. Application virtualisation avoids application clashes and the problems of installing and maintaining an entire application suite on hundreds of individual PCs.

iBorrow initially delivered a modest suite of 15-20 applications, but CCCU has now virtualised 90% of its application suite, delivering over 600 icons to the desktop. These are all delivered both to our TS servers and to our conventional PC clients. This means a student now gets exactly the same application delivery on iBorrow and on fixed PCs.

Of all the virtualisation approaches, virtualised applications offered the greatest benefits.

Server virtualisation in iBorrow

The iBorrow project was based upon VMWare server virtualisation. All the CCCU data centre servers are virtualised.

" *Terminal Services is the easiest method of delivering a desktop virtually. Basically, there is a server that allows as many users as you have licenses (CALs) for to log in and see a desktop with applications. The server has to be reasonably powerful (e.g. Quadcore, 16GB RAM) and you will need at least three: two for redundancy and one for a connection broker. If you virtualise servers the usual procedure is to buy a blade server with disk storage – we bought a 6 blade server providing 48 cpus.*

Usual technical specifications state you should get 50 users per terminal server – we found a full desktop provision in a virtualised data centre meant 25 users per server. Therefore to cover around 175 users iBorrow need around 6 virtualised terminal servers and a connection broker. These are now all Server 2008 R2 and we easily provisioned with the blade purchase, with room for expansion. "

Geoff Kimmons, User Technology Development Team Manager

Lessons from iBorrow

- Use inexpensive hardware. The team had initially expected to use one of the 'thin-client' notebooks that were available from a number of suppliers. However, they turned out to be a niche product and a price that reflected it. The availability of mass-market netbooks proved a highly cost-effective alternative.

- Do not assume that the 'conventional wisdom' is correct – it may be outdated. New market segments can have a disruptive effect on pricing. Netbooks are substantially cheaper than conventional laptops for commercial, not technical, reasons. And they transformed (perhaps briefly and temporarily, since the market has subsequently returned to conventional hard disks) solid state disks from the esoteric and expensive to cheap commodities.

- HE pricing can substantially alter the economics of your project. This typically affects software choices much more than hardware. While the benefit of community buying arrangements of equipment can be considerable, it will typically only provide a few percentage points saving – and occasionally is behind the market and provides no real saving at all. (HE offers a big and a meanly competitive marketplace to suppliers, but supermarkets are bigger and meaner!). For software, however, education licences can transform the cost-effectiveness of different solutions compared with the commercial market. For iBorrow, the virtualisation approach used (Microsoft App-V over Terminal Services) was attractive mainly because of its very favourable licensing terms.

- Virtualisation is not a panacea and needs to be used selectively. It involves compromises which need to be balanced against the benefits arising from saving staff time and greater fexibility.

8: Monitoring impact: delivering on expectations

The investment of £35m in building Augustine House was the largest single project in CCCU's 50 year history. The iBorrow project was itself a £0.5m investment shared between JISC and the University. For institutional managers there is the need to demonstrate (evidence) that significant investments are value for money. Similar large-scale investment are evidenced across the HE sector. Library and learning centres are often large and prestigious and represent a significant investment for the institutions. Measuring the impact of any project or intervention has always been important, but is perhaps becoming increasingly

so within the financial constraints facing HE, where value for money will be increasingly critical. However, there are few published exemplars of methodical impact studies, indeed the Evaluating Learning Spaces (JELS) project (Pearshouse et al., 2009) found that although institutions were keen to advertise their new or innovative learning spaces, they rarely undertook any systematic evaluation of these spaces post-occupancy, although the need to evaluate the learning and teaching taking place within a space was recognised by most institutions.

Evaluating institutional innovation

The JELS project, funded by JISC and conducted by the University of Nottingham, set out to identify and review the tools, methods and frameworks used to evaluate technology-supported or enhanced physical learning spaces. A key finding was that what evaluations were undertaken, tended to be as part of an institutional process, typically prompted as part of a student satisfaction survey and not usually for external publication. The strongest driver for (internal) evaluations was the National Student Survey, but as existing student satisfaction and other surveys were meeting this need, there was little impetus to undertake further evaluations. The priority seemed to be to look at whether the institutional space was being used in line with design ambitions, using metrics such as the increase in occupancy/footfall. Few new methods or technologies were being used, with only 20% of evaluators in the study reporting the use of Web 2.0 or multimedia technologies in their evaluations.

In order to evaluate the impact on student learning there is a need to move beyond simple satisfaction surveys and adopt more formal research methodologies. Surprisingly JELS found institutions reluctant to apply their expertise in research to their own large-scale investments. Assessing impact can be problematic, because often impact will only be evidenced in the longer term, and because it can be difficult to isolate other variables or events from the particular intervention in question. The various data gathering activities were intended to provide a baseline to use as a comparison with follow-up studies rather than to draw any firm conclusions at this stage.

Day: Sunday, Monday, Tuesday etc

Time: Morning, afternoon, evening

1. Roughly how often do you visit this library?
    - every day
    - couple of times a week
    - once a week
    - couple of times a month
    - once a month
    - less than once a month

2. Why are you visiting the library today?
    - to take out a book
    - to find a journal article
    - to access library internet resources
    - to research
    - to work or study quietly
    - to work with others
    - to use a computer
    - to go to the Helpdesk

3. Do you often visit the library to work in a group with others?
    - yes
    - no

4. Do you think you would visit the library to work in a group with others if more facilities were available?
    - Yes
    - No
    - Not sure

5. Do you regularly bring a laptop with you when you come to the library?
    - yes
    - no

6. If there was a laptop available for you to borrow, would you use it?
    - yes
    - no
    - don't know

7. For your university work, which of these do you use regularly?
    - Internet
    - Email
    - Microsoft Word
    - Excel
    - Access
    - Powerpoint
    - MSN Messenger
    - SPSS
    - Any others?

8. This is the type of laptop we are planning to have available for students to borrow and use while working in the new Learning Resource Centre in Augustine House. Do you think you would be likely to want to borrow it?
    - Yes
    - No
    - Not sure

9. If no, why not:
    - Would rather use my own laptop
    - Would rather use a fixed computer
    - Keyboard is too small
    - Screen is too small

10. Personal details:
    - Male or female
    - Age – under 21, 22-30, 31-40, 41-50, over 50
    - Undergraduate or postgraduate
    - Full or part time
    - Where is your course based?
    - Canterbury North Holmes Road
    - Canterbury Harbledown
    - Broadstairs
    - Medway
    - Salomons
    - Folkestone

1. Securing baseline data

In an attempt to measure the impact of the iBorrow project, baseline data was collected against which the experience of the new Augustine House and the iBorrow notebooks would be compared. The transition would be significant for existing staff and students, moving from a traditional, rather cramped library with no space for group working and insufficient computers at busy times, to a significantly bigger, brighter new learning resource centre with far more flexibility and technology. The move of all student services into the building and working through the i-zone would be a novel experience for all concerned. What were the most significant changes for the staff involved? Would the move have a significant impact on the students? What suited their needs? Did their behaviour change in any discernible way and finally was there an impact on students' learning?

The aim of the study was to establish:

- How many students were using the library at regular intervals throughout the day

- How many were using fixed computers or their own laptops

- If there were groups of students working together

- What were the primary purpose for visits

- What comments students had on features of the current library

- How students regarded the potential of a new library

Over a period of two months a wide selection of baseline evidence was gathered. The research was opportunistic - resources were limited and so surveys and observations had to be carried out when researchers (members of staff and student volunteers) were available. The timing was dictated by the pending removal of some staff from the library building and eventually the closure of the library as part of the transition to the new site.

Semi-structured interviews were conducted with professional support staff from six departments who directly support students and were about to move to Augustine House.

Interviews with academic staff illustrated how few staff appeared not to have thought about the impact that Augustine House could have on their teaching, except perhaps in a negative way, focusing on the distance between main campus and Augustine House, which they saw as limiting their opportunities to, for example, set tasks whereby students needed to find information in the library and report back.

2. Initial occupation

The iBorrow notebooks were not released as soon as the building opened. This four week interregnum allowed us to baseline the behaviours of students in the new building without mobile resources. Observation took take place in Augustine House over a week to record students' use of the building and of fixed computers or their own laptops within the learning spaces.

As the building opened it became apparent that that most academic staff were not engaging or were unaware of the opportunities and facilities of the building and therefore not promoting or using the building for learning. As part of the staff development to support the projects there were guided tours and awareness raising events arranged for academics.

3. Six months later

When Augustine House and the iBorrow notebooks were fully available, to provide supporting data about the way students were using them, observations and interviews with students and staff were followed up. A second online staff survey was also undertaken.

As well as the more traditional research methods, such as interviews, surveys and observations described here, the iBorrow project also used an innovative location tracking system to record the movement of the notebooks and the associated demographics of users (see Chapter 10).
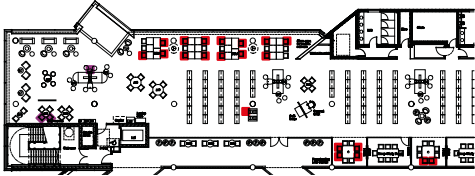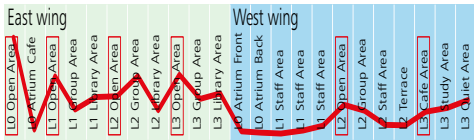
Timing	Methods	Results
Baseline	Photographs of the way students used the old library	http://www.flickr.com/photos/heywayne/sets/72157622831401137/
	A week long observation study of students' location throughout each day, with groupings and technology in use, using a pro forma to record what they saw	It was clear that significantly more of the observed students were using a laptop than were writing by hand or using a book. At busy times it was difficult for some students to find a fixed computer to use.
	Standing outside the library entrance a spot survey of 275 student users using the old library	Most of those in the survey visited the library every day or a couple of times a week (although the results are obviously skewed by the fact that we were surveying students who were using the library, not all students). The most popular reasons given for visiting the library were, not surprisingly, to take out a book (37%) or to use a computer (28%). Asked if they regularly worked with others in the library, 71% said they would do so if more facilities were available. Students were shown an iBorrow laptop and asked if they thought they would borrow one to use one in Augustine House: 212 (77.4%) said they would. There were no significant differences in the demographics of those who would or would not borrow the laptops.
	An online survey of staff with 80 responses	Just before Augustine House officially opened the survey asked staff about their own use of the old library and the way they engaged students with it. There were 80 responses. The most popular responses for use with students were directed activity to find subject resources (37), session with a Faculty Liaison Librarian (28) and library tour (26). Anticipating the opening of the new building only 29 respondents said they felt fully informed about the resources for teaching and learning which would be available and only 23 said they had plans on how they would use the new facilities/resources with their students.
		General comments concerned the building itself and how it would work for students, not how staff could use it in their teaching. Asked how they thought their work with students might change once Augustine House had opened, most comments were that it was too early to tell but others were more positive –most of these comments referred to the flexible use of spaces, opportunities for group working, the modern building being a good place to study and encouraging students to be there. Many comments referred to independent learning, group study, flexibility, meeting a variety of needs. Several staff praised the provision of cafe facilities, which they thought would encourage students to stay and work for longer periods rather than just dropping in to return or collect a book. Ten respondents thought Augustine House, with its flexible learning spaces and the availability of enhanced information technology, was likely to result in improved student learning. Others were less sure - some said they needed time to work out how to use it to best advantage, others referred to the potential of space for a wider range of activities which would help students become independent learners, i.e. their ability to set more directed group tasks and research tasks.
	Semi-structured interviews with 14 support staff from six departments	Most of the comments were about the implications for staff of working in the new building, including the problems of working in open plan offices, but there were positive views about the new facilities for students, including new book stock, with the physical (building) changes perceived to lead to cultural changes in teaching and learning.
		Interviews with academic staff illustrated how few staff appeared not to have thought about the impact that Augustine House could have on their teaching, except perhaps in a negative way, focusing on the distance between main campus and Augustine House, which they saw as limiting their opportunities to, for example, to set tasks whereby students needed to find information in the library and report back.

" *I think it is an excellent idea and enables students who would not normally have access to a laptop, to use them.* "

" *The group study rooms are popular, plus the ability to eat and drink in the space without feeling that they're doing something wrong.* "

" *They find the different areas beneficial as, dependant on their activities, it allows them to move and adapt to their relevant needs. It also gives them autonomy in their learning.* "

" *I think the concept is excellent, the iBorrow laptops allow me to choose when and where I work with students, without the restriction of being tied to a specific area.* "

Timing	Methods	Results
Initial Occupation	Observations were recorded and presented diagrammatically on building floor plans	They showed a peak of activity in the building for a few hours around lunch time. Most activity was dictated by the seating or availability of fixed computers but students appeared to favour particular areas of the building such as the group study rooms and quiet areas. The open spaces with flexible furniture were only receiving limited use.
Six Months	Location Tracking As well as the more traditional research methods, such as interviews, surveys and observations described here, the iBorrow project also used an innovative location tracking system to record the movement of the notebooks and the associated demographics of users. (see Chapter 10).	
	Observations were recorded and presented diagrammatically on building floor plans	See Chapter 14 for outcomes
	A second online staff survey	Generally very positive comments about the iBorrow notebooks, referring to them as a brilliant or fantastic idea. In several cases the staff themselves had not used iBorrow but still thought it a good idea.
	Interviews with 174 students, working alone or in groups of two to six.	Almost unanimously the students said that the new building and the introduction of the notebooks had increased their flexibility of working and studying options compared with the old library. Students could work in a location of their choice and group members working together on an assignment could do so without each having to bring their own laptop. Notebook users could remove themselves to a quiet corner of the building if they wished or could work as part of a group in the coffee shop. Some example scenarios:

Four Year 2 forensic computing students, working with notebooks at a table in the third floor hallway, friends from the same course but working separately

Two Year 2 law students using notebooks to work on a joint report, choosing notebooks because of the flexibility. They were sat in a quiet corner of the second floor, on the corner of a table so they could work together, fully using up the five hour battery life of the notebook, then they intended to change notebook and continue.

A Year 3 history student, buried in books on a sofa by the window, an iBorrow balanced on the arm of the sofa so she could take notes as she read.

A Year 1 student with special educational needs and his mentor both using notebooks. The student was working on an assignment while the mentor was checking email etc, facilitating the student/mentor relationship in a way that did not exist prior to the notebooks.

Conclusion

The emphasis of the iBorrow project was upon establishing the potential of mobile technologies to enhance IT provision within large-scale learning spaces. The JELS project provided us with the impetus to collect benchmark data which proved invaluable in making judgements about the extent of changes which are occurring. To achieve this we had to evaluate the impact on student learning through a variety of practical and accessible methods of auditing and monitoring. Taken together, the various methods provided data and supporting evidence of changes associated with the innovations. Students, academic staff and support staff reacted to the different spaces, raising issues around the conjunction of learning, spaces, and the technology.

The outcomes of the data analysis and judgements about the extent to which we achieved significant change are discussed in Chapter 14.

9:
SwITch at Northumbria University

The iBorrow project benefited from the experience of other institutions undertaking a similar journey, albeit with alternative technology and in different contexts. This case study from Northumbria University is an opportunity to compare and contrast the respective problems and solutions encountered in each project.

Northumbria University Library has a reputation for delivering innovative, student-focused services positioned at the heart of the student experience. It is renowned for its excellent customer service and is a holder of the Cabinet Office's Customer Service Excellence award. It has been developing flexible, technology-enhanced learning spaces for a decade enabling students to study in state-of-the-art spaces within a hybrid resources environment.

Development of the laptop service

Northumbria was an early adopter of wireless laptop loans. In 2001 to support students' diverse study styles and avoid flooding the library with hardwired IT study spaces, which would have constrained the degree of flexibility we wanted to offer, we offered our first Laptop Loan Service. The loan service was mediated by library staff and worked well at both the City and Coach Lane Campus libraries, with students able to borrow them within the library for a maximum of two hours (restricted by the battery life). No problems were encountered with these 'inadvertently' leaving the building as they were security tagged, wireless only and, most importantly, issued to the student smartcard, making the student accountable if the laptops are mislaid, as with other library loans on their cards (JISC, 2005).

Scaling the service

As the Library service moved to 24/7 opening at City Campus it became evident that the Laptop Loan Service, in its current guise, whilst heavily utilised, was constrained by being a mediated service. The laptops had to be returned prior to the closure of the Enquiry Desks when the 'lapsafes' were locked overnight and therefore unavailable for student use for a large proportion of our extended opening hours. Whilst there were sufficient hard-wired computers in the building to meet the overnight demand, the popularity of laptops and the flexibility they offered led us to reconsider the service. Moving from a mediated to a self-service model would enhance IT options for students offering greater flexibility, particularly important for those students unable to use the service during the day.

To ensure a truly 24/7 service a 'lapsafe' containing 30 self-service laptops was purchased. This would be piloted to see how students used them alongside the other IT facilities on offer. We chose Wyse X90L thin clients with five hours of battery life and were impressed by their robustness and security which enabled our colleagues in IT Services to run them as Wyse series Citrix clients. Their solid design means no moving parts and a far longer lifespan than other comparative laptops. And of course no hard drive means no data whatsoever is lost or compromised if a Wyse X90L is stolen or mislaid. Each laptop is also secured with a tag, standard across our stock security systems. The 'lapsafe' was located in a convenient and accessible area for all students, with a separate power supply and fitted with RCD plugs for safety. Procedures and 'health and safety' notices are clearly displayed next to the laptop trolley.

It was important to distinguish between this additional service and the Laptop Loan Service which was still being offered from the Enquiry Desk until the pilot had been sufficiently trialled and evaluated.

The new service was branded as **SwITch Self Service Laptops** and launched in October 2010. It aimed to:

- Improve student access to IT 24/7, offering flexibility for use anytime, any place (in the library), on comfy seats in the basement, at the group study tables or at study desks without hard-wired IT terminals
- Enhance group study and collaborative learning
- Provide a cost effective option

The brand provides a simple concept for the service:

> **Switch on – and go**
>
> **Switch seats – use the laptops anywhere in the library**
>
> **Switch off – return laptops to the appropriate floor**

A soft launch using library plasma screens, posters, leaflets and word of mouth was successful in letting students know about the service. Students were very quick to tell each other about it. The idea is simple: students help themselves and replace the laptops for recharging after use.
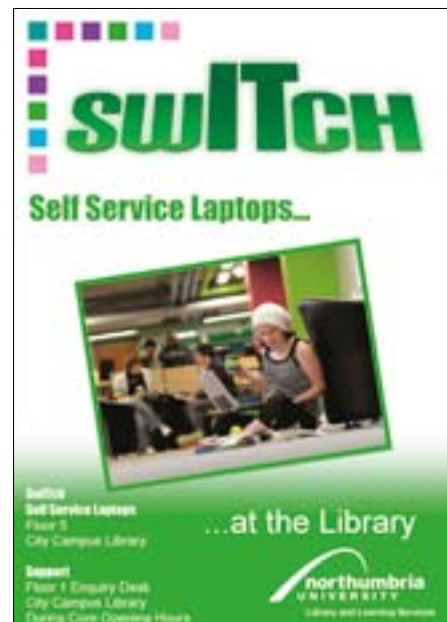
Administration and maintenance

Before implementation, checks were undertaken to ensure the power supply could accommodate the 'lapsafes'. Health and safety checks were carried out and robust long-life battery powered laptops were scoped. Also important was ensuring the laptops could easily be removed, returned and reconnected to the lapsafe power chargers. Since the implementation of the SwITch Self Service Laptops there have been few problems. Laptops not being returned, or being hidden, were initial issues but are not such a problem now we have discovered their hiding places! Students sometimes even recharge the laptops with their own chargers!

An advantage of using WYSE series laptops is that any laptop can be plugged into any of the available 'lapsafes' in any location, due to their compatible power supply. This is a real advantage as it allows students to return the laptop to the nearest 'lapsafe'. Whilst the intention is to encourage students to return them after use rather than leaving them lying around (so that they can be recharged properly), we are finding that students usually leave them where they have used them. Interestingly other students tend to use them where they find them, so unless the battery is flat this is a good flexible way of maximising their use.

By their nature the laptops have to be regularly checked and a small team in the Library maintain and administer them with support from IT Services as required. Every 30 days the laptops are fully checked and any missing from the 'lapsafe' are tracked down to check functionality. Additional checks were made during the busy exam period running through Easter to mid-June to ensure they were fully operational at all times. Any laptops found lying around unused were retrieved and put back in the 'lapsafes' for recharging. We have incorporated this recovery task into our roving service and are finding that students who may be reticent in asking questions at the enquiry points feel more comfortable asking for help in this way when they see staff retrieving the laptops.

In February 2011 the Library increased the SwITch service from 30 to 50 laptops with 20 new WYSE X90CW which are smaller netbook-style thin clients, but still compatible with X90L thin clients.

The Basement learning café is proving to be the most popular area for laptops use. This is a designated social area with comfortable seating, furniture that can be moved to accommodate different size groups, whiteboards and vending machines and a café serving snacks and hot drinks 24/7, making it an ideal environment for students to relax and study as they wish.

Early statistics and informal feedback have shown that the service has far exceeded our initial expectations.

As a member of library staff observed:

" *The flexibility of the swITch service meshes nicely with the libraries flexible learning space concept. The service also dovetails with the 24/7 service of the library, and is available at all times students are in the building* "

Student comments include:

" *Great idea fits in with the 24 hours service provided at the library* "

" *Love it* "

" *Great but need more* "

" *Like the freedom not the worry I may forget to return and be lumped with a fine* "

Plans for further enhancements to the SwITch Service

In 2010-11 the Library offered students both the SwITch Self Service Laptops and the laptop loan service. The popularity of self-service and the review of the pilot project has decided us to expand the service within the City Library and to introduce this to the Coach Lane Campus Library which has only been running the Laptop Loan Service this year. As this library is about to undergo a major refurbishment we are eager to provide swITch here to truly update and enhance our services to students. Coach Lane Library will have 30 WYSE X90L and 20 WYSE X90CW thin client laptops housed in two 'lapsafes' located across the floors. This will lead to the withdrawal of the Laptop Loan Services at both libraries in 2011-12. From September 2011 the library will have increased the self-service laptops from an initial 30 in October 2010 to at least 140 compatible and robust laptops. We are optimistic this service will continue to be popular with students offering, as it does, flexible learning options which enhance the student experience.

10:
Evidence-based planning

University IT systems are a source of data on all aspects of students' time spent at university. Most of the student information is confidential, governed by the Data Protection Act, yet vital to the effective running of the university. Making relevant data available in a meaningful format to staff who require it is often termed Management Information.

What constitutes the type of 'information' that proves useful in planning and managing resources, such as large-scale learning spaces? This chapter reports on the exploration of some relatively new data collecting tools and alternative ways to display such information accessibly for a range of users.

Understanding user behaviours in large-scale learning spaces

The iBorrow project provided a wireless mobile service within the library but was designed to enable us to collect a range of empirical information relating to how a diverse and heterogeneous student corpus interacts with different spaces using mobile vs fixed computing as part of their learning, and related questions around their preferences, e.g. location. The hypothesis was that the use of location-aware technology, in conjunction with other data, can provide information on how students use mobile resources as individuals or within a group context.

Ethics

Whenever gathering user data, ensuring that ethical and legal requirements, such as the Data Protection Act (DPA), are not infringed is a fundamental part of the design of this process. Our systems allowed a query of every device that the Mobility Services Engine (MSE) is aware of (which would include staff and student laptops and any wireless device in the building). We believed it was important to make sure that we only track the 200 devices that formed part of the project. Although our data set did not aim to identify individual students, each had to enter their student ID when they logged on to an iBorrow laptop. This logon needed to be kept from the research team in order to preserve student anonymity. A unique identifier was attached to a user profile which did not reveal the student ID. Thus the research team could track an individual file within a session, but could not know the ID of the student logged on.

Whilst the 'ethics approved' data we chose to collect is sufficiently generic not to infringe DPA principles, the process to get to the ethics-approved data requires careful design of the collection and aggregation of sensitive information. We were very clear from the outset that whatever the research was actually doing, it could be perceived by students as some kind of surveillance activity that was checking up on who was using the library, who was using Facebook instead of working, and so on. Clearly we wished to avoid this perception so we worked closely with the Students Union who were able to satisfy themselves, and thus other students, that we were mindful of their privacy. The students were treated as collaborators in the research rather than the subject of it.

A sample from the data records – the 'zone' position is shown towards the right

Wireless location - tracking users

Once a mobile device is logged on and receiving data via the wireless network it is possible to triangulate its position within a network of wireless transmitters (nodes). In order to get the location of each netbook we purchased a hardware device, Cisco 3300 Series MSE, which allows an Application Programming Interface (API) to query where devices are within the range of the network. The MSE will provide accurate x y coordinates for each of the 200 devices (accurate to a square metre). Within Augustine House we found that the materials in the building imposed limitations on accuracy and therefore chose to configure the location data into 'zones' within the building and use these in the reporting data (for example each of the three floors have about six zones). Although it is technically possible to record the netbook's whereabouts second by second it was decided that sampling every five minutes would provide an appropriate 'snapshot', based on the premise that this iteration would capture movements of students between areas of the building and not overwhelm us with an unnecessary amount of data.

Our research into students' use of the iBorrow service sought to understand the profile of users' at their point of use. It was decided to collect the following data, provided from the Student Records System using students' logons when they signed on to an iBorrow notebook. This included:

- Level of study: undergraduate or postgraduate
- Type of undergraduate degree: single or joint honours
- Subjects studied: major and minor subjects
- Year of undergraduate study: year 1, year 2 etc.
- Age
- Disability: yes or no, not details of disability
- Gender
- Mode of attendance: full time, part time etc
- Postcode of student residence: only the first half, CT1 or ME1 etc.
- Campus where student is based

It was anticipated that the use of the iBorrow location tracking data would enable deeper conclusions to be drawn about the ways that students use a learning centre, for example:

- To what extent is iBorrow use a snapshot of student use of IT in the library? Could you correlate from netbook use to overall use of the Centre?
- The choice about use of IT resources (fixed or mobile) and those who make little use of them
- Whether particular groups of students gather in certain places, eg near subject resources
- The pattern of use of specific zones, eg individual or group, flexible spaces
- The use of particular zones of the building by different types of student – age, gender, subject studied etc – and at different times of day
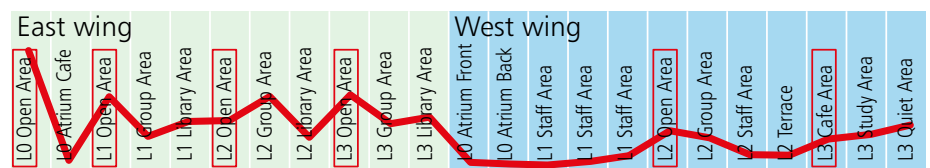
Use of netbooks within the two wings of Augustine House over a three month period. The more flexible, configurable zones are outlined in red.
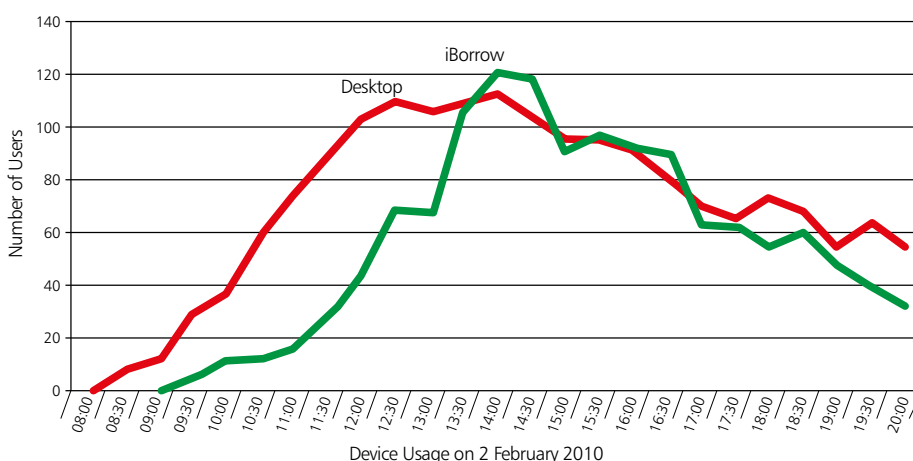
Netbook usage, combined with logon data from the fixed desktop devices, provided a useful picture of supply and demand for fixed and mobile devices that can be built up to provide daily, weekly or monthly use statistics.

Visualising the user data

The location tracking sampled every five minutes, coupled with up to 200 students' records, produced an enormous quantity of data which was quite inaccessible in its raw form. Whilst the graphs and pie charts were relatively easy to create using spreadsheets to sample or synthesise, actively querying the data required us to develop a custom-built front end to a database.
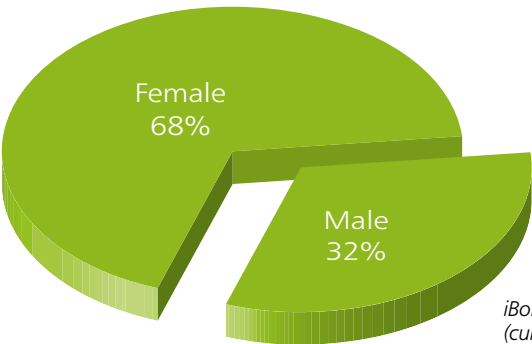

*iBorrow user demographic
(cumulative data over 3 months)*
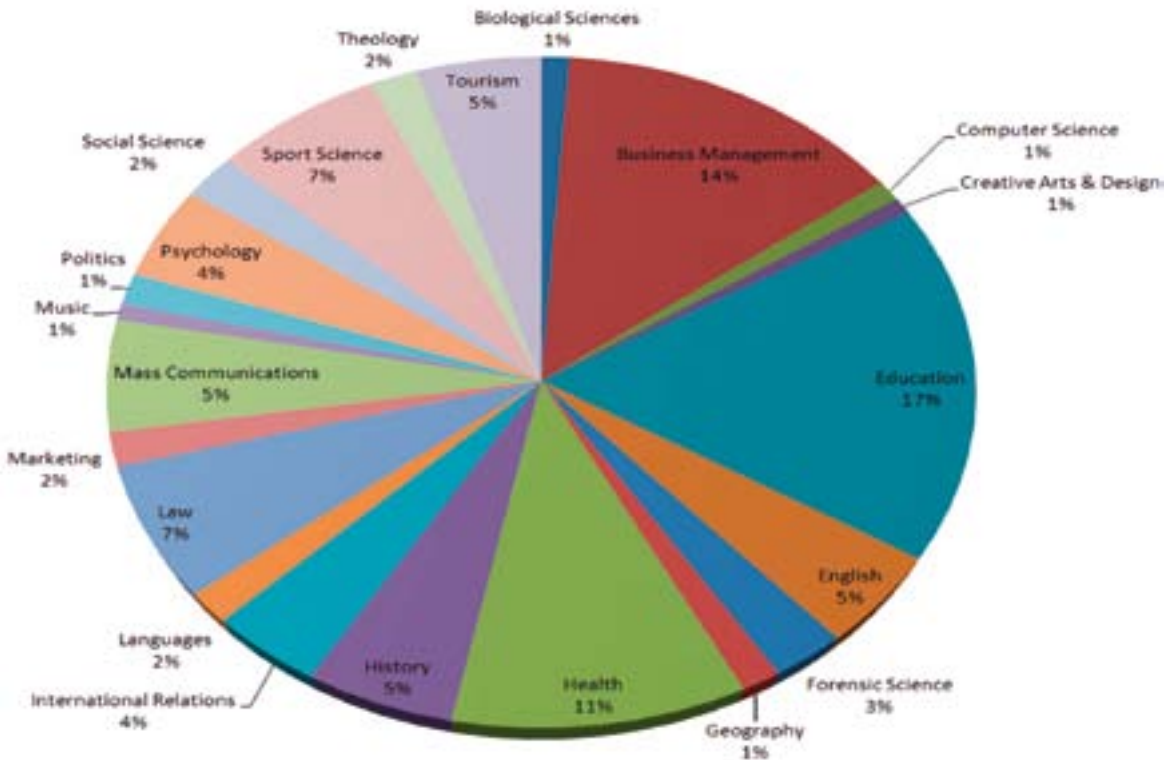
Custom-built front end showing information on the duration of use by selected users

3D modelling

Working in partnership with another JISC Institutional Innovation Project member from Sheffield University, we were able to explore an exciting opportunity to use 3D graphics to present the data, potentially in real time. The WeCamp project constructed a digital model of the building in UCampus which was then overlaid with the location data to provide a spatial and temporal image of activity within the building.
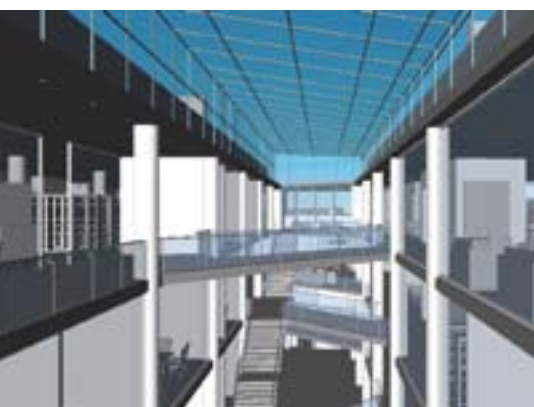
The 3D modelling approach has generated a new kind of data resource that can be used in several ways:

- Direct user 3D navigation into the 'datascapes' on the uCampus platform

- Construction of a dedicated website linked to uCampus supporting a more structured access and navigation of the datascapes by third parties

- Juxtaposition of 2D snapshots of 3D datascapes to inform spatial cross-referencing through the building floors. The potential exists to create animation in real time but with approximately 10,000 data entries per day it would demand prior work on the XML generation process from the data store. This type of modelling is currently available if the rationale for its use exists. (University of Sheffield, 2010).

www.wecamp.group.shef.ac.uk/AHE/

Conclusion

Using location tracking software, combined with suitably anonymous student-related data, provided the managers of the building and service providers with a richer picture of behavioural patterns exhibited by students when using the ICT facilities available within different zones in the building. Beyond the end of the iBorrow project we are continuing to monitor how students respond to, and use, the spaces and ICT facilities. Based on the spatial and temporal data collected from tracking we have made adjustments to the positioning of the laptop trolleys; decisions about increasing the number of fixed PCs within the building and the sighting of these; and the mix of fixed and mobile resources provided within the building. We also extended opening hours and the iBorrow data was useful in monitoring the activity within the library zones during this extended time. The potential for this type of data to inform resource decisions can be obtained from swipe-card systems in most libraries. Augustine House is an 'open library' therefore automated user data is limited to loans and returns.

Our analysis of tracking data, even when coupled with student profiles failed to answer more subtle questions about factors that were significant in gaining an understanding of the role of the netbooks in learning, for example:

- What influences student choice between the different IT resources?

- What IT resources are used in a group context - netbooks and fixed PCs and students' own resources

- How do groups use the space and the IT resources?

- Is there a difference in applications used on different devices?

To answer these types of question required additional data which can only be collected using more conventional research strategies (see Chapter 8).

11:
Developing a sustainable solution

Augustine House set out to be a landmark building that would represent the ethos of a new type of learning but one which also met CCCU's commitment to sustainability.

> *In many ways, the location and quality of the University's estate is an outward expression of its vision and values.*
> *(CCCU Strategic Plan)*

Achieving this objective within a very constrained city centre location presented particular challenges for designers. CCCU embraced the BREEAM (Building Research Establishment Environmental Assessment Model) which describes sustainability not only in terms of the use of sustainably sourced materials, energy/water consumption and energy generation, but also as appropriateness of design and location, and its impact on the users of the building.

Renewable energy

A number of technologies for using renewable energy sources, e.g. photovoltaic cells, solar collectors for hot water, biomass boilers and wind turbines were investigated during the design phase. The conclusion was that these options were unviable at the time of design. The final solution adopted was geothermal heat pump technology. This was designed to supply at least 25% of the total energy demand for the building from a local renewable source. The factors influencing the final decision included:

- financial viability
- site conditions
- payback periods
- building usage
- infrastructure requirements

Geothermal energy

The geothermal option was the most financially viabile, since the up-front expenditure required to install the water circulation system into the structural pile infrastructure will be paid back by savings in the use of gas and electricity over a 10 year period.

The geothermal heat pump system takes advantage of the natural stable temperature in the earth. The system is used as a pump to extract heat from the earth to heat the building in winter, and a heat sink to disperse heat to the earth in summer.
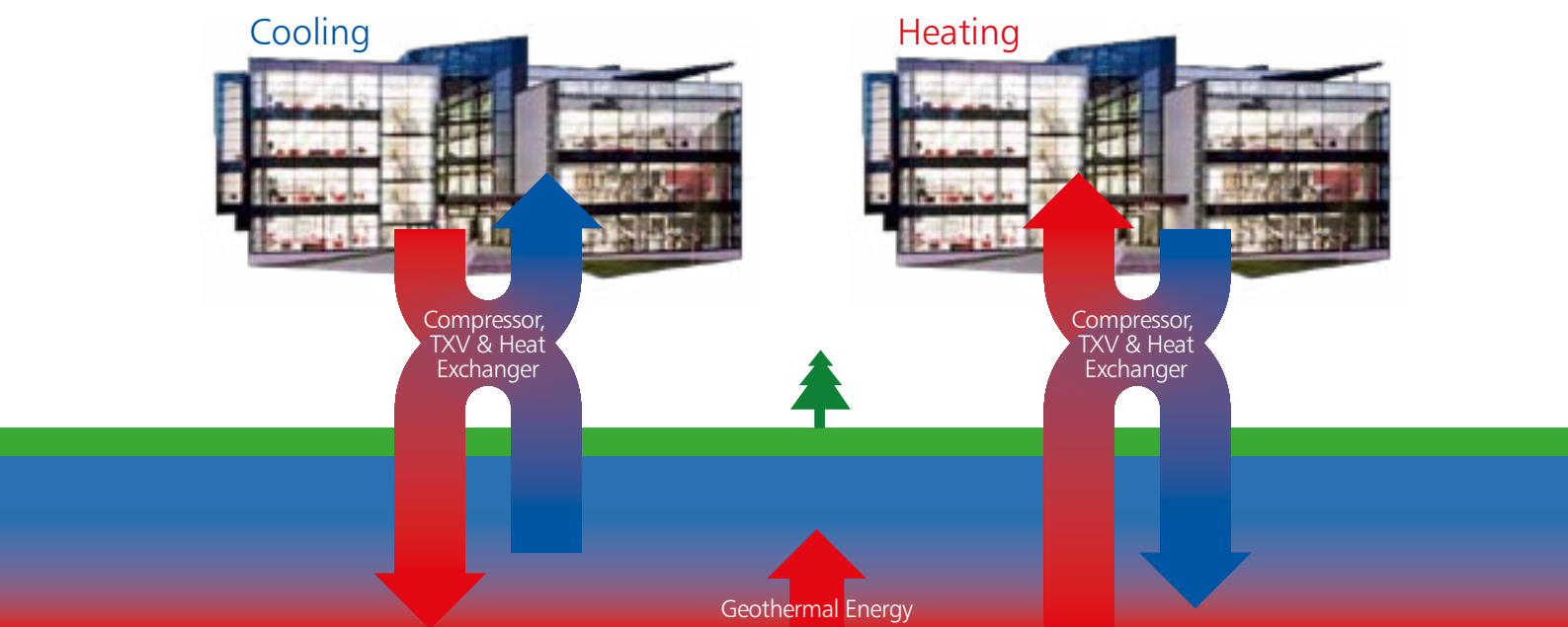
The closed-loops required by the system are integrated within 258 reinforced concrete piles to minimise disturbance to the ground. Heat pumps use compressors and heat exchangers similar to domestic fridges to remove heat or cold from the circulating water, depending on the time of year and the environmental demand. In designing a geothermal solution the key factors were:

- the temperature gradient below the building
- the capacity of the local geology to dissipate the excess energy
- the availability of land to support horizontal trench-based pipework

These factors combined and the ability to use the structural piles already part of the building design, meant that this was a very economical solution. It has no locally visible, audible or polluting impact on the environment, uses the earth's natural capacity and has a very high inherent reliability due to the simplicity of the technology.

Sustainable Option	Cost (over 'base cost')	Estimated Payback (if applicable)
Base 10% energy pile scheme	£360,000	n/a
Maximise the use of the energy piles -	+ £167,450	10 years
3 blade wind turbines	+ £49,000	23 years
Twisted wind turbine	+ £79,000	37 years
Roof mounted PV panels	+ £188,000	50+ years
Integral PV lights	+ £33,000	20 years
Solar HWS	+ £130,000	20 years
Rainwater harvesting	+ £ 204,000	n/a
Grey water recycling	+ £115,000	n/a

Cooling

Heating

Compressor, TXV & Heat Exchanger

Compressor, TXV & Heat Exchanger

Geothermal Energy

Maximising solar energy

The layout and design of the building sought to take advantage of the view to the city wall and maximise the amount of north light by introducing full height glazing on the north façade. Solid elements such as the fire escape stair cores, which limit the amount of glazing and hence reduce solar heat gain were placed on the south façade. The east and west façades have approximately 50% solar control glazing to let in natural light while limiting solar heat gain to avoid overheating.

A glazed atrium slices through the main volume of the building to introduce natural daylight deep inside, hence reducing the need for artificial lighting.

The exposed concrete soffit is used as a thermal store, thereby reducing overall building energy consumption by lowering the heating and cooling loads provided by electricity. Concrete has a thermal capacity such that its temperature changes very slowly. This quality allows the building to maintain a more consistent internal environment when the external air temperature changes during any normal 24 hour period. This reduces the energy input required to heat and cool the building during occupation.

Sustainable access

The site chosen was an underutilised brown field site close to excellent public transport routes serving Canterbury city centre. The site is very sustainable in transportation terms, being sited in the immediate vicinity of both the bus depot and train station, with several public car parks within very close walking distance and extensive Park and Ride facilities.

Taking advantage of the site location, the development sought to encourage the use of public transport by only providing operational parking, including some disabled parking bays, spaces required for wardens or caretakers and minibus parking for shuttle bus services.

The layout provides urban spaces in which pedestrians and cyclists have priority over vehicles. A safe cycle route is provided along the eastern boundary of the site bringing cyclists to cycle storage towards the rear.

- Parking
- Taxi Rank
- Bus Station
- Train Station
- CCCU
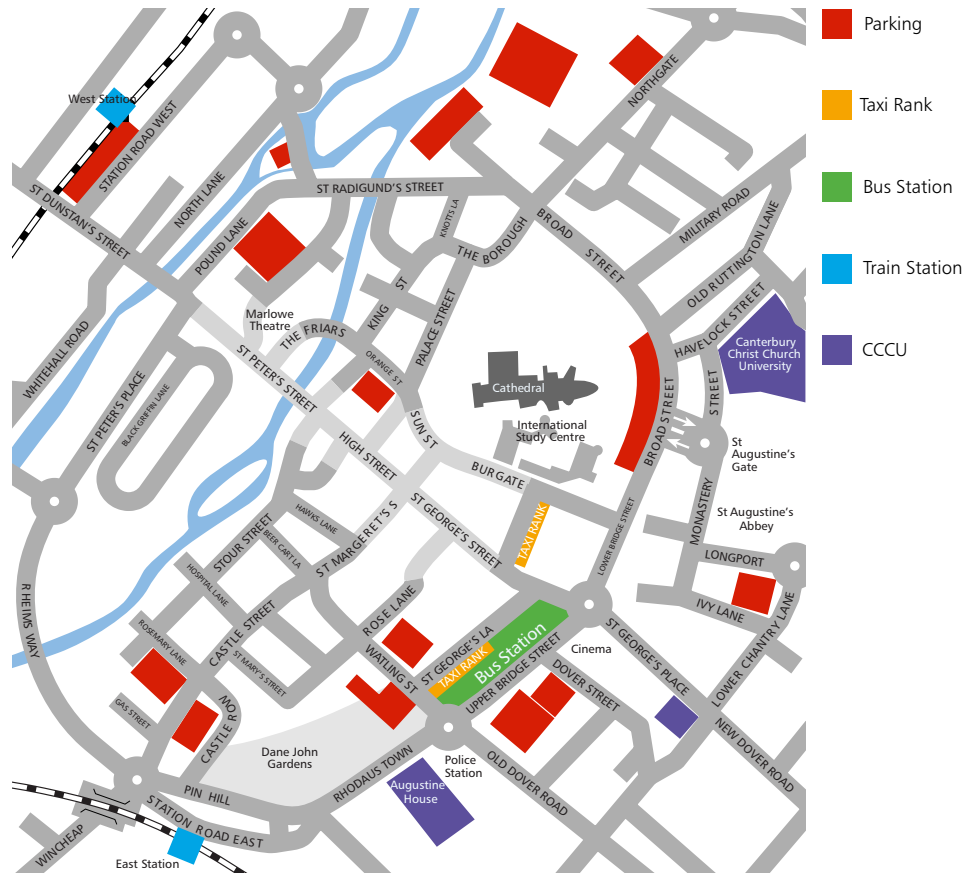
Sustaining the urban landscape

The front façade of the building seeks to complement the historic Canterbury city wall, which sits directly opposite to the site by reflecting it in the simple, glazed façade.

The building also draws in views toward the local archaeological, historical and cultural surroundings of Dane John Mound and Canterbury Cathedral in the form of clear glazed 'cuts' protruding from the façade. As a result, the building users are well aware of the cultural heritage of Canterbury around them.

A prominent flint element is incorporated into the external works at the front of the building. This ties in with the construction of the Norman city wall. In addition, the colours of flint, a range of greys including some reflective surfaces have inspired the choice of colours for the external elevational materials.

The project has sought to provide open spaces that are integral to the development in the form of high quality hard and soft landscaping around and as part of the building.

In the front of the site, the provision of grassed areas with trees of different heights and a pedestrian footpath between the road and the front of the building has acted to break the massing and profile of the building, and complement the green area in front of the city walls.

Towards the back of the site, a large lawn area takes advantage of the southern sun. As the building is designed to be multi-levelled, there are 'gardens in the sky' with landscaping on roof terraces both at the front and back of the development.

Green ICT

Computing resources at the University account for 25% of the scope 1&2 carbon emissions. In order to maximise the use of library space and electronic resources, the move to large-scale mobile iBorrow devices, providing a 50/50 split of mobile and fixed devices, was a new departure for CCCU.

There are three keys strands to the green ICT agenda:

1
Back end services delivery infrastructure

Server and desktop virtualisation consolidates services onto a more efficient server infrastructure (see Chapter 7).

2
End user devices with low embedded carbon and low energy consumption

Whilst the life of a mobile resource is generally regarded to be less than that of a fixed device the energy consumption can be up to 80% less. So this decision, whilst not wholly taken on energy saving grounds has provided a significant saving over a wholly desktop based provision Purchasing energy efficient desktop devices and printers is always at the forefront of the procurement checklist.

3
Power and use management of end user devices

Power management of desktop devices has been centrally controlled for several years. The use of intelligent scripts that hibernate or shutdown computers once logged off for more that 20 minutes has had a significant impact.

Flexibility for future use

While Augustine House was designed to meet the needs of CCCU, it will also provide new amenities to the local community as the multi-purpose hall and supporting facilities will be available to the public for events and functions.

Long term flexibility was of prime importance to the development. Through a simple structural solution and an adequate services provision, the building is adaptable for different uses over its lifetime. All mechanical and electrical services are easily accessible and reconfigurable, being installed below a suspended floor, which also acts as the plenum for air ventilation systems. By creating large open spaces, flexibility is imposed through the open plan philosophy. Temporary partitions and mobile office pods could easily be used to segregate spaces and provide elements of privacy.

www.jisc.ac.uk/whatwedo/programmes/greeningict.aspx

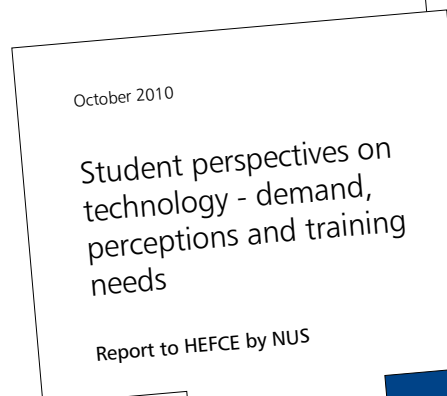# 12: Staff development for technology enhanced learning

This chapter details the ways in which CCCU has supported the professional development of its staff generally and in particular their engagement with Augustine House and iBorrow.

The need for professional development to support technology enhanced learning?

The UCISA survey (Browne, 2010) reported that one of the three key barriers seen by respondents to the use of technology enhanced learning was academic staff knowledge. Not surprisingly, staff development was seen as one of the key means through which the new demands that technology and change are placing upon the sector will be met. Other reports have highlighted staff skills, competence and confidence as key barriers to progress. The Committee of Enquiry into the Learner Experience (2009) considered the issue of staff IT capability as part of the digital divide. The report recommended that "HEIs support staff to become proficient users of an appropriate range of technologies and skilled practitioners of e-pedagogy, incorporating both into initial staff training and CPD programmes".

The experience of students also highlights the lack of digital literacy amongst staff. The NUS (2010) highlighted students' concerns over the ICT competency of lecturers and academic staff. "There are varying levels of ICT competence on the part of lecturers and staff and, whilst some are clearly skilled or at least able to function in an IT setting, others lack even the most rudimentary IT skills".

The HEA/JISC Benchmarking and Pathfinder Programme (HEA, 2008) noted that many participating institutions had moved on from discussions about e-learning, and "focused their attention on the use of technology to enhance learning and teaching, to support all aspects of the institution's business". This development is reflected in the change of language in the sector from e-learning to technology-enhanced learning (TEL).

JISC

October 2010

Student perspectives on technology - demand, perceptions and training needs

Report to HEFCE by NUS

Challenges and Realisations from the Higher Education Academy/JISC Benchmarking and Pathfinder Programme

An End of Programme Review by the Higher Education Academy, Evaluation and Dissemination Support Team

September 2008

Higher Education in a Web 2.0 World

2010 Survey of Technology Enhanced Learning for higher education in the UK

UCISA SURVEY

ucisa

Supporting TEL developments at Canterbury Christ Church University

All universities have their own models of support for TEL. At CCCU, support is primarily provided by three professional services; the Learning Technology Team operating within the Learning and Teaching Enhancement Unit (LTEU), the IT Training Team within Computing Services and the Faculty Liaison Librarians. These teams have all been in existence over ten years and each has adopted the model of one team member leading on the support for one faculty. The Learning Technologist provides pedagogic advice and consultancy on the planning and delivery of TEL, the IT Trainer provides the technical training on university systems and the Liaison Librarian supports staff with managing discipline library

resources and students' information skills. Gaining an understanding of the culture within a faculty and its departments has enabled them to build relationships through which they acquire the confidence of academic staff. The teams contributed to the staff development engagements which supported the launch of Augustine House. They worked alongside a further group of staff, the Learning and Teaching Coordinators, academic staff who link the work of the teams to their faculty.

CCCU engagement with the HEA/JISC Benchmarking Programme showed that although widespread use of our VLE could be evidenced, this was not always creative, and the use of learning

technologies was generally limited to the basic tools. It was identified that as long as staff lacked the confidence in engaging with emerging digital tools the majority would require technical training from the centre (professional services) as each new tool came along. This systems-led 'training' model was not resulting in the incremental rise in staff digital skills and confidence generally, and looked increasingly unsustainable. The digital world is one of constant change, with the number of tools available to use growing more rapidly than ever before. Staff would need to be able to exploit a range of tools, which they evaluated as being significant for their teaching, and not just the tools within the VLE.

The DEBUT solution

In 2007 the University launched a new approach to supporting staff to become more digitally literate, not simply acquiring skills with tools that the University identified as core but generally able to confidently investigate new technologies and applications without reference to central professional services. The DEBUT (Digital Experience Building in University Teaching) programme was initially funded as an HEA/JISC Pathfinder project which built on the Benchmarking exercise. DEBUT uses a situated approach to staff development grounded in the concepts of digital literacy (Westerman & Barry, 2009).

The DEBUT programme has run on an annual basis since 2007. Participants on each cohort are provided with a menu of tools and asked to choose a range of these to learn, to suit their needs and context. Learning these tools involves group workshops over six days around the summer break which facilitates participants to share practice as they learn.

All the teams that provide staff development for TEL at CCCU work together to provide the DEBUT experience. Since 2007 nearly 150 staff have undertaken DEBUT and overwhelmingly they have evaluated the programme as contributing to a significant increase in their digital literacy. Many now confidently try out and use technologies in their learning and teaching and often become 'champions' within their collegial groups leading on planning for their use.

Photo Editing
Search it
Digital Photography
PowerPoint
Netvibes
Desktop Video Conferencing
Podcasting
Personal Portals
RefWorks
Wimba Create
Bb Wiki
Huddle
Quizdom

DEBUT
Digital Experience Building in University Teaching

> " *The net effect has been a real growth in my confidence about my ability to deal with technology overall because I have learnt that actually it is quite intuitive. Most things nowadays are quite logical or at least maybe logical and intuitive don't go hand in hand but there is something that works in a fluent way about the way you operate things.* "

> " *It makes you aware of all those other things available.* "

> " *It has widened my understanding broadly of the possibilities that could be used for personal, professional or educational development.* "

> " *I feel much more confident … if I just fiddle around then something will come up and at the end I can just get rid of it and unfiddle it. Before I was so petrified about … I don't know … it not working out.* "

> " *It has made it very clear in my mind what I can see myself using or what I can see the value of.* "

> " *This [digital video] is proving to be a valuable experience in lots of ways, both in terms of reflecting on my own learning and my students' and also because my confidence has improved so much.* "

> " *It has been interesting to integrate the different digital tools. I have used pictures from Flickr and updated the reference lists used at the end of the [PowerPoint] presentations using RefWorks.* "

> " *You wouldn't believe how much my IT skills have developed. Now I can use sound, podcast and the other day I downloaded an audio book. Now I wouldn't have had the confidence to do something like that before but now I feel I can press buttons on my computer and it won't break.* "

New learning spaces, new challenges

Despite the availability of professional support and our success with DEBUT, like many institutions, CCCU has some staff for whom new technologies and their potential for teaching and learning strategies are challenging or appear irrelevant. For the HE sector this issue will increase in significance as technologies are used to support all aspects of learning and teaching, not just niche distance programmes.

For CCCU there was the additional concern that the success of Augustine House would be contingent on the extent to which staff engaged with the technologies and the spaces within the building. Often it is academic or programme administrative staff who students rely on to signpost them to other services and departments. Therefore, prior to opening, the decision was made to acquaint academic staff with Augustine House and to encourage them to question how they and their students would interact with staff, space and resources within it. With the opening of Augustine House the institution not only had a new library and flexible learning space, but a new home for all student-facing services with a single help desk through which student queries were channelled. In conjunction with the opening of the i-zone, a bank of online self-help resources were also created for students to foster a culture of self-help. Academic and professional staff needed to be informed of these new arrangements and supported in finding mechanisms to best guide students in their use. For example, academic staff would need to consider the timetable and pattern of their programme to enable students to make the most of the resources and space afforded by Augustine House and the best use of their time. Students needed more significant chunks of time in their timetable to work in a resource rich environment with a mix of individual or peer learning alongside tutor support, outside of a classroom context.

As has already been indicated, Augustine House potentially offered very new ways of working and learning. Students could talk, eat, were expected to access a range of technology, could reconfigure spaces and help themselves to resources, including mobile netbooks. The provision of opportunities for active and collaborative learning were key to the vision for Augustine House. In addition to formal bookable group areas, the building has many spaces designed for informal, ad hoc group working. To support this activity, students can use the iBorrow netbooks, projectors and whiteboards. However, many students need their academic staff to model or validate these new patterns of learning before they feel confident and comfortable adopting them. It was anticipated that staff would talk to students about how to use the new building and that they would devise collaborative and group activities to encourage new styles of learning and use of the facilities now available but also be part of these learning activities. A series of case studies has been produced with the aim of encouraging tutors to find ways in which they wish to use the resources with their students (see Chapter 14).

Professional development for large-scale learning spaces

There was a question as to whether academic staff would readily embrace the opportunity to use a building ten minutes walk around a ring road from the main campus. Additionally the decision had been taken early in the project that there would be no bookable 'teaching spaces' within the building other than group study rooms for by students.

In the year leading up to opening a wide range of publicity, presentations and discussions were organised to enable staff to establish their attitudes towards the new resource.

In the weeks prior to opening the professional staff began their work. Each faculty team (the learning technologist, trainer, librarian and learning and teaching coordinator) talked to staff, gave presentations, and familiarised themselves with the building and the opportunities it afforded.

The faculty teams developed faculty-tailored tours of the building for staff and continued to run a significant number of these during the initial opening months of the building. The library staff also provided student tours, with their academic staff in attendance. In some faculties, the tours were quite formal and large-scale. In others a more informal small-scale visit was preferred. However, in both types of visit the supporting staff would highlight key information and key benefits of the building to academic staff.

Conclusion

With the building now having been in operation for nearly two years, the staff development effort continues but has evolved. Familiarisation is still part of the effort, but this is now targeted at new staff, and associate staff, with their conferences being held in the building whenever possible.

Some students interviewed in Augustine House reported that their tutors had modelled the use of the facilities and that their use of them had been heavily influenced by those experiences. Other students had received less direction from their tutors but they had support from peers. The good news is that students just get on with it and for many it has become their primary learning space.

The number of tutors engaging their students through using resource-based tasks in the library continues to grow. The opportunities offered by Augustine House are increasingly appearing within curriculum design during the planning and validation of programmes. Furthermore, as part of the DEBUT programme, an option has been developed on the use of the technologies and space in Augustine House.

Built on the pedagogic scenarios model developed by Collis (illustrated in Chapter 14) the next phase in staff development for Augustine House is the generation and dissemination of case studies illustrating the possibilities. The hope is that vehicles such as case studies for sharing successful practice will support a critical dialogue between tutors and within course teams.

Despite the efforts described here there is more work to do to engage staff with Augustine House and all it has to offer. Many academic staff are not clear on how best to use the spaces, or convinced of the benefits of using peer/social spaces within their existing learning and teaching practice. Many have expressed their concerns around moving from a controlled classroom to the uncontrolled environment of large-scale learning spaces. In recognition of this there are currently plans to redesign some spaces to allow tutors the opportunity to meet, brief and debrief students without disturbing others, a development welcomed by many staff.

13: Managing institutional innovation: a view of change management in HE

A 'definitive approach' to the management of change does not exist. In his critical review, Rune By (2005) concluded: "… what is currently available is a wide range of contradictory and confusing theories and approaches, which are mostly lacking empirical evidence and often based on unchallenged hypotheses regarding the nature of contemporary organisational change management." No models exist specific to HE, where 'projects' often lead changes.

All this increases the importance of informed professional judgement in HEIs, in times when calls for change are non-stop, and creating an organisational culture ready to cope with change is part of the management challenge.

This article offers a sense of position in difficult terrain. It sketches a history, sets out the main models, identifies the leading 'gurus', and offers an adaptable example which incorporates commonalities between the many models. You must add your personal experience, judgement and partialities to decide the best path for you. What follows aims to aid your professional judgement by indicating the boundaries of uncertainty. It always helps to know what you don't know.

Today's management gurus

Checking the 'gurus' on change management reveals their advice is mainly based on experience accumulated over 50 years from the space race, and a variety of mostly American business concerns. Only recently has HE in the UK and Australia become a source of relevant experience. The focus has moved from mechanistic sequencing programs to acknowledge the importance of the organisational, social and psychological contexts of change. There is no coherent theoretical underpinning of the many models. Reviews abound, but evaluations of models in action are all too few.

The business world provides most contemporary gurus. The eight step model of change management, developed by John Kotter of the Harvard Business School (1996) features prominently on UK government websites. But Kanter and others (1992) had already identified 'ten commandments' for executing change, and Luecke (2003) has since identified seven steps towards the same end.
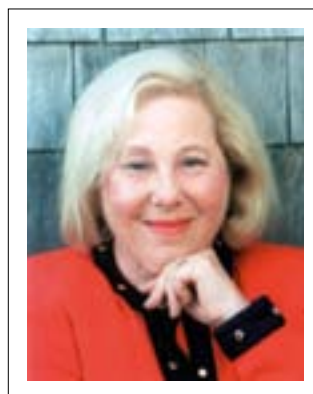
In school-based education, Michael Fullan (2008) provides the reference points. Recently he has emphasised 'six secrets of change' in recognition of a contemporary emphasis on fostering change-ready climates within organisations.

Michael Fullan   *Randall Luecke*   *Rosabeth M. Kanter*   *John P Kotter*

Models of change

In 1960s America, three large-scale change strategies aimed for wide spread take-up through purposeful dissemination. The smaller scale *Institutional Development* model gained later acceptance. All four are still detectable in today's approaches.

Change strategy	Description	Augustine House/iBorrow
Empirical-rational Planned change in response to evidence of a need for change. This model still has a general relevance.	In the early 1970s the *Empirical-rational* approach led to international use of the RD&D, *Research, Development and Diffusion* (or *Dissemination*) model. This was used by curriculum development quangos to guide changes in schools and FE colleges. But by 1980, as a large-scale model, it had unfairly fallen into disrepute, largely because results were expected too soon, with insufficient support at operational levels, and poor long term funding. Nevertheless, the late 1980s saw increasing adoption of RD&D at local levels. A growing professionalism in HE management helped wider adoption in HEIs, but levels of success were strongly affected by different histories and internal structures.	The need for development of our library learning resources came from student and staff feedback, and the Augustine House project answered this obvious need to improve available space and facilities. iBorrow and the provision of mobile technology within Augustine House was a response to a perceived change in how students were being directed, or choosing, to learn. This publication is part of our dissemination.
Normative-re-educative In Britain, this is better understood as *Professional exchange*. *Professional exchange*, and aspects of a RD&D approach, often feature strongly in use of the *Institutional Developmental* model.	A *Professional exchange* philosophy has been particularly strong in Britain. It values the exchange of information about good practice between fellow-professionals while preserving their autonomy of action. The *Institutional Development* model, closely associated with RD&D, has social psychology origins. It is based upon regular institutional self-review, and assumes a participatory and collegiate style of management, but is not always seen that way by staff. International adoption by the School Improvement Movement, and its operation by the 1990s UK School Management Task Force, further increased its prominence. All its forms include some kind of action cycle, e.g. Scan for priority problems; Plan; Do; Review; and start again.	The Augustine House team visited HEIs of interest and produced an illustrated report to aid the project team's decision making, and communication with the architects and others. Scanning existing practice helped the iBorrow team decide to adopt a 'Collect, use and return' system for deploying its laptops JISC exists to promote professional exchange within the HE system, and its work to promote an understanding of learning spaces, and the role of mobile technologies, is manifest in both CCCU projects.
Power-coercive Known as *Political-administrative* in Britain. It has operated via cascade style dissemination to introduce changes to the assessment and examinations systems.	In the late 1980s the government reverted to a *Political-administrative* approach to educational change. Since then actions of central government have increasingly impacted upon the HE system. The introduction of the Research Assessment 'exercise' is one example. The role of the Quality Assurance Agency (QAA) in monitoring policy implementation is another.	Although JISC funding played its part in supporting our curriculum change, this Power-coercive model does not apply to either the the Augustine House or iBorrow projects. The motivation to invest in such large-scale developments did not come from any policy of central government. The 'student as consumer' demanding value for money in terms of university resources could be seen as a bottom up example of power-coercive change.

> " *If we want things to stay as they are, things will have to change.* "
>
> (Giuseppe di Lampedusa)

> " *Change has a considerable psychological impact on the human mind. To the fearful it is threatening because it means that things may get worse. To the hopeful it is encouraging because things may get better. To the confident it is inspiring because the challenge exists to make things better.* "
>
> (King Whitney Jnr.)

> " *If you want to truly understand something, try to change it.* "
>
> (Kurt Lewin)

> " *It is not necessary to change. Survival is not mandatory.* "
>
> (W. Edwards Deming)

A general purpose model

The following approach draws on commonalities in current models, and the author's experience in UK education. It best fits short or medium term time-scales, and you need to adapt it to fit what kind of change you envisage, your context, and your resources. Its 20 components tackle some detail behind models that seem to have fewer. So, find something in the literature that speaks to your partialities, and adapt the following to your change culture.

Establish a core steering group of relevant power-holders able to take decisions that matter and will stand. The power lines of this group will determine how well the changes eventually take root.

Identify what the change is meant to accomplish and criteria for its success. Agree a description, *The Vision,* that can be readily communicated to others, emphasising the gains that will accrue.

In preparation, it is vital to gather intelligence, if possible from similar HEIs who have experienced similar changes. Consider possible 'pilots'.

Generate a sense of urgency by laying down time-lines.

If appropriate, set up sub-projects with specialist teams that have their own steering groups, and work to a recognised project management process. Employ specialist project teams on short-term contracts if really necessary, but this can make final assimilation more difficult.

Communicate! Communicate the vision using every means available. Strong project logos and well designed newsletters are still as important as using ICT and Web2.0 networks. Communicate widely any progress made as soon as it happens, and give public credit to those responsible. Communicate regularly, and don't be too afraid of repetition.

Employ an experienced, independent, but honest and friendly evaluator who will provide informal formative feedback as well as brief reports.

Don't worry about negative attitudes too early. Change the context and the necessary behaviours, and changes in attitude, will follow. But keep alert.

As obstacles to change emerge, work round them, or use financial muscle to help remove them. This may mean procedures have to be altered, or additional equipment acquired.

Provide strong leadership to repeatedly demonstrate where the changes will take people, and the gains to be made.

Delegate tasks and powers as required, but do not lose control. Monitor events.

Monitor progress in regular formal meetings using a wide range of formal and informal sources of evidence. This requires clarity about: aims, success criteria, and what counts as evidence that the criteria are met. Financial records often lag too far behind events to offer much help.

Use specific training of groups, and demonstration/coaching for key individuals, to encourage accommodation and adaptation. This will help to consolidate the changes into new procedures and eventually promote assimilation.

Think laterally about how to reward good outcomes. Public recognition, increased responsibility, help with enhancing CVs, gaining publications, and career advancement may all be considered before financial rewards.

Identify talent, and offer training and other opportunities to encourage its development. This will benefit the whole organisation in the longer term.

Do whatever seems called for to consolidate the changes.

Keep monitoring because changes take time to bed in, and there is always need for adjustment.

Organise events to celebrate publicly the attainment of key milestones. The more these relate to visible change, the better.

Tell everyone how the success of the change has brought about gains for students, staff, and other stakeholders such as the local community.

Use the experience to cement the image of the organisation as proactive in meeting future challenges.

> " *I cannot say whether things will get better if we change; what I can say is they must change if they are to get better.* "
>
> *(Georg Christoph Lichtenberg)*

The nature of change

Contradictions and confusions in theories of change management are not surprising. There are many different combinations of change and its context. Processes and procedures outlast their time. Technological developments keep coming. Then there's legislative change. And let's not forget the changes required as staff move on, or as buildings no longer function as required.

The major factors affecting decisions and actions are: the scale and type of change, its time-scale, and the resources available for its achievement. Other essential considerations are the people dimension, and the culture in which the changes must operate. Most models of change management come from business and commerce. But how far do values, imperatives and available rewards in the business world match those within charities, not-for-profit co-operatives, social services and the educational sector?

There is no model of change management specific to HE in the UK, and yet HE managers are expected not only to manage an increasing rate of change, but also to encourage change-ready cultures in their HEIs. Thankfully, there are common features in the models on offer. These are built into the 20 component adaptable exemplars on page 60.

Many HEIs and other complex organisations manage change via projects. CCCU has adopted PRINCE2 as its standard procedural template. It was deployed in the management of both the Augustine House and iBorrow projects.

JISC resources

Management of change literature specific to HE in the UK is hard to find. JISC's *Change management* infoKit provides access to what does exist. The infoKit is based on a University of Luton led, HEFCE project, and the project team concluded:

- There are no easy solutions
- Adapt processes to suit the change intended
- Change requires teamwork and leadership (and the two are related)
- Work with the culture (even when you want to change it)
- Communicate, communicate, communicate
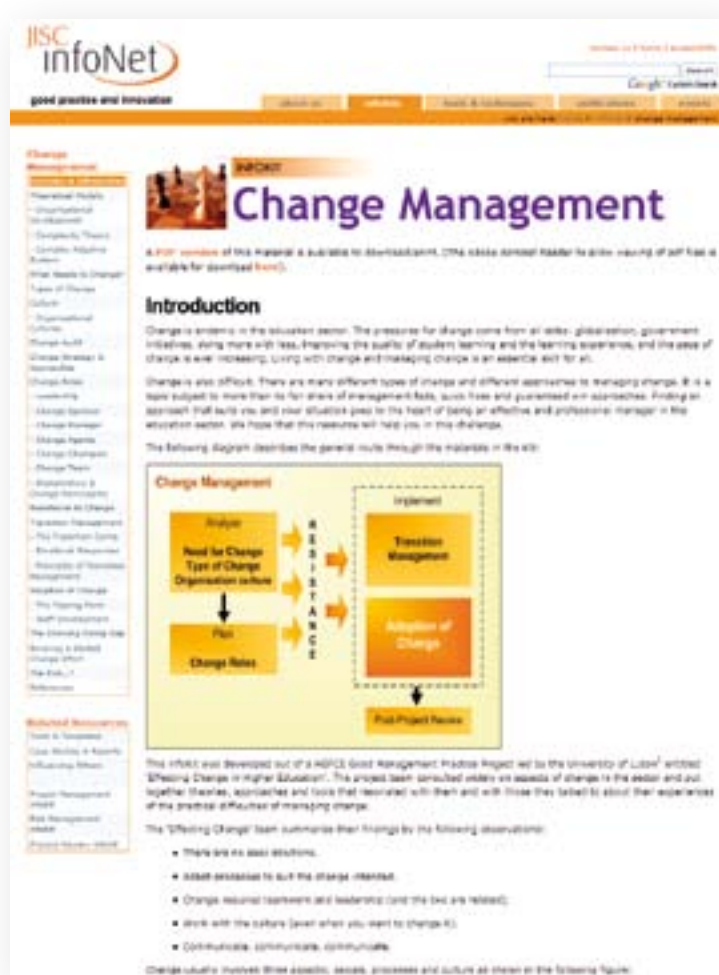
The infoKit is available at:
www.jiscinfonet.ac.uk/infokits/change-management

> 66 *It's not the progress I mind, it's the change I don't like.* 99
>
> *(Mark Twain)*

> 66 *There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.* 99
>
> *(Niccolo Machiavelli)*

14: Towards aligning pedagogy, space and technology

What is a learning space?

The concept of a 'learning space' is problematic as various stakeholders invariably will not share the same common language or understanding of the term. For architects, estate planners, educators, psychologists, librarians, learning technologists, tutors and students it will mean something more than just a pure physical space, embracing sensory, virtual, social and cognitive spaces. Introducing emergent (e.g. mobile) technologies into the learning context creates further complexity as they add their unique characteristics and opportunities. When presented with a means to explore and make sense of new spaces and technologies tutors may plan and develop innovative pedagogic practices and approaches to enrich the learning experience. However, their students may exploit or subvert these plans as they make sense of the new environment and encounters within tutors and their peers.

Troublesome spaces

Media rich, large-scale learning spaces appear to have the potential to provide innovative opportunities for a rich and diverse array of learning contexts and encounters which students find stimulating and which promote learning.

However, Radcliffe (2008) cautions that "Peer to peer/social learning spaces are some of the most talked about areas within educational institutions and also the least understood and studied." Temple's (2007) literature review of learning spaces showed that a significant proportion of the literature makes various claims about the benefits of learning spaces which are either anecdotal or are not empirically supported.

The potential opportunities provided by new learning spaces can become 'troublesome spaces' for tutors due to their:

- not having developed a thorough 'mental map' of the learning space and the facilities that are available in and around it
- underestimating the time involved in designing and planning for these 'learning events'
- attempting to control an unpredictable and open 'teaching' environment
- existing learning and teaching philosophy

Students also experienced Augustine House as a 'troublesome space'. It was not always clear to them what they can and cannot do in certain spatial configurations; this was further compounded by the fact that they perceive it as being "just a library".

Aligning space, technology and learners

Much work has been done to try and investigate a relationship between pedagogy, space and technology and whether these three elements are, or can be, aligned in some way.

> " *…the convergence of technology, pedagogy, and space can lead to exciting new models of campus interaction.* "
>
> *Oblinger (2005)*

Pedagogy, Space, and Technology: The 'Elusive Triangle'
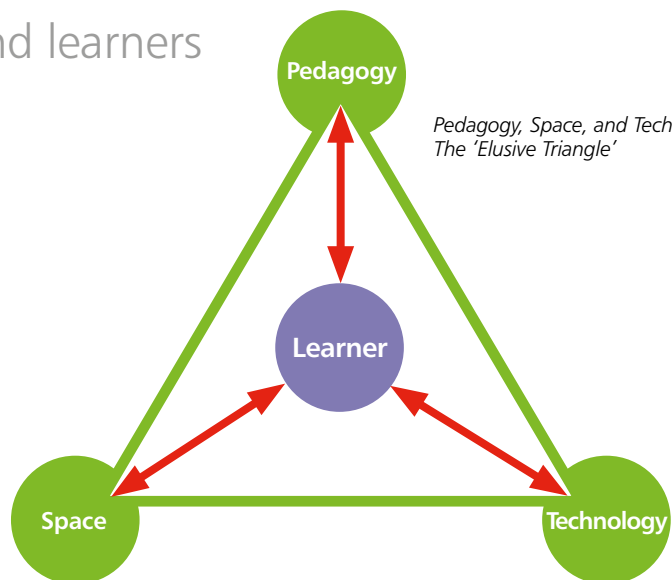
Radcliffe (2008) provided a tool that uses the relationship between pedagogy, space and technology in order to inform the design, operation and assessment of learning spaces, with each of the three elements influencing each other in a reciprocal manner. It places great emphasis on the importance and arrangement of space to influence patterns of learning and teaching.

Fisher (2005) went so far as to propose a range of pedagogies that could be used, depending upon the subject matter, to support a range of student skills and competences that could be linked to particular spatial configurations that lent themselves well to these learning activities.

The varying experiences of both academic staff and students surrounding Augustine House and the iBorrow netbooks suggest that within any given learning space there is a constant negotiation between pedagogy, space and technology. A conceptual model has been tentatively proposed which shows pedagogy, space and technology as creating an 'elusive triangle' with the learner based in the heart of the three elements. The triangle is 'elusive' because it recognises that the intersection and interplay between the three elements and the learner is complex and problematic and the relationship is not always fully understood.

The triangle itself represents the 'learning environment' in which all four elements play an active part. The 'learner' is an active participant inside the 'pedagogy-space-technology' triangle, influencing, and being influenced by, these three elements according to the situation and context. What is currently missing from the model is a notion of time as the learning experience changes and evolves over time for any given space, technology, group, context or tutor.

JISC, 2006: www.jisc.ac.uk/media/documents/publications/learningspaces.pdf

Case study

A fortuitous delay over security allowed the researchers to observe how students were occupying the various learning spaces before and after the iBorrow netbooks were introduced into Augustine House.

The first plan view below of Augustine House shows a third floor space prior to the introduction of iBorrow. It shows only a few students using their own laptops (purple squares); most of the other students were sitting at desks with fixed PCs (red squares). Access to a computer is on an individual basis and the social interaction limited.

In contrast, the second plan view below shows the same space a few months after the introduction of iBorrow. Now extensively occupied by students with iBorrow netbooks (green squares) and with the fixed desktops still in heavy use, it appears the iBorrow netbooks allow students to occupy spaces of their own choosing, working with or alongside friends who are not necessarily engaged in a shared activity. Such social interactions were not so observable with the fixed PC areas.

Professor Betty Collis, the pedagogic consultant on the iBorrow project, cautions that:

"...it remains frustratingly difficult to isolate the impact of a particular learning space or intervention on learner development..."
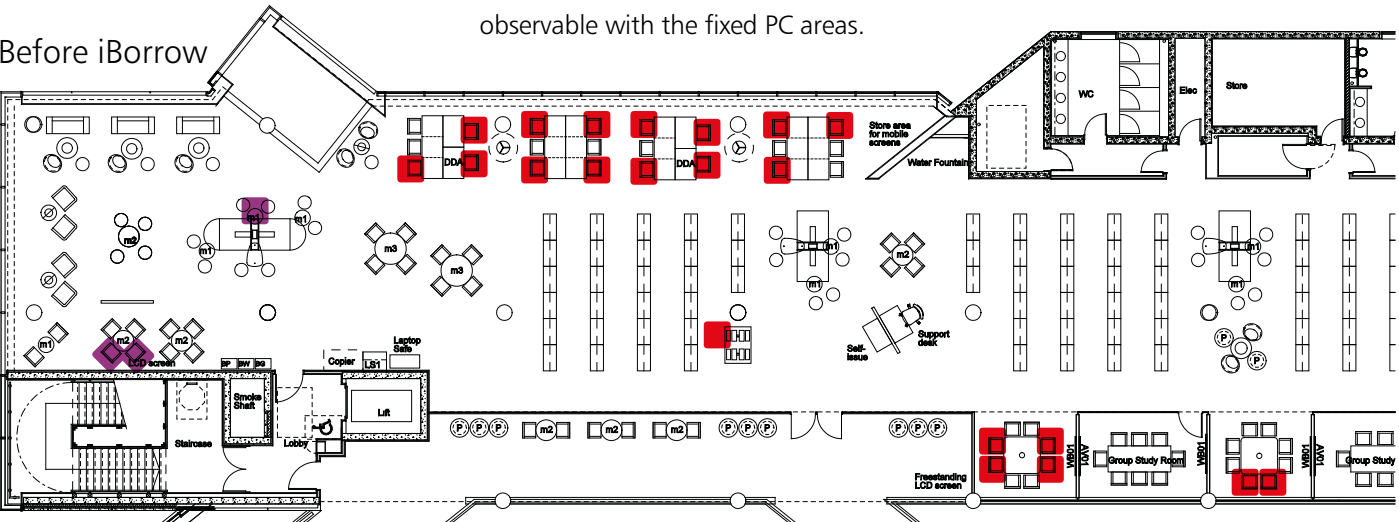
Before iBorrow

Augustine House (Before): Third floor (East wing) October 2009

KEY: 🟥 Desktop Users   🟪 Own Laptop Users   🟩 iBorrow Users

After iBorrow
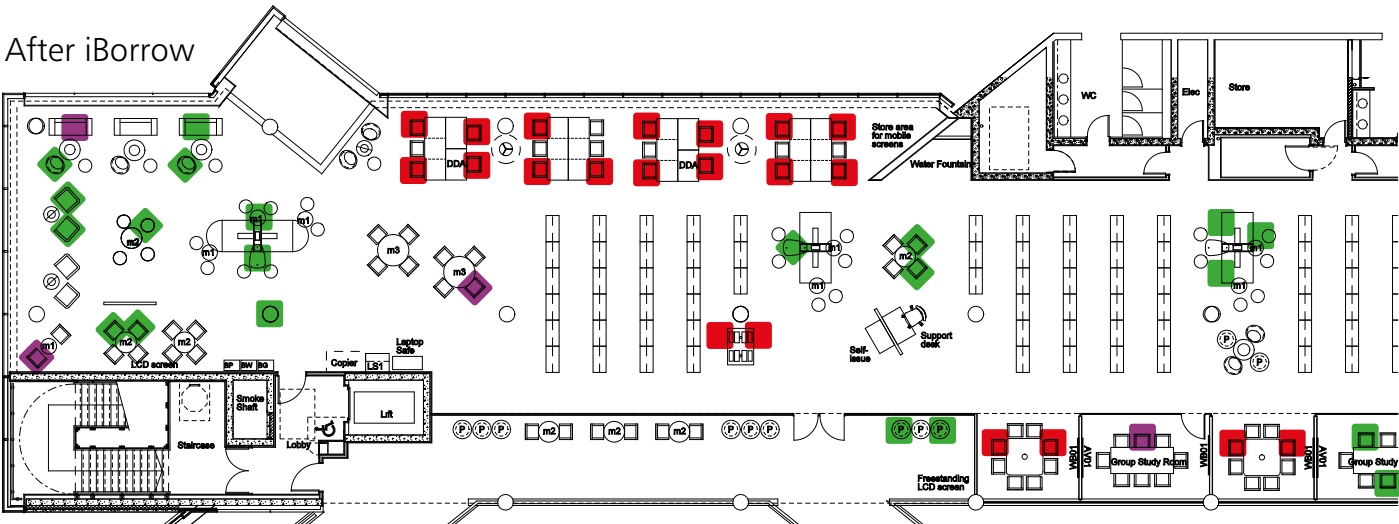
Augustine House (After): Third floor (East wing) February 2010

The student interviews (see Chapter 8) highlighted that the portability of the netbooks, coupled with the flexible spatial configurations of Augustine House, afforded them the capacity to work within different social and spatial configurations and that they were able to choose the technologies that they wanted to use and the spaces that they wanted to occupy, in order to study or undertake assignments.

Senior management, planners and architects of large-scale learning environments work to achieve a successful balance between the proportions of open, social spaces and closed private spaces that are made available to students. However, the troublesome nature of large-scale learning spaces produced contradictory message emerging from our feedback:

- Our aspiration in designing the spaces was based on a social learning model, but feedback from many students showed a preference for 'silent spaces' free from noise and other distractions allowing them to 'focus' on their work with the additional benefit of feeling 'safe and secure'.

- The lack of a shared vocabulary or values surrounding behaviour in 'a library' showed as a tension for tutors, librarians and students between traditional studious behaviour which was challenged by the open, flexible spaces that promoted social and creative engagement.

- Students' use of the spaces was almost wholly self-determined. Few reported their tutors directing them to the resources. Despite the availability of tours and workshops run by library professionals to show them how to use the facilities, students looked to encouragement and direction from their academic tutors to provide inductions and undertake authentic tasks within the spaces.

- As the Library and Student Services Centre, Augustine House may have signalled to academic staff that the relationship between themselves, students and the space would be based on a traditional library model rather than being required to induct students into a rich variety of learning spaces.

- Even teachers who recognise that the new 'learning spaces' were not synonymous with traditional 'teaching spaces', found their early experiences in engaging students with the resources challenged their skills and perceptions of teaching and learning and required them to adjust these strategies.
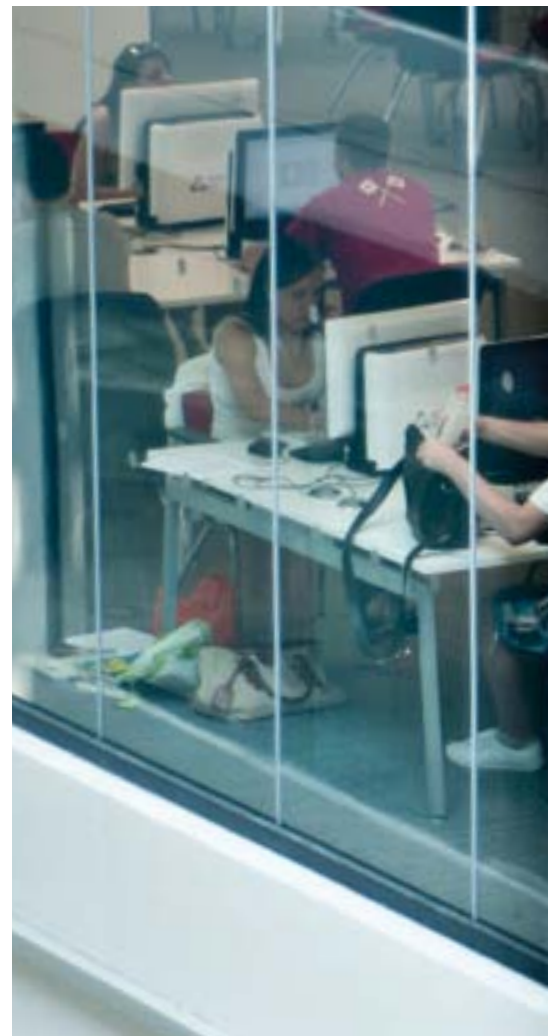
Conclusion

Some tutors have demonstrated they can circumnavigate some of this 'troublesome space'. Firstly, they develop a thorough 'mental map' of the learning space and the available facilities, and in doing so, were to an extent able to minimise the risk of the 'troublesome space'. Secondly, we provided a suite of development opportunities where staff can explore a number of scenarios which appear to be facilitated by this particular blend of 'physical' and 'digital' spaces.

Planning and evaluating learning spaces

To enable the project and tutors to plan, capture and understand the nature of learning taking place, Professor Betty Collis helped develop a tool which we termed a 'Pedagogy Scenario'. The tool asks the tutor to consider and reflect upon the nature of the activity to be performed or carried out, how it would be resourced, how many students would be involved and whether they would be placed into groups, the spaces which the students would occupy, and the kinds of technologies that would be adopted to support this activity.

Pedagogy Scenario

Question	Coding	
1. How many students involved:	(a) One? (b) A pair? (c) A group?	(c) Group (10 students)
2. Nature of activity:	(a) Process (study, discuss, deepen understanding, etc.) ? (b) Product (produce something for assessment)?	(a) Process (discuss, share ideas about L&D initiatives particular to their organisation)
3. Nature of study resources being used:	(a) Developed by the group/individual? (b) Located in the library/via the network?	(a) Developed by the students themselves and (b) idea generation and mind mapping tools located via the network.
4. Type of activity:	(a) Catch up, review, study for exam? (b) Project work? (c) Prepare for practicum or field work? (d) Short exercises?	(a) Study/review/reflect for assessment
5. Focus for communication:	(a) For organisation/information needs? (b) For peer feedback/learning dialogue?	b) For peer feedback/learning dialogue with tutor.
6. Who chooses how to use AH:	(a) Tutor? (b) Student?	(a) Tutor (but could also include (b) if students make further decisions themselves about when they should meet to work in AH.
7. Role of the tutor during AH use:	(a) Planned availability (virtual or face to face or phone)? (b) Unplanned availability but could be contacted? (c) No availability?	(b) Unplanned availability but could be contacted.
8. Use of technology within AH	(a) To capture, retrieve, work on, share knowledge, knowledge products (group archive, group workspace resources, group memory, etc)? (b) To access study materials from expert sources? (c) For individual organisational needs (note taking, document management, accessing VLE for organisational purposes, printing, etc)?	(a) work on, share knowledge/ knowledge products.
9. Which zone(s) of AH is most likely to be helpful?	(1) Individual reflective? (2) Group reflective? (3) Enclosed collaborative? (4) Semi-enclosed collaborative? (5) Open lounge collaborative? (6) Flexible interactive? (7) Stand-up IT? (8) Support? (9) Printer/copier? (10) Coffee area? (11) Other area for informal contact such as an outside terrace?	Zone 2 (Group reflective) during preliminary planning and idea development.

Resources

JISC's infoKit *Planning & designing technology-rich learning spaces* contains a wealth of information, materials and resources to help planners, policy and decision makers, and educators to begin the task of planning and developing their own learning environments.

The infoKit is available at:
www.jiscinfonet.ac.uk/infokits/learning-space-design

JISC infoNet on Learning Spaces

Conclusion

Despite international interest in learning spaces spanning 15 years, our understanding of the nuanced dynamics of pedagogy, space, and technology is still fairly new, and in some cases uncharted territory. Augustine House has provided the opportunity to begin an investigation of how our students' learning patterns (the 'learner footprint'), are, or can be, influenced within a large flexible space using mobile technologies, and the extent to which they are driven by tutor-led, or student-led, learning activities. (see Chapter 17).

It would seem that if tutors want to engage their students in using the spaces and facilities offered by a large-scale learning environment, there first needs to be a shared vocabulary to support a discourse around the experience. Within these spaces the boundaries are blurred between 'library' and 'social'. Tutors need to be active users of the space, modelling patterns of behaviour which can inform students' motivation and attitude towards use of the space.

15:
Across the sector

Following a successful iBorrow conference in Augustine House in March 2010, attended by over 50 institutions, we continued to host visits from 30 institutions and in some cases provide a days consultancy, courtesy of JISC Benefits Realisation phase of the Institutional Innovation Programme.

We canvassed colleagues who engaged with iBorrow a year on for progress they have made with mobile learning in their own institutions. Below are some of their responses.

Pete

We looked into the possibility of loaning netbooks as opposed to laptops to our students. Taking inspiration from Canterbury, namely the use of solid state drives, we began piloting a self-service scheme with just five netbooks – this has been so successful we have just ordered another 16. It is not on the scale of the technical achievement at Canterbury but does rely on some of the same principles where the students are concerned – trust and honesty!

Jon

We are now trialling the use of loaned laptops in one of our libraries. The library is quite difficult to fit with fixed PCs, so we supplemented the fixed PCs with about 15 ordinary laptops and netbooks running the standard student build of Windows 7 and connecting to the network wirelessly. The laptops are loaned from the Service Desk and can only be used within the library. We haven't evaluated the trial yet, but things are currently looking positive and the students certainly use the laptops.

Linda

We launched our own netbook loan scheme in January 2011. We have 50 Samsung netbooks and 10 Samsung laptops spread across 4 cabinets. As with the iBorrow scheme, students are able to help themselves to one and take it away to work on. The machines are loaded with our standard Windows 7 desktop image and authenticate to the wireless network during boot up. Students from each of the three institutions are presented with the same login screen as the PCs and can access MS Office applications, the internet, network drives and printing. Security is provided by an Active RFID system. Each netbook has an RFID tag fixed to the lid. An antennae is installed in the entrance and will trigger an alarm if a netbook/laptop is detected leaving the building. Labstats from Computer Lab Solutions is installed on each netbook/laptop and allows us to monitor how many are in use at one time.

Whilst no formal data gathering has been done yet, day to day evidence shows that the initiatives have proved popular.

Dawn

Many thanks for your interest, we have implemented a trial of loan netbooks within our library building.

Rachael

This is all budget-dependant but we are hoping to carry out a refurbishment of one of the floors of our Library to include more bookable group study space. This however has not been finalised! We've been looking into providing a mobile classroom based on a lockable laptop unit. As a precursor to this we're conducting an overhaul of teaching rooms with a focus on flexibility of space usage. We have a server virtualisation project in the pipeline and next year we will be investigating desktop virtualisation. We already have an integrated Library and IT Help Desk and are looking to further use our new service desk software in other service points around the College. There has also been some suggestion of an iBorrow-type project for 2011-12 so we will see where that leads us.

Amber

Since our initial contact with iBorrow we have introduced our own self-service netbook loan scheme. This provides 60 issue-free netbooks to students (and staff) for use in the Library only.

Michael

We really enjoyed the conference last year and have subsequently expanded on a few of the ideas you had to help us redesign our largest open access facility last summer.

We do have plans to increase our mobility much in line with what you had done. However that is a long term strategic project with virtualisation a corner stone of it (hopefully for the 2011-2012 academic year) though at present details are not finalised.

Really loved the ideas you provided for an integrated service desk, however we do not have such services centralised at present, though we have passed on the information to the University Librarian.

The main thing we wanted from iBorrow was the portable computing you had created, bearing in mind we haven't got virtual desktops yet. We set about creating an environment where the mobile computers could be used in conjunction with physically placed desktops.

To do this we needed quite high powered and therefore expensive laptops, which created a security problem. We have a unique solution to get round this.

As you have done we have security tagged the assets and have alarms and sensors on the entrance/exit gates. However what we did differently is employ a company called Traka. Working with them (and I have to admit we are still prototyping the design) we have what we refer to as laptop lockers. These lockers have access control built into them, meaning the asset remains in the secure locker until a recognised student uses their campus card to open a locker and take one, the details of the student are kept, and when they return the asset they scan their card once more and the locker draw opens up and lets them put it back in. As an

added security point, all the laptops have low level RFID tags that the locker drawers sense, so it can tell when a laptop is present or not.

Giving the students access to laptops is all well and good, however, we have had to look at the provision of seating for them, so we have access to powered furniture. Again, the system we have used is brand new. We realised that all the powered furniture that had been available used hatches at seating level to power devices. However we wanted power and data lines (due to our infrastructure being better able to support wired rather than wireless) at a more obvious height. We have gone with a system called Hive 2, which gives power and data provision over the shoulder, utilising a modular framework which we can move around into many different shapes should it not work in a particular area.

To add to all this information we have some pictures of the area which I hope will give you a flavour of what we have tried to achieve in the area showing many of the things I have spoken about above:

This has been achieved with internal funding. However were glad of the input from the iBorrow to help us with our ideas.

Yousef

Thank you for the conference and your advice and support, it was a great opportunity for me to learn from your experiences and I am glad to say that we are now only days away providing our students with laptops similar to your setup and that will be a great benefit to all.

Nick

We have moved to server virtualisation but it will be some while yet before we can adopt a model which relies on software virtualisation.

We have expanded our laptop loan service, run through the learning resources centres, and our service allows borrowers to take laptops outside the library. Given that we are trying to develop learning spaces outside the library, this is very important for us. We are actively considering the balance between desktop PCs and laptops – and the extent to which we should actively encourage students to bring their own laptops onto campus. We surveyed students on their use of laptops in December/January and plan to repeat this survey in a year's time.

We are actively considering the creation of a 'one stop shop' student centre, bringing together a range of different help desks, particularly in the context of further campus closures. However, discussions are still at an early stage.

Paul

The main take away from our contact with iBorrow was the use of thin client laptops. As a result of this we investigated using a similar arrangement in our Library. In the end we improved the arrangements for our laptop loan scheme though very much small scale (20 devices) and not exactly in the same way that you have done. It is reported as working very well. Nevertheless your approach provided useful food for thought.

We were progressing virtualisation in any case, and have continued to do so. The vast majority of our server provision is now virtualised under Hyper-V, and our use of RDS has increased. This is used for both thin and fat clients, and forms a key component of our Location Independent Working roll out.

16:
A JISC perspective on innovation

Innovation and the management of institutional change

Institutions that are innovating with technology across an entire university have to review and, where appropriate, change existing business processes; to implement new technical systems and processes; to review existing policy and strategy; and engage staff and students in the revised practices of learning, teaching and research. iBorrow's experience within the JISC's Institutional Innovation Programme contributed to a wider project-community exploration of the relationship between innovation and the management of institutional change.

Support, Synthesis and Benefits Realisation (SSBR)

The SSBR project (JISC, 2011) delivered services to the JISC Institutional Innovation Programme and its constituent projects. The project was based on a community (network) approach to programme support.

The synthesis of experiences from the projects demonstrated that there are many elements in what is a complex and varied process of converting innovation into embedded institutional practice. Effective change management processes need to be implemented to bring about the desired strategic objectives across an institution, and tools and methodologies for researching institutional development to support the design process are essential.

Programme outcomes

Key word	Title	Note
1. Efficiency	Efficiency, effectiveness and quality	Useable and used; it works, it impacts on resource use and is felt to be valuable.
2. Solutions	Sustainable technological solutions	Aligned with physical/natural world, holistic, large systems thinking; guidelines, how-tos, technical specifications, QOS, WAN, rss.
3. Setworks	Enhanced community networks	Pre-formal and formal (what Duton, 2007 calls 'pro-social' networks) regular meetings of groups of people at conferences, assemblies, seminars, community and professional associations, working groups, committees; business groups, professional institutes.
4. Leadership	Strategic leadership	Best practice exemplars, models, guides, sustained innovation.
5. Development	Access to strategic advice, demonstrators and detailed guidance	Information, workshops, consultancy, skills provision.

Innovation Briefings

Innovation and the management of institutional change
Modernising IT provision
Podcasting and electronic lecture capture
Mobile technologies
Employer engagement
Portals for work-force development
Flexible, negotiated frameworks for accreditation
Accreditation of prior (experiential) learning
Mentoring and supporting learning
Using e-portfolios to support work-based learning
Technologies and standards
Technologies supporting retention
BR Report

Evidences

Supports, informs

Exemplifies

etc. etc.

New institutional configurations: Portals & partnerships

What: is actually being changed – innovation themes

Pedagogies: new learning practices,
Frameworks
Physical/digital
Participation

V10

Institutional strategy and policy

JISC Intended outcomes

Efficiency
Solutions
Networks
Leadership
Development

JISC Institutional Innovation Programme

Why: the problem to be addressed

Institutional ICT concerns

Learning, teaching & assesment
Research & development
Business & community engagement
Learning resources
Administration
ICT services
Estates

Institutional Change Management Issues

What are the emerging lessons for institutions?

Recognise the impact of change on existing management structures

In many cases the introduction of an innovation – new technology, or new processes to capitalise on new technology – is profoundly disruptive. The operating units within institutions have developed systems for their specific purposes, with their ways of doing things and with a network of familiar relationships. For an innovation project to be effective, it is likely to require a range of new linkages, new co-operative alliances, and shifts in power and ownership. Even the models of management (reporting lines, committees, timetables) might need re-inventing.

Maintaining the momentum generated by a large-scale innovation project is difficult. Once the technology is delivered the task of daily maintenance can become demanding. Managing mobile resources in the library challenged support structures in ways that desktop PCs have not done. Whilst the netbooks maintenance remains the responsibility of Computing Services, auditing and ensuring the netbooks are on charge overnight has passed from the building security staff to Computing Services who are understandably reluctant to accept further work at times which are not 'on cover'.

Make systems flexible and responsive

To be able to respond to the ever-changing demands of the education sector, institutions need to able to review, change and redesign existing systems. A model of process review within the institution will support this approach.

Augustine House was designed to be 'flexible' to meet the needs of the rapidly changing HE sector. The evaluation and research activity within the project, including the student data, provided evidence for patterns of use within the building. Additionally other focus groups and survey feedback has informed a review of the way that students and staff have reacted to the spaces and technology. Some adjustment is planned for the third year of operation.

Use existing tools

Most institutions are now effectively using and adopting established methodologies for systems review and design processes. There is no need to re-invent them.

PRINCE2 … ensured that line managers were fully involved with decision-making, and setting and reaching project milestones.

Stay focused

Institutional systems are large and complex, making whole-institutional analysis and design a difficult and costly task. Undertaking a focused review within an institutional review framework and set of policies provides a more manageable set of tasks.

Working within the existing IT strategy ensured the project would be fully supported and allowed the design team to concentrate on key issues such as useability.

Exploit existing opportunities

Many successful institutional change projects around technology are the result of doing the right thing at the right time, such as identifying the emergence of a new technology within the student population, linking to an existing institutional policy.

A large-scale learning space and the perception that learner preferences within libraries has changed provided a strong rationale for the mobile technologies deployed by the project. The need to understand the associated pedagogy emerged strongly from the JELS Report adding weight to the original contention that little is known about students' learning within such spaces.

Using senior managers as agents for change

Many reports record the importance of having the active support of one or more senior managers. While this can sometimes be just a personal enthusiasm, a powerful combination is formed when the project is at the same time contributing to the university's strategic direction. A traditional method is for the chair of the project board to be a Pro-Vice Chancellor.

“ *Strategic alignment within iBorrow was achieved as the University was already engaged in a major initiative to improve the quality of the library resources and student services in general. With senior management support, and the opportunity offered by the Institutional Innovation Programme, iBorrow was designed to complement institutional objectives for Augustine House ensuring that the outcomes of the project would be embedded into the student experience within the new building.* ”

Involve all stakeholders

Whole scale institutional change may require a large number of relevant people to be included in the systems review and design process from IT managers and estates, to students and academic departments. The support of senior management is also essential but will not reduce the need to engage a large number of people and also support bottom-up development as well as top-down management.

“ *A broad base for the project was designed into its management structure. Its Management Group included the Augustine House project manager and the Heads of Library, Student and Computing services. This greatly aided the speed and effectiveness with which decisions could be reached and aided communication with stakeholders in the project: academic staff, library, student services and support staff, and students.* ”

Top-down bottom-up

There was a corresponding bottom-up approach, as enthusiasts worked on the innovation project and on the feedback and assessment reforms. For institutional change to improve lecturer practice, the project team deemed that a strategy which worked from both directions was essential.

“ *The iBorrow concept drew on the enthusiasm and expertise of technical staff for virtualisation and wireless networking. However it was not a bottom-up approach from academic staff and therefore faced a challenge in engaging them with the new building and the learning opportunities it offered. Significant effort has been made to engage tutors through tours, individual support from faculty librarians and learning technologists, development of case studies and building experience of the resources into programme design. We knew it was important to engage academic staff but this proved difficult prior to the launch of the project. Progress continues to be made in embedding the building and its learning resources into modules.* ”

Develop community guidelines

Many of the projects were designed to test applications that new technology might offer the HE sector, and therefore they have a significant technical element. However, technology is not sufficient of itself to bring about institutional change, and projects attempted to establish whether they can be easily implemented and embedded, whether they are scalable up to institutional requirements, and whether they are sustainable in the long term.

“ *The iBorrow project was designed to operate at an institutional scale from the outset. However the pedagogic changes made possible by the technology have proved to be more elusive. Technology changes rapidly and the decisions made within the project have already been superseded. As the netbooks approach the end of their life-cycle the decision to replace them with alternative mobile devices, or not, will be indicative of the extent to which the project has embedded mobile learning as a campus experience.*

The response of other HEIs to the lessons learned has been encouraging and a number have made considerable progress within their own universities with suitably scaled mobile projects. ”

17:
A reflection

Professor Betty Collis is emeritus professor of the University of Twente, where from 1988 to 2005 she headed a research team in 'Technology for Strategy, Learning and Change'. A prolific author with over 700 papers and as many conference presentations in over 35 countries, she now works as a consultant and specialist in the application of technology for strategy, learning and change in HE. The iBorrow team were fortunate to have her as an external advisor to the project, and she reflects here on the lessons learned from – and some of the intriguing and unanswered questions posed by – an analysis of the 'learning footprints' of the students using the iBorrow facility.

The question of how learners experience learning in a technology rich age is relevant and important. It has been timely that the iBorrow project took place parallel to the design, development and implementation of Augustine House, the new library and student services centre at CCCU. To examine the context of the iBorrow project from research and pedagogic perspectives, we chose to use the metaphor of learning footprints for 21st century learners. By learning footprints we mean some evidence of where a learner has been or is going and what she is using and possibly leaving behind while she is making the footprints. Within this metaphor we would like to reflect upon two questions.

The first is of a descriptive nature and relates to what we have been able to do during the implementation phase of the iBorrow project: What are patterns in these learning footprints when learners are in Augustine House and, more generally, how can the iBorrow project help us to better understand when, where and how 21st century learners go about their learning activities?

The second question brings in issues of causality or at least correlation and thus can only be speculated upon with the data we so far have from the iBorrow context: How do the affordances of different learning spaces influence learning footprints?

Where, when, with what?

It is not easy to answer these questions even within the iBorrow project. A visit to photos showing a large range of learning environments in UK HEIs (JISC Infonet's photo stream) immediately makes it clear that the idea of capturing where and when learners go for their learning activities requires multidimensional elaborations. There are dimensions relating to flexibility, to social interaction, to physical aspects such as types of seating and working environments, and to the tutor/ learner balance in decision making about when and how to make use of a learning setting. And to further complicate the issue it is clear that learners move seamlessly in and out of, and occupy at the same time, various blends of learning spaces and environments. Milne (2007) notes the interplay between physical spaces and virtual spaces, each further segmented in terms of the extent to which the instructor designates or is present in the spaces. He identifies formal physical spaces (such as classrooms or seminar rooms), physical social spaces (such as coffee lounges), physical transition spaces (such as hallways), physical small group work spaces (such as a meeting room in a library), physical private spaces (such as the learner's own residence), virtual social spaces (such as Facebook or any other social community environment), virtual public communication spaces both formal (course environments in VLEs) and informal (blogs), and virtual private environments (email and instant messaging). For any learning activity learners may combine or recombine various combinations of these different types of spaces. In the iBorrow context, learners experience these re-combinations while making use of technology: fixed desktop computers, computers linked to the library system, their personal devices, and the iBorrow netbooks linked to the internet and the local intranet via a WiFi network.

We regularly see learners multi-tasking, sometimes with both a fixed PC and iBorrow computer, so that they can carry out parallel activities such as communication and data sharing with fellow learners at the same time as they work on an analysis or essay or presentation. Clearly the message is that there is a blurring of boundaries when we consider where and when learners carry out learning activities.

To analyse the complexity even further, we need also to include the learners' virtual footprints, not only where they are physically but also virtually. However, because of the non-invasive policy of collecting iBorrow data we did not collect information on what software applications the learners were using while engaged with the Augustine House computers and thus it is only from our observational data that we can comment on their actual processes and tools while using the iBorrow technology. Nonetheless, we are further than we were before in terms of following learner footprints. The iBorrow project has moved the field further in terms of capturing this rich context of possibilities associated with when, where and how learners go about learning activities. Now, at least with a broad-brush view, we can describe where learners go in a multifaceted library and learning centre and how long they stay when they are in their various locations.

It is the accompanying data that we collected, outside the specific scope of the iBorrow project plan, involving observations, questionnaires, and contact with students, that we have augmented our location data with richer descriptions of learner activity. The iBorrow project has a large collection of images (Barry, 2009) of students going about their (learning) activities in the Augustine House that show some of the many ways that the iBorrow laptops fit into the mosaics of these learning snapshots. From the iBorrow data, observational as well as log data captured by the server technology, a fascinating pattern appears to be emerging. When students elect to use one of the fixed PCs in Augustine House they also appear to be working privately and predominately individually. When however, they are using the iBorrow laptops with their easy mobility and access, we see social interaction, use of the group spaces in Augustine House, and blends of discussion, computer use, debate, sharing, and combinations of formal and informal learning as well as of private and personal activities occurring parallel with active learning processes. When we see students move with their iBorrow laptops from a group study room to a social space we see them continue with their on-going blends of learning and living. Physical spaces do not constrain them. The iBorrow data make this clear to see.

Affordances: correlation or causation?

Universities are making large investments in both physical and virtual learning environments on the assumption that these investments will lead to different, and presumably better, learning footprints than in pre-21st century times. Although it remains frustratingly difficult to isolate the impact of a particular learning space or intervention on learner development, our experiences with the iBorrow project suggest that the affordances of Augustine House, coupled with those of the mobile, easily accessible iBorrow laptops, their linkage with fast and reliable servers with personal and group archives and tools for group collaboration and knowledge construction are important to the new patterns of social learning that we are seeing emerge.

The affordances of Augustine House as a physical environment are a critical component. Learners can easily flow in and out of different sorts of physical settings, with different sorts of furnishings, and their supportive technology flows along with them. They stay on the network if they move from a group room with a work table to a social area or to settings with cushion-type seating and informal table and workservices. It is the combination of the affordances of Augustine House as a physical facility with the affordances of the iBorrow easy-to-borrow laptops and the high speed WiFi network that, we believe, leads to (and thus not only is correlated with) the many examples of different learning processes and settings that we see in the Augustine House context.

Learners are in pairs, triads, groups, sharing data and ideas via display monitors or within combinations of physical and virtual workspaces. Virtual and physical tools and resources mingle seamlessly; learners flow in and out of combinations of social and private learning and social and private knowledge sharing and construction. These combinations are occurring based on the learners' own ideas; in general, tutors are not (yet) steering them to group-based learning settings or knowledge sharing and construction.

Conclusions, for the moment…

The iBorrow context, that of a blend of mobile and easily accessible network technology, standardised versions of tools and applications available on demand in the same updated configuration to all learners, and flexible learning and interaction spaces in the Augustine House, all under the learners' control, highlights the complexity and the excitement of following learners' footprints in HE. We have further confirmation of how easily today's students handle information and communication technologies and how they multitask in many ways as they interact and learn. And we have at least correlation evidence that the affordances of the iBorrow context are associated with many different patterns of learner interaction.

Several promising lines of research are appealing in this context. One relates to pedagogy: What learning activities can tutors incorporate into their modules that capitalise on the affordances of Augustine House and its technology, particularly the iBorrow laptops? Will these lead to new learning experiences within a module or programme that in turn can affect the curriculum and the expectations of both learners and their eventual employers? Another line of continuing research relates to a deeper investigation of what learners are doing, beyond location, particularly with their iBorrow laptops as they work together. Do the affordances of the physical facility and the technology have different empowerments for different points in the learning

process, for example, for conceptual exploration, for peer support during assigned learning tasks, or for revision practices? For each of these different learning moments, how can the affordances of the physical and virtual contexts be further exploited? And another line relates to changes in learning spaces in the future: Can the multi-faceted affordances of a context such as Augustine House and its technology lead to a richer form of traditional learning settings such as lectures or seminars, changing not only their locations but also their dynamics?

The iBorrow project has helped us along the way to these sorts of new investigations.

18: References

Click on any web references shown to automatically open the links in your web browser

Chapter 1: Introduction

Alexi Marmot Associates. (2006) *Spaces for learning: a review of learning spaces in further and higher education*. Edinburgh: Scottish Funding Council. Available at: http://www.sfc.ac.uk/collaboration/spacesforlearning/spaces_for_learning.aspx (Accessed: September 2011).

Fullan, M. (1993) *Change forces: probing the depths of education reform.* London: Falmer. p.22.

Gibbs, G. (2010) *Dimensions of quality*. York: HEA. Available at: http://www.heacademy.ac.uk/assets/documents/evidence_informed_practice/Dimensions_of_Quality.pdf (Accessed: September 2011).

JISC. (2006) *Designing spaces for effective learning: a guide to 21st century learning space design*. Bristol: JISC. Available at: http://www.jisc.ac.uk/media/documents/publications/learningspaces.pdf (Accessed: September 2011).

JISC. (2007) *Transforming and Enhancing the Student Experience through Pedagogy (TESEP).* Available at: http://www.jisc.ac.uk/whatwedo/programmes/elearningsfc/tsep.aspx (Accessed: September 2011).

JISC. *Institutional innovation programme*. Available at: http://www.jisc.ac.uk/whatwedo/programmes/institutionalinnovation.aspx (Accessed: September 2011).

Pearshouse, I. et al. (2009) *A study of effective evaluation models and practices for technology supported physical learning spaces: JELS final report.* Available at: http://www.jisc.ac.uk/whatwedo/projects/learningspaces08 (Accessed: September 2011).

Watson, L. (2006) 'The Saltire Centre at Glasgow Caledonian University', *SCONUL Focus,* 37, pp4-11. Available at: https://www.sconul.ac.uk/publications/newsletter/37/2.pdf (Accessed: September 2011).

Chapter 2: The institutional perspective

Bennett, S., Maton, K. & Kervin, L. (2008) 'The digital natives debate: a critical review of the evidence'. *British Journal of Educational Technology*, 39 (5), pp775-786.

CCCU. (2006) *Learning and teaching strategy 2006-2010*. Canterbury: CCCU.

Johnson, C. & Lomas, C. (2005) 'Design the learning space: learning and design principles'. *EDUCAUSE Review*, 40 (4), pp16-28. Available at: http://www.educause.edu/EDUCAUSE+Review/EDUCAUSEReviewMagazineVolume40/DesignoftheLearningSpaceLearni/157984 (Accessed: September 2011).

Prensky, M. (2001) 'Digital natives, digital immigrants', *On the Horizon*, 9 (5), pp1-6.

Radcliffe, D. (2008). 'A pedagogy-space-technology (PST) framework for designing and evaluating learning places', in Radcliffe, D. et al. (eds) *Learning spaces in higher education: positive outcomes by design*. Brisbane: University of Queensland. Available at: http://www.uq.edu.au/nextgenerationlearningspace/proceedings (Accessed: September 2011).

Chapter 3: The library story

Alexi Marmot Associates. (2006) *Spaces for learning: a review of learning spaces in further and higher education*. Edinburgh: Scottish Funding Council. Available at: http://www.sfc.ac.uk/collaboration/spacesforlearning/spaces_for_learning.aspx (Accessed: September 2011).

JISC. (2006) *Designing spaces for effective learning: a guide to 21st century learning space design*. Bristol: JISC. Available at: http://www.jisc.ac.uk/media/documents/publications/learningspaces.pdf (Accessed: September 2011).

Chapter 4: Putting students first

1994 Group. (2007) *Enhancing the student experience*. *Policy statement*. London: 1994 Group. Available at: http://www.1994group.ac.uk/documents/public/SEPolicyStatement.pdf (Accessed: September 2011).

Foskett, N., Roberts, D. & Maringe, F. (2006) *Changing fee regimes and their impact on student attitudes to higher education*. Report of a Higher Education Academy funded research project 2005-2006. University of Southampton and the Knowledge Partnership. Available at: http://hca.ltsn.ac.uk/assets/documents/research/changing_fees_regimes_full_report.pdf (Accessed: September 2011).

Hill, F.M. (1995) 'Managing service quality in higher education: the role of the student as primary consumer'. *Quality Assurance in Higher Education*, 3 (3), pp10-21.

National Student Forum. (2010) *Annual report*. Available at: http://www.bis.gov.uk/policies/higher-education/students/student-listening-programme/nsf (Accessed: September 2011).

Chapter 7: Value for money: virtualisation

JISC. (2009) *Thin-client saves energy costs - a case study at Queen Margaret University*. Available at: http://www.jisc.ac.uk/media/documents/publications/greenict-queenmargaret.pdf (Accessed: September 2011).

Chapter 9: SwITch at Northumbria University

JISC. (2005) *Innovative practice with e-Learning: case studies supporting learners: designing flexible learning spaces: Northumbria University*. Available at: http://www.elearning.ac.uk/innoprac/institution/resources/northumbria.pdf (Accessed: September 2011).

Chapter 10: Evidence-based planning

University of Sheffield. (2010) *The Augustine House experiment*. Available at: http://www.wecamp.group.shef.ac.uk/AHE (Accessed: September 2011).

Chapter 11: Developing a sustainable solution

BREEAM. *The world's leading design and assessment method for sustainable buildings.* Available at: http://www.breeam.org/ (Accessed: September 2011).

Click on any web references shown to automatically open the links in your web browser

Chapter 12: Staff development for technology enhanced learning

Browne, T. et al. (2010) *2010 survey of technology enhanced learning for higher education in the UK*. Oxford: UCISA. Available at: http://www.ucisa.ac.uk/groups/ssg/~/media/groups/ssg/surveys/TEL%20survey%202010_FINAL.ashx (Accessed: September 2011).

Committee of Inquiry into the Changing Learner Experience. (2009) *Higher education in a Web 2.0 world*. Bristol: JISC. Available at: http://www.jisc.ac.uk/publications/generalpublications/2009/heweb2.aspx (Accessed: September 2011).

HEA. (2008) *Challenges and realisations from the Higher Education Academy/JISC Benchmarking and Pathfinder programme: an end of programme review*. York: HEA. Available at: http://elearning.heacademy.ac.uk/weblogs/pathfinder/wp-content/uploads/2008/09/Bench_and_PathFinalReview20080926.pdf (Accessed: September 2011).

NUS. (2010*) Student perspectives on technology: demand, perceptions and training needs: report to HEFCE*. Bristol: HEFCE. Available at: http://www.hefce.ac.uk/pubs/rdreports/2010/rd18_10/ (Accessed: September 2011).

Westerman, S. & Barry, W. (2009) 'Mind the gap: staff empowerment through digital literacy', in Mays, T. et al. (eds) *Transforming higher education through technology enhanced learning*. York: HEA. Available at: http://hca.ltsn.ac.uk/resources/detail/learningandtech/transforming_he_through_technology_enhanced_learning (Accessed: September 2011).

Chapter 13: Managing institutional innovation: a view of change management in HE

By, R.T. (2005) 'Organisational change management: a critical review', *Journal of Change Management*, 5 (4), pp369-380.

Fullan, M. (2008) *The six secrets of change: what the best leaders do to help their organizations survive and thrive*. San Francisco, CA: Jossey-Bass.

JISC. *Change management infoKit*. Available at: http://www.jiscinfonet.ac.uk/infokits/change-management (Accessed: September 2011).

Kanter, R., Stein, B. & Jick, T. (1992) *The challenge of organizational change*. New York: The Free Press.

Kotter, J. P. (1996) *Leading change*. Boston, MA: Harvard Business School Press.

Luecke, R. (2003*) Managing change and transition*. Boston, MA: Harvard Business School Press.

Chapter 14: Towards aligning pedagogy, space and technology

Collis, B. (2010). *Studying learning spaces in the iBorrow context*. Canterbury: CCCU. Available at: http://www.canterbury.ac.uk/projects/iborrow/documents/iBorrow-Pedagogic-Research-Reflections.pdf (Accessed: September 2011).

JISC. (2006) *Designing spaces for effective learning: a guide to 21st century learning space design*. Bristol: JISC. Available at: http://www.jisc.ac.uk/media/documents/publications/learningspaces.pdf (Accessed: September 2011).

JISC. *Planning & designing technology-rich learning spaces infoKit*. Available at: http://www.jiscinfonet.ac.uk/infokits/learning-space-design (Accessed: September 2011).

Fisher, K. (2005). *Linking pedagogy and space*. Available at: http://www.eduweb.vic.gov.au/edulibrary/public/assetman/bf/Linking_Pedagogy_and_Space.pdf (Accessed: September 2011).

Oblinger, D.G. (2005) 'Leading the transition from classroom to learning spaces', *EDUCAUSE Quarterly*, 1, pp14-18. Available at: http://net.educause.edu/ir/library/pdf/EQM0512.pdf (Accessed: September 2011).

Radcliffe, D. (2008). 'A pedagogy-space-technology (PST) framework for designing and evaluating learning places', in Radcliffe, D. et al. (eds) *Learning spaces in higher education: positive outcomes by design*. Brisbane: University of Queensland. Available at: http://www.uq.edu.au/nextgenerationlearningspace/proceedings (Accessed: September 2011).

Temple, P. (2007*). Learning spaces for the 21st century: a review of the literature*. York: HEA. Available at: http://www.heacademy.ac.uk/assets/documents/research/Learning_spaces_v3.pdf (Accessed: September 2011).

Chapter 16: A JISC perspective on innovation

JISC. (2011) *Create support, synthesis & benefits realisation (SSBR)*. Available at: http://www.jisc.ac.uk/whatwedo/programmes/institutionalinnovation/create.aspx (Accessed: September 2011).

Chapter 17: A reflection

The ideas in this reflection have been nurtured by the iBorrow Project and further reworked from the following:

Barry, W. (2009) *iBorrow images*. Available at: http://www.flickr.com/photos/heywayne/sets/72157622488906510/ (Accessed: September 2011).

Collis, B. (2009) *Learning footprints: keynote presentation at the 17th Improving Student Learning Symposium*. Imperial College, London. 9th September.

Collis, B. & Moonen, J. (2010) 'Foreword', in Sharpe, R., Beetham, H. & De Freitas, S. (eds) *Rethinking learning in a digital age*. London: Routledge.

JISC Infonet's photostream. Available at: http://www.flickr.com/photos/jiscinfonet/sets/ (Accessed: September 2011).

JISC. *Planning & designing technology-rich learning spaces: photo library*. Available at: http://www.jiscinfonet.ac.uk/infokits/learning-space-design/more/flickr (Accessed: September 2011).

Milne, A. J. (2007) 'Entering the interaction age: implementing a future vision for campus learning spaces today', *EDUCAUSE Review*, 42 (1), January/February, pp12-31. Available at: http://net.educause.edu/ir/library/pdf/ERM0710.pdf (Accessed: September 2011).

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