

**Queen Margaret University  
POE report. Operational  
Review Stage**

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15<sup>th</sup> June 2008

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## **Executive Summary**

### **Introduction**

This report sets out the findings of the Post Occupancy Evaluation (POE) Operational Review of the Queen Margaret University's (QMU) new Musselburgh campus development. The review was commissioned by the Scottish Funding Council as part of a larger scale research project that is being carried out by BRE in order to pilot the SFC's new POE guidance. This research involves carrying out POEs of four projects that have received SFC funding, three of which were specifically funded by the SFC to promote Sustainable Development. These are:

- Queen Margaret University Musselburgh Campus
- John Wheatley College East End Campus
- Carnegie College EcoSpace Facility
- Cumbernauld College Campus Extension

Post occupancy reviews are a valuable method of obtaining feedback on recently completed construction projects from those personnel who were involved in the process as well as occupants and other end users. Such reviews provide useful information that can be used in two ways. Firstly, to highlight any problems that can be addressed and solved within the project in use and secondly, to provide lessons that can be used to improve the process and design on future construction projects.

The POEs are being undertaken at three stages as recommended in the SFC Guidance:

- Operational review: 6 – 12 months after handover
- Functional Performance Review: 12 – 18 months after handover
- Strategic Review: approximately 3 years after handover

The Operational Review as recommended in the SFC guidance would usually involve both a review of the process of delivering the project (Post Project Review) and a initial review of the technical and functional performance of the building during operation. However as there had been a number of delays with the project and as, at the time of the review, QMU were still under temporary occupation and had not yet received the final certificate of completion, a decision was taken to focus upon the process issues and incorporate the review of the building performance into the Functional Performance Review that will take place in the Winter of 2008.

This report only covers the academic accommodation provision. The student residential blocks were constructed under a separate contract and not addressed in this study.

### **Description of the project**

The Queen Margaret University was established in 1875 as the Edinburgh School of Cookery, became Queen Margaret University College in 2000 and was granted a University title in January 2007 in recognition of its academic achievements in teaching and research. The University has over 4000 students (FTE) and 500 staff in its two main faculties: Health and Social Sciences (comprising School of Health

Science and School of Social Sciences, Media and Communication) and Business and Arts (School of Business and Enterprise and School of Drama and Creative Industries).

The brand new Queen Margaret University campus is located just outside Musselburgh in Craighall, Midlothian on a 35 acre greenfield site. The project, entitled Re:Locate, involved the development of a main academic building, student residences, a student union building incorporating indoor sports and drama facilities and surrounding external landscaping with all weather-facilities and a range of environmental features. A key feature in the design, and a requirement of the brief, is the large open plan Learning Resource Centre (LRC) located at the heart of the main academic building. This uses the natural slope of the site to create a terraced internal atrium running the whole length of the building.

The new campus is the first new university campus to be built in Scotland for 30 years and was designed to exceed current environmental standards and to set a new benchmark in sustainable design. The project team used BREEAM and CEEQUAL to guide sustainability and achieved Design and Procurement BREEAM Excellent ratings for both the Main Building and the Sports Centre/Student Union building. At the time of this report it was also on track to obtain a CEEQUAL Excellent rating.

Environmental technologies employed in the building include;

- Biomass Boilers
- Thin Client computer technology
- SUDS pond
- Air tightness and u-values above building regulation requirements
- Green travel plan
- Water efficiency
- Intelligent lighting controls
- Natural ventilation

The budget of the 26,000 m<sup>2</sup> project was £105 million in total. It was funded through site disposals, SFC grant, fundraising and loans.

Following an observational visit by the BRE team, a review workshop focusing on the process issues associated with the design and construction of the project was carried out on the 21<sup>st</sup> May 2008. The topics covered in the session were:

- Briefing, feasibility and design
- Construction process
- Handover and moving in

## Findings

The new QMU campus is now fully occupied and is proving popular with both students and staff who are proud of their new campus. The project team is looking forward to the Functional Performance Review which will provide in-depth feedback on the performance of the building and feel that this will yield positive results.

The project has been a unique challenge for QMU and it was agreed that they and their project team rose to this challenge and achieved what they set out to achieve at the start of the project. It has provided a building that demonstrates the ethos of QMU, has supported a culture change in the way that teaching and

learning is delivered and has delivered space efficiencies within an attractive campus that has the highest sustainability credentials.

The campus is seen as something of a benchmark for sustainable design and the University has had many visitors wishing to see the project with particular interest shown in the LRC, the Biomass system, sustainability, space management and ICT.

In spite of some disappointing contractual issues and delays that marred the end of the project, the process was felt to have been generally successful. There was excellent user consultation and this provided good buy-in for the project from staff and students

A particular success was thought to have been the way sustainability was embedded into the project. When the project started in 2003, sustainability was not a recognised issue as it is today and so there was a steep learning curve for the University and the project team but they all feel that they have learned a great deal and that the campus is a model for sustainable design. Although the building does not have the look of what is often expected from a sustainable building eg green roofs, wind turbines etc it is felt that it has actually achieved a real and better sustainable solution through good design principles planned from the outset.

There were a number of lessons that the review participants would take into account if they were to embark on a similar project and that they would recommend to other Higher and Further Education clients and the SFC. These are detailed in Appendix B but include the following:

- To be successful, sustainability should not be an add-on or afterthought. It has to be embedded from the word go so that it can be economic in terms of both capital cost and long term operational cost. For QMU it was driven from the top as one of the key business drivers from the outset. This top level interest is continuing post-completion through an Environmental and Sustainable Working Group with senior management support to manage the move from delivering a sustainable building to managing it in a sustainable way.
- Internal and external project management was very successful. Establishing clear responsibilities and sign-off procedures at an early stage of the project streamlines decision making and helps with internal project management
- On a large, long term project it is a good idea to have a member of administration staff devoted full time to the project team to provide continuity and deal with the day to day running of the project
- A staged selection process for consultants can be very successful and helpful for the client team. It is a particularly good idea to bring the Project Manager on board from the start and for the architect to be involved with selection of the engineers
- The project was helped by the quality of the initial brief. A good, detailed and informed client brief ensures that the design team can understand the client requirements from the project and develop these in the design
- It is very important to involve the end users and listen to their views as they will be the ones using the building and know what their functional requirements are. The process needs to be carefully facilitated so that they will all walk away happy.

- From a structural engineering point of view, it is advisable to get as much of the design eg reinforcement detailing done pre-tender as then there are fewer questions and grey areas post-contract
- The contract used was a hybrid Design and Build contract. With hindsight a 2-stage D&B may have been a better route from the programme point of view. In a tight market contractors may be wary of tendering for atypical contracts
- There was a major change to the design just post contractor appointment due to circumstances beyond the control of the client. If at all possible, avoid major changes on a D&B contract as these can be very costly
- Commissioning of systems is very important but responsibility for this can be a grey area in the contract. It is suggested that a specific clause should be written into the contract to the effect that the main contractor should bring in specialist commissioning personnel to oversee the commissioning if they do not have the expertise in-house.

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## 1 Introduction

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### 2.1 Project background

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The budget of the 26,000 m<sup>2</sup> project was £105 million in total. It was funded through site disposals, SFC grant, fundraising and loans.

## 2.2 Project timetable

Option appraisal	1997-8
Outline design brief	July 2003
Architect appointment	Jan 2004
D&B tender issued	July 2005
Project started on site	October 2005
Project handover	
Offices	September 2007
Academic	October 2007
Sports/Union	January 2008

### 3 Methodology

Prior to the main Post Project Review workshop session an observational walk-round of the building was carried out by the BRE Team. This enabled the team to orientate themselves around the building and to gain an understanding of the design and construction issues that would have a bearing on the session.

A review workshop was carried out on the 21<sup>st</sup> May 2008 by an independent consultant from BRE and focused on the process issues associated with the design and construction of the project. The session was attended by ten representatives from the supply and demand-side who had been involved in the project – the Vice Principal (Learning and Teaching), Project Administrator, Director of Estates and Facilities, Architect, Project Managers, M&E Engineer, Structural Engineer, and Quantity Surveyor. The topics covered in the session were:

- Briefing, feasibility and design
- Construction process
- Handover and moving in

The following sections set out the findings of the workshop sessions. Suggestions for lessons that can be taken into account on future projects are given at the end of each subsection. These are summarised in Appendix A.

## 4 Findings – process

### 4.1 Feasibility, design and briefing

#### 4.1.1 Feasibility stage

By the early 1990s it was generally agreed that the QMU estate had problems in condition terms as well as being inflexible and unsuitable for a modern higher educational learning environment. The teaching was split over three campuses in the Edinburgh area, Corstophine, Leith and Gateway, resulting in duplication of facilities, poor utilisation and inefficiency in space use.

A thorough estates option appraisal was carried out in 1997-8 and concluded that the existing estate was not fit for purpose due to the condition and space profile of the buildings and their locations. The report also confirmed that the then QMUC was not financially viable as an institution within the current estate and that the best option was to relocate to a new, purpose-built campus. The two main campuses accommodating 3 of the 4 schools would be consolidated in a new location, retaining the Gateway, a former theatre in Edinburgh that had been acquired in 1997, for drama and theatre teaching.

As well as delivering a new estate, the aim of the project was also to carry out a business transformation through a review of all the University's activities in order to increase efficiency and effectiveness in use of the buildings. This would include issues such as rationalisation of space, adoption of open plan working and centralised timetabling. It was calculated that the move would enable the University to reduce their estate area by 35% on the existing 26,519 m<sup>2</sup> (net) total of non residential space area.

The search for a suitable site in the Edinburgh area was instigated and by 2001, after reviewing between 50 and 60 potential sites, a short list of four possible sites was drawn up. A full business case comprising a financial and non-financial appraisal was carried out on the shortlist of 4, and compared with a base case of no change. After two abortive bids for other locations, a successful bid was made for the current site in 2002.

This site was thought to be a particularly good one due to its location to the East of Edinburgh within East Lothian. Retaining links with Edinburgh was historically important for the University and also this area had a history of low HE participation rates and therefore would serve as a catchment area offering a good potential for growth.

#### 4.1.2 Project Management

The Campus Development Committee was created to oversee the project. A number of specialist external consultants who had worked with the University in the past were appointed to advise the Committee on the evaluation of each site.

An internal Project Team with representation to the governing body was established, in line with the Scottish Executive guidance at the time. There was a set procedure for an overall framework for the project including clear sign off responsibility at different levels. This meant that there were no grey areas in decision making that sometimes cause delays on projects.

The internal project management worked well. It was thought to be especially useful to have an administrator working full time on the team as this provided continuity on such a long-term project. There were regular project team meetings and design meetings throughout the project.

The first external appointment, made was the external project manager. The appointment was advertised through OJEU and the Project Manager was appointed in Summer 2003.

*Lesson: Establishing clear responsibilities and sign-off procedures at an early stage of the project, streamlines decision making and helps with internal project management*

*Lesson: On a large, long term project it is a good idea to have a member of administration staff devoted full time to the project team to provide continuity and deal with the day to day running of the project*

#### **4.1.3 Appointment of architect and other consultants**

Once the choice of site had been finalised, the concept team were asked to develop a master plan for the new campus for submission to planning, based on the outline design brief.

The appointment of the consultants was carried out in stages. The QS had been brought on board in October 2003 and they and the Project Manager participated in the selection of the architect at the end of that year. The architect was appointed before the other consultants and was then involved with their selection. The idea was to build the team slowly and this worked well.

This staged process was thought to have been very successful and the whole process was well planned. It was felt to have been a good idea to have the Project Manager coming on first to help to manage the selection process - this does not often happen. It was also helpful for the architect to be involved with the selection process for the engineers - usually this happens in tandem. The architect had an input into the scope of services which was therefore more robust and it also ensured that they had a team that worked well together - a very important factor in project success.

*Lesson: A staged selection process for consultants can be very successful and helpful for the client team. It is a particularly good idea to bring the Project Manager on board from the start and for the architect to be involved with selection of the engineers*

A decision was taken to select the architects through an international competition which was managed successfully for the University by the RIAS. A brief was developed for the architect selection, with criteria based on a quality assessment. Particular issues that were emphasised were the LRC element and sustainability as well as the past experience of the team. A short list of four were invited to interview and the final choice was made on the basis of the best solution and design recognising the one-off and important nature of the project for the institution and exhibiting an understanding of the ethos of the project – a bespoke project for QMU rather than an ‘off the shelf design’.

The other consultants were selected through an interview process, advertised in OJEU. A fixed scoring matrix was used including sustainability, experience etc on a circa 70:30 quality/cost ratio. The team thought that they had the right people for the job in terms of the consultants chosen, but there was some

concern that fees did not play a significant part in the process of the selection of the architect but were negotiated afterwards. With hindsight it was felt that some discussion of fees would have been appropriate, with a quality/cost split even to 90:10 to bring an element of commerciality and competition into the process.

*Lesson: Although the appointment of the architect went well, and was felt to have been the right choice, it was felt that it is a good idea to include some element of fees in the selection criteria but with much less importance than quality. This would save time later.*

A number of specialist consultants were identified at an early stage as being necessary for the project eg Acoustician, IT and sustainability and so they were appointed via the main consultants. It was felt that it had been a very good idea to have sorted this out on day one rather than waiting till stage C/D to make these decisions, as in some projects, as this saved time and enabled them to input into the design from the start.

*Lesson: Appointing specialist consultants eg acousticians, at an early stage and involving the engineers and architects in their appointment saved time and gave them early input reducing redesign later.*

### **Sustainability**

Sustainability was a key part of the design brief and also formed an important element of the selection process. The emphasis on sustainability was one of the original business drivers for the project and was supported from the top of the organisation. It fitted in well with the business case of the project eg efficiency, lower energy costs and it was therefore embedded into the project.

This helped to set the tone for the whole project. It was clear to the consultants that QMU was serious about sustainability, unlike on some projects where, although the client says they want a sustainable solution it was felt they are really only paying lip service to it and it is abandoned as soon as any decisions have to be taken eg budgetary constraints.

In fact even before the appointment of consultants, QMU had already done some work on sustainability eg they had a green travel plan in place. The problem for the client was that sustainability was such a new subject at the time and so they were relying on their consultants to provide advice on how to deliver a sustainable solution.

The M&E designers brought in a sustainability specialist as a sub-consultant to provide advice on sustainability in a holistic sense. They acted as a facilitator providing training workshops in sustainable design for the whole team at the strategic level. The participants questioned whether they should have been brought in as a consultant at an earlier stage and directly employed by QMU as they were working with the whole team anyway and their strength was at the strategic side, writing the Sustainability plan etc. Potentially the subcontractor role could have created some conflict. In the event it worked well for them as the team got on so well.

Also, by the time the consultant came on board, the team had moved to another stage in the design and needed to focus on the tangibles with advice about things they could do practically in the Stage C/D reports ie they wanted to use BREEAM and CEEQUAL Excellent but needed help in how to deliver these.

*Lesson: The role of a strategic sustainability advisor is important- but they need to be brought within the team as a direct report rather than a sub-contract to the services consultant or potentially this could deliver some conflict, although this was not a problem on this project. Also ideally they should be brought in at an early stage of the project*

Another related issue was the appointment of ecologist – it was felt that they should have been brought on board at an early stage but the team did not find out that one was required till later on in the project..

*Lesson: If BREEAM and CEEQUAL are being used to guide a project, the ecologist appointment should be made at an early stage to provide strategic advice*

#### **4.1.4 Briefing stage**

The client had a very detailed brief and had a good idea of their requirements. They had developed a detailed design brief report in consultation with the Academic Units, Support services and Corporate Services in June 2001 that described their vision, objectives and requirements as far ahead as 2020.

This brief set parameters in terms of their requirements for teaching and staff accommodation that were quite wide-ranging and laid out a plan for the future in terms of student numbers, activities, kinds of spaces needed etc.

The main objectives of the RE:Locate project were to ‘create a new campus that would:

- be attractive and distinctive
- represent the unique characteristics of QMU
- be fit for purpose
- achieve value for money’

The vision was to create a ‘campus in the park’ that was welcoming and inspiring but that at the same time maximised space and management efficiency. From the outset of the project the client put sustainability at the heart of the brief as detailed in 4.1.3.

The design brief was carried over to inform the development of the Masterplan and outline design brief in 2003 and enabled the team to set the space and construction budget.

In retrospect, it was appreciated that this very detailed and well-thought-out brief was a large part of the success of the project. It was very clear about what the college wanted to achieve and this made the job of the design team much easier.

*Lesson: A good, detailed and informed client brief ensures that the design team can understand the client requirements from the project and develop these in the design*

#### **4.1.5 User /Occupant consultation**

User consultation was very much a part of the concept for the project from the outset.

- There were a series of different working groups to inform the 1998 option appraisal eg LRC group, staff accommodation group, teaching group. A number of these groups continued into the design stage of the project eg LRC group
- Staff and students were also involved in visiting the short-listed sites and in the decision making process around site selection. Although there was some concern about location and journey to work, there was a fair amount of agreement that this was the site with the most potential.

- The architect worked extensively with the users and carried out focus groups/working groups with staff and students, mainly at Stage D. The groups were facilitated by the architect and administered by the project Administrator. There were 6-7 groups that met fortnightly, each with about 12 members. This was thought to be an ideal size for such groups - the concept was for the members to be fairly strategic people to act as a conduit for issues and ideas from their own staff.
- The architects held a number of presentations throughout the project to keep people informed
- It was felt to be very helpful that the Project Administrator attended all of the working group meetings as this provided consistency from the client side. She was able to make notes and feed back to the client. It was also helpful that the Project Managers attended many of the user meetings as they knew straight away where any problems lay and could report back to the project team.
- Consultation was also carried out with specialist personnel eg the IT department were involved in the 'thin client' discussions
- There were regular meetings with the Facilities staff to discuss practical, operational issues eg waste management

There were a number of issues concerning the user consultation

- There was some scepticism amongst users at the start as they had begun the consultation process with two previous sites and these bids proved unsuccessful
- Getting people to make decisions in the focus groups was sometimes difficult. For some users it was hard to get them to believe it was a real project
- Some people had entrenched views. Some members who are outspoken can push their views
- There were some conflicts within focus groups due to the mix of members eg LRC group comprised librarians and IS who had different requirements.
- It took some time to obtain agreement about the design of the LRC. One of main concepts of the building was that the LRC was the glue that held it together and as such it needed to be open to let people walk through. However the Librarians saw it as a place for books and as such it would need a secure entrance at each end. Finally the group was taken on a tour of 3 other LRCs and they came on board. If this had not happened they would probably have had to agree to the two entrances as a decision had to be made or the programme would have been in jeopardy. It might have been better to give the group a more limited choice of options although it was felt that they had to go through this process. If it was seen as totally imposed, this could have alienated them.
- There were also concerns about the move to open plan working. The team achieved agreement by analysing the brief, explaining the constraints and showing what they could afford within the budget. The group then was involved with discussing ideas for the design of the shared space.
- Information from the working groups did not always get communicated down to the rest of the staff.
- Because this was such a long term project, and also due to the change in location, many of the people who were involved from the user side have left QMU and other staff, many of them new, are now questioning decisions that were agreed. Some of these design assumptions were fairly major especially those around the change management process eg open plan, LRC, not configuring

around academic departments, not having local ownership of spaces. These were all huge issues that were successfully worked through at the time but it was felt that as time went on the message should have been reiterated to include new staff.

*Lesson: It is important to have someone from the client side at each focus group to focus on the big picture as otherwise the facilitator can end up getting involved in the politics and this is not their role.*

*Lesson: It is very important to involve the end users and listen to their views as they will be the ones using the building and know what their functional requirements are. The process needs to be carefully facilitated so that they will all walk away happy.*

*Lesson: On key points where contention may be anticipated, it may be better to give a more limited choice of options to avoid delays in decision making that may hold up the programme.*

*Lesson: It was very helpful that the Project Administrator attended all the working group meetings and the Project Managers attended many of them. This provided consistency and they knew straight away where any problems lay and could report back to the client on this. This made a big difference to the success of the groups*

*Lesson: The size of the focus groups is important – about 12 is ideal as if they are too big they can get bogged down, and impede decision making. However group members should be encouraged to communicate and consult with the other members of their departments.*

*Lesson: On a long term project there will be inevitably be staff changes amongst the end users – it is therefore important that if major changes in working practice will result, that staff are sufficiently involved and that there should be an on-going process to reiterate the message to include new staff.*

#### **4.1.6 Detailed design stage/Design issues**

Once the architect was appointed there was some revisiting of the Masterplan to take their new ideas on board to fit the needs of the project. Although the Masterplan had taken the design up to almost Stage C, it had always been planned to do a new Stage C.

The main changes were:

- A very strong part of the brief was that the LRC should be the heart of the campus but in the concept design it was a separate building. The revised design put the LRC much more at the heart of the scheme.
- After appointment, a site analysis was carried out and as there were a number of issues with the site eg it was windswept and exposed with a the motorway alongside, an option analysis of four suggested options was developed. This took into account the orientation of the buildings in terms of views from campus, sunlight/daylight, natural screening from road noise, the approach to the campus and the walk from the station.
- The original concept of the University Square was changed to provide a more human scale whilst preserving the concept of a large open area with green space between the surrounding buildings
- Parking was moved from a dominant position at the front of the buildings which was thought to convey the wrong message from BREEAM point of view.

The architect worked with the other consultants to finalise the design and the changes were discussed and agreed in regular design team workshops with the Project Team. When the strategic Masterplan was agreed they began to involve the working groups to discuss the internal design.

There were some issues at the design stage, mainly at Stage D:

- The brief was to achieve a 35 % space reduction and the budget had been based upon this but the 2003 area brief was found to be twice the size of the existing as the academics still came forward with misconceptions about what space they actually needed. To resolve this issue they brought in a space management consultant who carried out a space audit to work out the actual space requirements from the ground up. This took about 6 weeks out of the programme but it was felt that it had to be done as without it they would not have achieved the cost plan. It would have been preferable to have dealt with this issue much earlier in the project eg at Stage C.
- The academics were still concerned about the change to open plan working and therefore the project team revisited this element of the detail design with the help of a space planning consultant. This additional exercise was successful as it demonstrated the need for the change case on a cost and space as well as a cultural change basis.
- The project was to programme at all stages of the design as the team had built in a realistic contingency to deal with such issues. However one issue they should have taken into account was the impact of the academic year. Some decision points came just as key academics were on holiday and this delayed decision making.

*Lesson: On an academic project be aware of the impact of the academic year and try to timetable main decision points away from the holiday period when academics are away*

From the services point of view the main design issue was sustainability. They had investigated complex solutions eg PVs, ground source heat pumps etc but decided that the simple solutions and an efficient design would work best, and be most affordable. They therefore wanted to make things as simple and efficient as possible to provide a healthy environment. Natural ventilation was seen as a win/win solution as it gave low running costs and low capital cost. From the design point of view this was not easy to achieve - a lot of design work and thought went into it although it was quite a straightforward design solution and they had prior experience of this method.

It was pointed out that this design using natural ventilation should be not used as a benchmark for every site. On this project sustainability was taken seriously from the start so QMU was prepared to be realistic and accept some compromises eg in choosing natural ventilation they accepted the implications of the thermal modelling that the temperature on some days could be over 20 ° C.

*Lesson: The services design using natural ventilation has been successful but should be not used as a benchmark for every site. Sustainability was one of the key drivers so the client was prepared to accept that there may have to be some compromises - other projects may not have sustainability embedded from such an early stage.*

From a structural point of view, the teams worked well together to provide sustainable solutions such as using exposed soffits. This concept was new to the client so a mock-up was produced to ensure that they would be happy with the solution.

The Project Managers insisted that the structural engineers should complete the reinforcement detailing before they went to tender and with hindsight they agreed that this was the right thing to do. It saved a lot of time negotiating with the contractor later. It is not normal practice to tender a job on full reinforcement drawings but they felt that this was a good position to be in.

*Lesson: From a structural engineer's point of view, they advise getting as much of the design eg reinforcement detailing done up front as possible pre-tender as then there are fewer questions and grey areas post-contract*

#### **4.1.7 Approvals - planning and other restrictions on the project**

As the site was green belt and the council was putting forward a local plan to change the designation to institutional and employment uses, QMU was invited to put in an early planning application as part of the process. The master plan based on the outline design brief was submitted.

The master planning was slightly complicated by the fact that they only have 1/4 of the site 35 out of a total of 140 acres. There was no road infrastructure or services into the site and the site owners wanted any infrastructure to be capable of taking future potential development into account.

Planning and building control were very supportive. There was good support for the project from East Lothian Council as there was no HE facility in the area at the time eg they assisted with the creation of the access road.

There were some issues with obtaining approvals from the Council's fire engineers for the ETFE roof to the atrium. East Lothian Council's small team did not understand the technicalities, and therefore brought in external consultants and the Edinburgh fire engineer who had more experience of ETFE to advise them. This all took additional time. It was felt that this may not have been such an issue with a bigger council who might have had previous experience of the new technology.

*Lesson: With new technologies such as ETFE, allow additional time for approvals etc particularly with a small authority as you will need to take more time to speak to them. Relaxations were the issue here so it pays to be aware of this and submit relaxations early.*

There were a number of problems due to the utilities as there was so much infrastructure to bring in. Utilities are a big part of any project and the answer is to start as early as possible in dealing with them.

*Lesson: Utilities are a big part of any project and dealing with the utility companies can cause delays. The answer is to start as early as possible in dealing with them.*

The BREEAM assessment was straightforward and both parts of the project achieved BREEAM Excellent. The assessors also provided advice on how to achieve this.

The project is on line for a CEEQUAL Excellent but they still not got the verification through as yet. This is taking time as not all the documentation was easily available. The whole process of getting this information out of people has proved to be quite onerous.

*Lesson: Prepare the team for accreditation schemes such as BREEAM and CEEQUAL, by giving members a document list listing all the evidence that should be kept for checking at the end of the project and giving someone the responsibility for keeping these*

## 4.2 Construction stage

### 4.2.1 Appointment of main contractor and subcontractors

The whole team was involved in contractor selection.

The procurement route chosen was a hybrid Design and Build (D&B) Contract. This was chosen in preference to a conventional one or two-stage D&B because there were concerns about possible cost implications.

Another innovative concept that was unique in the UK at the time was to go out to tender with specialist subcontractors already in place so that they would have a fully designed building as part of the tender. They would then not waste time with buildability issues and also obtain more competitive pricing. However there was still a final element of choice for the main contractor and there were major issues with the subcontractors who won the tender as they could not grasp that they might not get the job. Even though they would have been 99% certain they said they would not commit to the drafting process unless they got the full order first. In the end the contractors did keep them all on

The specialist sub-contractors were chosen through a tender process and were:

- Curtain walling/cladding
- Concrete,
- Lifts
- ETFE roof
- Gyplock walling system

The route was partly successful. They did obtain cost certainty on some of the high risk packages before they commenced. The sub-contractors came in at Stage E and attended workshops and added value to the process with some good ideas, but there were some unforeseen problems eg Gyplock went into administration.

Another reason for this policy was that, at the time, the construction market in Scotland was overheated so it was not easy to get main contractors to bid. It was thought that this approach would make the job more attractive as it would de-risk the job for the main contractor by removing all the interface risk. However in the event they did not have a lot of interest - only 3 companies were on the tender list.

It was thought that if they had used a conventional two-stage D&B route they would have had more interest. Contractors did not understand the route and so, in such a tight marketplace, they did not get the level of competition they wanted.

There was also some perception in the market place that the companies who were awarded the specialist design portions were going to get the major contractor appointment The M&E subcontractor was appointed by the Main Contractor from a list of approved University contractors.

*Lesson: With hindsight a 2-stage D&B may have been a better route from the programme point of view. In a tight market contractors may be wary of tendering for atypical contracts*

*Lesson: With hindsight they would go with the specialist subcontractor route again, particularly for high risk specialist packages eg ETFE roof. However they would also try to gain the understanding of the market about the process before going out to tender.*

#### 4.2.2 Relationships within project team

There were regular meetings throughout the project eg monthly project team meetings and fortnightly design meetings with the contractor, some of which were attended by the Client representative. Other meetings eg utilities took place on a bi monthly basis depending on the project stage.

The design team was novated to the main contractor although the QS and Project Managers were still working to QMU and initially relationships were very good. The design team still had residual duties to QMU and QMU and the contractor had not demanded 'Chinese Walls' so the relationships did not change much. Meetings and communication were still open.

The main contractor had a positive approach to organising the programme and managing the sub-contractors. However three months into the programme, the company was subject to a takeover. The new management introduced some changes into the organisation and personnel began to leave, mainly senior staff such as regional management. This was felt to have had an impact on the site and programme and affected relationships.

In spite of this it was felt that relationships were generally good, even those with the contractors and that there was a positive spirit and a real desire to get on with the project and do it well.

*Lesson: Not demanding Chinese walls after novation ensures that communication between the client and design team remains open and the relationship does not change.*

#### 4.2.3 Construction issues/During construction

The project started on site in October 2005 and progressed well at first. There were a few issues with utilities problems and some residual risks had to be sorted out before they started but this did not delay the programme.

Although in general most aspects went well, there were some issues that caused problems to the project.

- Services co-ordination on site was poor, eg operatives had to come back to take bricks out to put light fittings in. It was felt that some main contractors do not have programming and commissioning management experience for M&E and with hindsight it may have been a good idea to have embedded a commissioning manager to programme the M&E. This may have cost £50K but would have paid for itself.
- Another issue was labour. The M&E contractor was strong mechanically but it was felt that their electrical team were not as good. It was felt that in Scotland a combined M&E does not work so well as there is strength in one area but not the other. Workshop participants would not advise going down this route again without careful consideration.
- The process of using an exposed concrete frame was not totally successful. The concrete finish has been an issue both on-site, and in terms of managing the client's aspirations. Some of the problem is down to personal taste but they did do a mock up and the client was happy with that.

It was felt that the issue was not with the theory but the quality of construction. Some areas are fine eg some rooms and the columns, but the problem was control and workmanship. The engineers did spend a lot of time with the contractor on this but there are so many variables eg weather causing discolouration of the soffits due to dust blowing on the site etc and to some extent it is the nature of the materials. In fact the Concrete Society have used it as a good example (not

all projects have quality even as good as this). However with hindsight they should have skim coated the ceilings – then the finish would not have mattered so much.

*Lesson: With non standard finishes eg exposed concrete, more work may need to be put in investigating the methodology to highlight potential pitfalls, talking to other people who have used it in the past and working with the contractor. Visits to other buildings with the client will show what it will be like in reality and manage their expectations - if you they don't like it then it may be better to go for a different finish, in this case skim coating and painted.*

- The weather, particularly the wind, played a big part in the build on such an exposed site. The changing weather patterns across the day are very different from an inner city site. The contractor had to change his shift patterns to early morning shifts because the wind off the sea meant he could not run his cranes later.
- There were difficulties with the Biomass system as it is an innovative technology and there was a lack of expertise – not many people having done it in the UK at the time. It is felt to be a good solution for QMU - the specialists and the design were successful as was the actual installation so the biomass system itself is reliable, however there were supply chain challenges. There were also problems with the building housing the system, the interfaces of the systems with the rest of the site and responsibilities in terms of the supplier and the contractor. The firm that has been contracted to run the system had to bring in the Austrian suppliers to provide advice in the end. This resulted in increased cost and delays.

*Lesson: With an emerging technology attention should be paid to contractual issues and responsibilities so that there are no grey areas. More information should be put into the contract*

- There were issues with the ETFE roof as the supply chain was very limited. Their supplier was the only one in the country by the time the delivery came round and they had other huge jobs that took priority. This caused delays.

*Lesson: Be aware of limited supply chains with non-standard materials eg ETFE roofs as this can cause hold ups. The QMU team would only take on such a roof now with a health warning as only one supplier exists*

#### **4.2.4 Programme management and control**

At the design stage the client had very realistic timescales for each stage and they had kept a contingency in the strategic master plan so that some parts could take longer. Also there was a sign off period of four weeks between each stage. This was felt to be a good idea as on many projects there is such pressure to reduce times at the design stage and always causes problems later on down the line.

*Lesson: Realistic timescales are important. Additional contingency at the design stage allows enough to iron out any issues at an early stage and saves time later.*

However, there was a major change in the design, just as the contractor started. The original design did not include accommodation for the School of Drama and Creative Industries (DCI) as the Gateway Theatre had only recently been acquired. A later condition survey concluded that the building was in such poor condition that it could not be used. The additional teaching accommodation therefore had to be incorporated into the design, mainly by enlarging the sports building and also through some minor changes to the main building.

From the project management point of view, they could have managed to make the changes before the tender process as in fact they had another 6 months before they were due to go on site but this happened just at the wrong time, over the summer. They could not get an agreed brief from the academics who were on holiday at the time and they could not make a decision without going through due process.

The additional charge for this change by the contractor was £3 million which was more than the client had envisaged. An extension of time of two weeks in the programme was put forward by the contractor and agreed.

The client had little choice in the matter at the time as their hands were tied. However with hindsight, it was suggested that they should have kept the project as it was and then either added the facility as a separate standalone project at a later stage or taken the whole Sports and Union Building out of the project and done this as a separate build – which was something they were considering at the time.

This would have allowed them to have spent another 6 months developing the design and to have gone out to a small contractor. It might have taken some of the pressure off the main contractor and given everyone more time to reflect.

*Lesson: If at all possible, avoid major changes on a D&B contract as these can be very costly and cause delays*

*Lesson: When acquiring an existing building, ensure that a full condition survey is carried out prior to purchase to avoid problems later.*

For the first 12- 15 months of the contract there were no issues with the programme but then the contractors, began to fall behind. However although everyone could see that they were behind, it was reported that the contractor did not seem able to admit or recognise it. *'The contractor was in complete denial about the state of the programme and this was a cause of frustration every month'*.

In addition to the problems highlighted in Section 4.2.3, there were a number of issues that could have contributed to the delays

- Delays with core utilities such as Scottish Water
- The DCI, although this change was not thought to have contributed greatly to the eventual programme delays.
- They had problems getting labour especially on the M& E side.

However much of the problem was felt to be poor programme management and the lack of proper management looking over the job at a senior level. It was left it to the site team. Every time they put in a recovery programme they did not put the people in to fulfil it so the situation became no better.

Even a couple of weeks before the expected handover, the contractor said they would finish on time. For the QMU the move-in was all or nothing so they had to make a decision in advance to move on a certain day. However if they had enough warning they could have put contingency plans in place eg to delay it for a term. They would not have been very happy to do this and it would have taken a lot of courage for the contractor to have made that decision. That was when a senior person above the site team should have made that decision, but although the site team was saying that they would not make it, senior managers said they would.

In the end the project finished much later than anyone had envisaged. The delays also were felt to have impacted on the quality of the build. It would have been much better from a quality perspective, particularly in terms of the services, if the work had been finished off before the move.

*Lesson: If a contractor realises that the programme is getting behind, it is better for them to face up to this and discuss it openly with the client. Although they could be subject to a penalty, from the client point of view they would rather know the true situation so that they can make contingency plans, than find out at the last minute. Then they either have to make last minute changes to their move or move in with the works still being completed. This is far worse for them and the contractor in the long run as relationships are soured.*

#### 4.2.5 Financial issues

- The business case that followed the option appraisal was based on the project being entirely self funded, the majority coming from disposals of the current assets as no HE capital funding was available at the time. The SFC funding was a bonus that came in later on and was not part of the original business case.

The case was that the estate and operation would be so much more efficient on the new campus that the savings would justify the expenditure and the loans they would be taking on.

Over time, the income figures from disposals increased but the costs of the project also increased due to land purchase, utilises etc so budget on both sides changed from the 1998 projection.

- At each stage there was some value management but nothing major was omitted. It was felt that this was partly because the original briefing stage was so detailed. Apart from the DCI change, there were very few changes or variations.
- The project managers and client project team kept good control of the budget and the team was focussed on the budget all the way through.
- Because the project was not finally handed over at the time of this study, the final cost of the project is still uncertain. There is a major claim on the project as it was so late and there is a long way to go on the financial side on this project.
- The contractors were very slow at providing information and only now is the client getting information through to review the account. There are 70 instructions on the project, which was thought to be minimal on a £50 million project, but the team were only getting full detail at the time of the study, in May 2008.

*Lesson: A good, detailed brief that forms a realistic basis for the cost plan ensures that the budget is realistic and that there is little value management at the design and construction stages*

#### 4.2.6 Management of the site eg disruption/health and safety

The contractors were very good at managing the site itself. There were no major issues with disruption or health and safety. They did a lot of work with the community under the Considerate Constructors Scheme as required by the client for BREEAM and CEEQUAL.

*Lesson: Using BREEAM and CEEQUAL helps with site management eg ensuring that contractors use the Considerate Constructors scheme*

### 4.3 Handover, aftercare and moving in

Handover has been very protracted and at the time of the review the University was still operating under a temporary occupation certificate and had not yet received the final certificate of completion.

The campus should have been ready in July 2007 but as a result of the delays the moving in had to be carried out in stages.:

- Offices: September 2007
- Academic side: October 2007 with 50% of the teaching paces omitted
- Union and Sports: January 2008

Most of the facility had been handed over by the end of May 2008 although the contractors were still on site. The after-care service had commenced but there were still significant sub-contractor problems and there were still some fairly fundamental issues to be sorted out. There was a snagging list from when the building was due to be handed over but this is being revisited, as at that time the M& E side had not reached the snagging stage yet.

After the move there was still of work to be done on the M&E side. There were particular problems with the security systems, fire alarms etc. Most of the systems were operational but there was still some significant snagging and fine tuning to be done. Commissioning was still ongoing in May.

There was a problem with the commissioning, in terms of who had the responsibility for supervising this. It was felt that the contractor did not have the necessary skill level to carry out the commissioning and that this is a common problem. It was suggested that they should have put a specific clause in the contract specifying that the main contractor should bring in specialist commissioning personnel if they do not have the expertise in-house at management level.

*Lesson: Commissioning of systems is very important but responsibility for this can be a grey area in the contract. In future it was suggested that a specific clause should be written into the contract to ensure that the main contractor should bring in specialist commissioning personnel to oversee commissioning if they do not have the expertise in-house at management level.*

## 5 Conclusions

The new QMU campus is now fully occupied and is proving popular with both students and staff who are proud of their new campus. The project team is looking forward to the Functional Performance Review which will provide in depth feedback on the performance of the building and feel that this will yield positive results.

The project has been a unique challenge for QMU and it was agreed that they and their project team rose to this challenge and achieved what they set out to achieve all those years ago. It has provided a building that demonstrates the ethos of QMU, has supported a culture change in the way that teaching and learning is delivered and has delivered space efficiencies within an attractive campus that has the highest sustainability credentials.

The campus is seen as setting a benchmark for sustainability both for the local area and for Scotland as a whole and the University has had many visitors wishing to see the project with particular interest shown in the LRC, the Biomass system, sustainability, space management, and ICT.

In spite of disappointing contractual issues and delays that marred the end of the project the process was felt to have been generally successful. There was excellent user consultation and this provided good buy-in for the project from staff and students

A particular success was thought to have been the way sustainability was embedded into the project. When the project started in 2003, sustainability was not a recognised issue as it is today and so there was a steep learning curve for the University and the project team but they all feel that they have learned a great deal and that the campus is a model for sustainable design. Although on a superficial observation the building does not resemble what is often expected from a sustainable building eg green roofs, wind turbines etc it has achieved something superior, a real sustainable solution through good design principles planned from the outset.

There were a number of lessons that the review participants would take into account if they were to embark on a similar project and that they would recommend to other Higher and Further Education clients and the SFC. These are detailed in Appendix B but include the following:

- To be successful, sustainability should not be an add-on or afterthought. It has to be embedded from the word go so that it can be economic in terms of both capital cost and long term operational cost. For QMU it was one of the key business drivers supported from the top level of management from the outset. This interest is continuing post completion through an Environmental and Sustainable Working Group with senior management support to manage the move from delivering a sustainable building to managing it in a sustainable way.
- Internal and external project management was very successful. Establishing clear responsibilities and sign-off procedures at an early stage of the project, streamlines decision making and helps with internal project management
- On a large, long-term project it is a good idea to have a member of administration staff devoted full time to the project team to provide continuity and deal with the day to day running of the project

- A staged selection process for consultants can be very successful and helpful for the client team. It is a particularly good idea to bring the Project Manager on board from the start and for the architect to be involved with selection of the engineers
- The project was helped by the quality of the initial brief. A good, detailed and informed client brief ensures that the design team can understand the client requirements from the project and develop these in the design
- It is very important to involve the end users and listen to their views as they will be the ones using the building and they know what their functional requirements are. The process needs to be carefully facilitated so that they will all walk away happy.
- From a structural engineer's point of view, it is advisable to get as much of the design eg reinforcement detailing done pre-tender as then there are fewer questions and grey areas post-contract
- The contract used was a hybrid Design and Build contract. With hindsight a two-stage D&B may have been a better route from the programme point of view. In a tight market contractors may be wary of tendering for atypical contracts
- There was a major change to the design just post contractor appointment due to circumstances beyond the control of the client. If at all possible, avoid major changes on a D&B contract as these can be very costly.
- Commissioning of systems is very important but responsibility for this can be a grey area in the contract. It is suggested that a specific clause should be written into the contract to the effect that the main contractor should bring in specialist commissioning personnel to oversee the commissioning if they do not have the expertise in-house.

## Appendix A: Lessons learned record

<b>Feasibility, Briefing and design</b>	
<b>Focus Area</b>	<b>Recommendations/lessons learned</b>
<b>Project Management</b>	<p><i>Establishing clear responsibilities and sign-off procedures at an early stage of the project, streamlines decision making and helps with internal project management</i></p> <p><i>On a large, long term project it is a good idea to have a member of administration staff devoted full time to the project team to provide continuity and deal with the day to day running of the project</i></p>
<b>Appointment of architect and other consultants</b>	<p><i>A staged selection process for consultants can be very successful and helpful for the client team. It is a particularly good idea to bring the Project Manager on board from the start and for the architect to be involved with selection of the engineers</i></p> <p><i>Although the appointment of the architect went well, and was felt to have been the right choice, it was felt that it is a good idea to include some element of fees in the selection criteria but with much less importance than quality</i></p> <p><i>Appointing specialist consultants eg acousticians, at an early stage and involving the engineers and architects in their appointment saved time and gave them early input reducing redesign.</i></p> <p><i>The role of a strategic sustainability advisor is important- but they need to be brought within the team as a direct report rather than a sub-contract to the services consultant or potentially this could deliver some conflict., although this was not a problem on this project. Also ideally they should be brought in at an early stage of the project</i></p> <p><i>If BREEAM and CEEQUAL are being used to guide a project, the ecologist appointment should be made at an early stage to provide strategic advice</i></p>
<b>Briefing</b>	<p><i>A good, detailed and informed client brief ensures that the design team can understand the client requirements from the project and develop these in the design</i></p>

<p><b>User consultation</b></p>	<p><i>It is very important to involve the end users and listen to their views as they will be the ones using the building and know what their functional requirements are. The process needs to be carefully facilitated so that they will all walk away happy.</i></p> <p><i>It is important to have someone from the client side at each focus group to focus on the big picture as otherwise the facilitator can end up getting involved in the politics and this is not their role.</i></p> <p><i>On key points where contention may be anticipated, it may be better to give a more limited choice of options to avoid delays in decision making that may hold up the programme.</i></p> <p><i>It was very helpful that the Project Administrator attended all the working group meetings and the Project Managers attended many of them. This provided consistency and they knew straight away where any problems lay and could report back to the client on this. This made a big difference to the success of the groups</i></p> <p><i>The size of the focus groups is important – about 12 is ideal as if they are too big they can get bogged down, and impede decision making. However group members should be encouraged to communicate and consult with the other members of their departments.</i></p> <p><i>On a long term project there will be inevitably be staff changes amongst the end users – it is therefore important that if major changes in working practice will result, that staff are sufficiently involved and that there should be an ongoing process to reiterate the message to include new staff</i></p>
<p><b>Detailed design/design issues</b></p>	<p><i>The services design using natural ventilation has been successful but should be not used as a benchmark for every site. Sustainability was one of the key drivers so the client was prepared to accept that there may have to be some compromises - other projects may not have sustainability embedded from such an early stage.</i></p> <p><i>From a structural engineer’s point of view, they advise getting as much of the design eg reinforcement detailing done up front as possible pre tender as then there are fewer questions and grey areas post contract</i></p>

<p><b>Approvals - planning and other restrictions on the project</b></p>	<p><i>With new technologies such as ETFE, allow additional time for approvals etc particularly with a small authority as you will need to take more time to speak to them. Relaxations were the issue here so it pays to be aware of this and submit relaxations early</i></p> <p><i>Utilities are a big part of any project and dealing with the utility companies can cause delays. The answer is to start as early as possible in dealing with them.</i></p> <p><i>Prepare the team for accreditation schemes such as BREEAM and CEEQUAL, by giving members a document list listing all the evidence that should be kept for checking at the end of the project and giving someone the responsibility for keeping these</i></p>
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Construction stage	
Focus Area	Recommendations/lessons learned
<p><b>Selection of contractor</b></p>	<p><i>With hindsight a 2-stage D&amp;B may have been a better route from the programme point of view. In a tight market contractors may be wary of tendering for atypical contracts</i></p> <p><i>With hindsight they would go with the specialist subcontractor route again, particularly for high risk specialist packages eg ETFE roof. However they would also try to gain the understanding of the market about the process before going out to tender</i></p>
<p><b>Relationships within project team</b></p>	<p><i>Not demanding 'Chinese Walls' after novation ensures that communication between the client and design team remains open and the relationship does not change.</i></p>
<p><b>Construction issues</b></p>	<p><i>With non standard finishes eg exposed concrete, more work may need to be put in investigating the methodology to highlight potential pitfalls, talking to other people who have used it in the past and working with the contractor. Visits to other buildings with the client will show what it will be like in reality and manage their expectations - if you they don't like it then it may be better to go for a different finish, in this case skim coating and painted.</i></p> <p><i>With an emerging technology eg Biomass, attention should be paid to contractual issues and responsibilities so that there are no grey areas. More information should be put into the contract</i></p> <p><i>Be aware of limited supply chains with non-standard materials eg ETFE roofs as this can cause hold ups. The QMU team would only take on such a roof now with a health warning as only one supplier exists</i></p>

<p><b>Programme management and control</b></p>	<p><i>Realistic timescales are important. Additional contingency at the design stage allows enough to iron out any issues at an early stage and saves time later.</i></p> <p><i>If at all possible, avoid major changes on a D&amp;B contract as these can be very costly and cause delays</i></p> <p><i>When acquiring an existing building, ensure that a full condition survey is carried out prior to purchase to avoid problems later</i></p> <p><i>If a contractor realises that the programme is getting behind, it is better for them to face up to this and discuss it openly with the client. Although they could be subject to a penalty, from the client point of view they would rather know the true situation so that they can make contingency plans, than find out at the last minute. Then they either have to make last minute changes to their move or move in with the works still being completed. This is far worse for them and the contractor in the long run as relationships are soured.</i></p> <p><i>On an academic project be aware of the impact of the academic year and try to timetable main decision points away from the holiday period when academics are away</i></p>
<p><b>Financial issues</b></p>	<p><i>A good, detailed brief that forms a realistic basis for the cost plan ensures that the budget is realistic and that there is little value management at the design and construction stages</i></p>
<p><b>Management of the site</b></p>	<p><i>Using BREEAM and CEEQUAL helps with site management eg ensuring that contractors use the Considerate Constructors scheme</i></p>
<p><b>Handover</b></p>	<p><i>Commissioning of systems is very important but responsibility for this can be a grey area in the contract. In future it was suggested that a specific clause should be written into the contract to ensure that the main contractor should bring in specialist commissioning personnel to oversee commissioning if they do not have the expertise in-house at management level</i></p>