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# Post-Occupation Evaluation Study Report

Project: **North Lab**  
(The Peter Buttery Teaching Laboratory)  
Sutton Bonington Campus

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Date: April 2018



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# INTRODUCTION

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In January 2017, Building Understanding submitted a proposal, to the University of Nottingham Estates Department, to conduct post-occupation evaluations for a number of projects, and the proposal was accepted. North Lab (The Peter Buttery Teaching Laboratory) is the fourth project to be evaluated by Building Understanding.

This report aims to detail the strengths and the weaknesses of the North Lab project, put forward recommendations and highlight best practise and excellence that can be applied to future projects at the University of Nottingham.



# OBJECTIVES AND METHODOLOGY

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## OBJECTIVES OF THIS POST-OCCUPATION EVALUATION

- To bring to light any key issues associated with the building procurement process and management of the project
- To draw out stakeholder feedback concerning the design of the building and the experience of its end users
- To facilitate a half-day workshop, to discuss and debate the key issues revealed through the primary research
- To analyse all output from the face-to-face depth interviews, telephone interviews and the workshop, to provide a summary report with recommendations

## SCOPE OF THE STUDY

Building Understanding sought feedback on the following aspects of the North Lab project:

- Overall user satisfaction
- Design issues
- Satisfaction with specific spaces
- Construction issues
- Security
- Accessibility
- Air quality
- Cleanliness
- Internal room temperature
- Distraction from noise
- Lighting conditions
- Data connectivity
- Mechanical and electrical services
- Sustainability
- Operations and facilities issues

## STUDY PARTICIPANTS AND METHODOLOGIES

Building Understanding conducted face-to-face interviews and telephone interviews. Five different questionnaires were prepared in order to canvas feedback from respondents drawn from the following categories:

- Consultant team
- Contractors and specialist suppliers
- End-users of the facility
- Estates office staff

### Face-to-face depth interviews

Depth face-to-face interviews of approximately one hour's duration were conducted with people in the following roles:

- Project Manager

- Designer
- Operations Director
- Capital Projects Officer
- End user

### **Telephone interviews**

In addition, telephone interviews were conducted with individuals in the following roles:

#### **Consultant team**

- M&E Designer

#### **Sub-Contractor**

- M&E Supplier

#### **Estates Office Staff**

- Senior Engineer
- Site Maintenance Team Leader
- User Experience Designer for Teaching and Learning Spaces
- Carbon Reduction Manager
- Domestic Services

#### **End Users**

- Lecturer in Nutritional Biochemistry
- Laboratory Manager
- Associate Professor of Microbiology
- Head of School of Bioscience
- Professor of Veterinary Medicine

### **The workshop**

On 29<sup>th</sup> March 2018, a workshop took place involving eight attendees. The workshop objectives were to:

- Discuss and debate the key points of feedback gleaned from the primary research
- Generate recommendations to be applied to future projects commissioned by the University of Nottingham
- Highlight nuggets of best practise and excellence revealed in the project that can be adopted and applied elsewhere

The workshop commenced with a presentation, by Building Understanding, of the findings of the primary research. The areas of weakness and opportunities for improvement were then debated. Attendees were divided into breakout groups, with each group charged with assigning recommendations to specific points of feedback.

### **SAMPLE SIZES**

It is important to emphasise that the quantitative statistics in this report are based on very small samples. A total of 18 respondents provided feedback.

# PROJECT DATA

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<b>Name of facility:</b>	<b>North Lab (The Peter Buttery Teaching Laboratory)</b>
<b>Location:</b>	Sutton Bonington Campus
<b>Gross area:</b>	966m2 (excluding stair towers)
<b>Number of storeys:</b>	Three but only ground floor and stair towers re-furnished in this scheme
<b>Users of the facility:</b>	This is a multidisciplinary facility at University of Nottingham primarily used by the School of Biosciences and the School of Veterinary Medicine and Science
<b>Room types:</b>	Laboratory-open plan/Locker area/Tech area
<b>Start on site:</b>	May 2016
<b>Date completed:</b>	Laboratory: October 2016 External : February 2017
<b>Period on site:</b>	44 weeks (including external works)
<b>Gross project cost:</b>	Construction: £4m Full Project: £5.3m
<b>Funding:</b>	University of Nottingham matched funding from HEFEC STEM
<b>Contract type:</b>	Traditional JCT Intermediate

# PROJECT BACKGROUND

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## THE NATURE AND FUNCTION OF NORTH LAB (THE PETER BUTTERY TEACHING LABORATORY)

North Lab is a refurbished teaching space within the North Laboratory Building at the Sutton Bonington campus of the University of Nottingham. The Lab has been named in honour of a world-leading Nottingham University academic, Professor Peter Buttery, to acknowledge his contribution to animal science. It comprises a large open plan laboratory with a secondary locker area and a tech area. It is a multidisciplinary facility that can be centrally booked but is used primarily by the School of Biosciences and the School of Veterinary Medicine and Science.

The laboratory is designed specifically to operate at containment Level 2, due to radioactivity precautionary measures and pathogens, and accommodates microbiological and veterinary school practical sessions. It benefits from new high powered microscopes and dissecting microscopes and associated camera systems for teaching histology, pathology and microscopy.

The state of the art space accommodates large group teaching of up to 204 students and can be spilt into three zones to run classes in a range of subjects from soil science to molecular biology, which all take place simultaneously. There is live streaming of lectures and big 'repeater' screens are situated around the lab.

The students working in this innovative, paperless environment are issued with tablets to access information on-line, download presentations and log their findings. Audio from lectures is delivered via a speaker in each student's lab coat.

The space was originally dedicated to two laboratories, a research space and an additional space which was occupied solely by the bio-sciences faculty. The Lab is located within a 1960's building, which is awaiting full refurbishment.

The project involved the re-development of the ground floor and the stair tower whilst the first and second floors remained occupied.

While it is realised that it would have been significantly more efficient and less time-consuming to conduct both phases of the redevelopment project concurrently, due to issues connected with funding, the decision was taken by the University to carry out the works in two phases.

The building is located at the north end of the Sutton Bonington campus and was officially opened on the 27<sup>th</sup> January 2017, adding a fantastic facility to the campus.

## THE OBJECTIVE FOR THE PROJECT

The objective behind the creation of the North Lab was to provide a state-of-the-art paperless 'super lab' which could be used by several of the University disciplines

simultaneously and act as a showpiece for potential new student admissions, outreach programmes and summer schools.



# SUMMARY

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A high level of satisfaction with the completed North Lab is expressed by the participants in this post-occupation evaluation. Across the sample of respondents, there is agreement that the resulting building project represents a huge improvement, both to the building, and to the University's facilities. In the main, respondents feel that the Lab looks impressive, that the space works well and is flexible.

However, the journey to project completion was universally acknowledged by respondents as being difficult. It was described succinctly as:

**“It is a good facility. It meets the requirements of the original brief, how we got there was probably a little too painful for both the occupants and some of the team working on it.”**

Generally, the design phase was well planned and executed with the vision and objectives of the University being well understood. However, there were a number of issues concerning the construction phase of the project, which are examined in detail below.

It is considered that the North Lab is fitted out to a high standard but that the infrastructure of the technology required to run and service the laboratory constitutes a risk, as it is 100% reliant on Wi-Fi access, connectivity and the software used by the tablets

Overall, it is considered that the North Lab delivers better functionality and more flexible space than the previous facility. The ability to teach up to 204 students across multi-disciplines more quickly, efficiently and effectively is highly valued. There is now no need to repeat practical classes, split into two or three groups, because it is possible to accommodate much larger numbers than was possible previously.

## The Design Phase and Process

The design phase was considered to be a success with the Lab designed to meet the University's vision, acting on learning points from previous University projects.

**“With the designers it worked well, it was a continuity of the team that worked on S Lab and there were certainly no issues. We tried to use learnings from S Lab on this one.”**

However, some respondents feel that the main contractor did not fully understand the University's vision.

## Functionality

The facility is considered by respondents to be highly functional. High levels of satisfaction were expressed by the interviewees.

**“I think it works really well. It allows the different zones to be utilised, it allows for the quick changeover with the large technicians' space, so it definitely meets the needs.”**

## Flexible Space

The facility was designed with a high degree of flexibility, as per the original vision, especially with regard to moveable lab benches. In contrast to the S-Lab project, there were practical constraints to the ability to move the benches, due to connections to the water supply and to piped natural gases. Generally, the feedback on flexibility is positive. Users of

the facility question whether such a high degree of flexibility was actually necessary for their use, but it provides the university with the flexibility it requires.

“Before, it was very old fashioned and run down. They were small spaces so opening them up and creating the large spaces was really impressive. You can teach everyone in one hit, you can split it in half, in thirds, into small sections. It just gives that complete flexibility. With having that technician’s space, it allows that relatively quick turnaround between different sessions and it’s just maximising the use of the space.”

### **Disabled Use and Access**

One key positive feature of North Lab that is not debatable is that it has excellent disabled access and a secure environment.

The disabled access to the North Lab is considered as excellent as it is all at ground level. There was no negative feedback pertaining to the level of access for disabled users.

Provision for disabled users in the lab is considered good, providing a bench and equipment with flexible heights with a hearing loop for deaf students.

### **Security**

In the main, security is considered as appropriate, with pass cards and codes required to enter the building.

## **KEY CHALLENGES FACED BY THE NORTH LAB PROJECT**

### **Contractor tendering, programme management & timing**

With hindsight, it was acknowledged that the tendering process was not successful in producing a sufficiently wide choice of relevant contractors. This was due to the timing of the tender, the length of time the project was put out to tender and the risks attributed to programme timing and completion.

“From a contractors’ perspective we went out to five contractors who were all interested in the weeks leading up to it. We only got two returns. I think the programme scared a few people off, it’s a buoyant market. I think where it fell was that by the time we went out to tender everyone had already secured work for the summer. We couldn’t get out any earlier and it only went out for a three-week tender period initially which isn’t enough, I think we added on another week on to it. From a programme perspective there was a lot of risk that contractors can pick easier projects.”

### **Technological challenges and limitations**

The vision to make the Lab a paperless environment has not been without its teething problems, but the University is keen to make it work and there will be a review of working practices at the end of the academic year.

The Lab is reliant on the continuous provision of Wi-Fi services for the transmission of lectures and demonstrations, the recording of the results of experiments and audio to the microphones in the student’s lab coats.

Further restrictions have been raised by individual respondents, such as the inability to hold examinations in a paperless environment and having to take photographs of experiment results rather than take a physical paper read out from the equipment. Although these can be accommodated for the limited times this is required.

The data connectivity in the Lab is good but there have been some significant issues with the tablets that occurs when they receive updates. This issue is connected to Windows 10 and is a known issue. The problems have been reported to the I.S service desk but there has been little response.

“I think the biggest problem is the IT. The IT hasn’t turned out to be as flexible as we had hoped. We are running off tablets, which is great. The students do like that, but I don’t think some of them have got over not being able to have paper in the lab. It’s difficult for us to keep saying, well this is how it is, when the IT falls over. I think even now, we are coming to the point where we might have to review if we can continue to keep it totally paperless, because if the network isn’t functioning properly or we’ve lost a connection we can’t be solely dependent that we can’t operate.”

### **Key issues during the construction phase**

Widespread dissatisfaction was reported by interviewees, regarding aspects of the performance of the main contractor and with the journey through the construction phase of the project.

From an early stage, progress lagged behind programme. Respondents report that the main contractor did not admit to the delays, taking something of a ‘head in the sand’ approach, and that there was no recovery plan in place.

“They were not proactive. They would never say that they weren’t on programme, but when you challenge them about everything that they’d put on the programme they weren’t there. So even though they were trying to present a programme that was on programme, they weren’t! When they were getting towards the end with the cladding, they did flag up they weren’t on programme because they were saying ‘we haven’t got the tiles, this is the knock-on effect there’.”

Interviewees made negative comments concerning the resourcing of the project and some commented on the high level of churn in site personnel. There was poor engagement with the wider team, particularly concerning M&E. More than one respondent commented that the inclusion of an M&E coordinator would have been beneficial. The role of contracts manager, driving the programme and managing the supply chain was eventually filled, although several respondents feel that this individual should have been in place from ‘day one’. However, it was suggested that this individual effectively played the role of site manager and so there was a gap between operations management and the site team.

“There were additional roles that were missing. We needed a contracts manager from before day one, the time of appointment. We needed two site managers, one with an M&E coordination focus and one with a fabric building perspective. That was clearly stated at tender, at the pre-contract meeting. Unsurprisingly that is where a lot of the issues have come in. I think we had four site managers in total.”

One respondent pointed to the absence of a procurement manager from the main contractor’s team and several interviewees mentioned the churn of site personnel.

Furthermore, behaviour of operatives on site showed insufficient respect and a lack of understanding of the requirements and appropriate behaviours on a live academic site.

### **Outstanding and snagging issues**

The management of the snagging issues was not sufficiently resourced, leading to protracted defect resolution and it is still incomplete. There is still an issue with an on-going leak to the roof. The O& M manuals are still awaiting a few documents. At the time of writing, the final account is still not settled, and a number of defects are still outstanding.

“We have an issue with regards to a roof leak that hasn’t been resolved by [the main contractor] because they can’t seem to grasp it. There is an area that’s got a warranty on it, but because they’ve not quite finished it, what we’re going to end up doing is putting that work into the next phase. There is an issue with the air handling unit, and that’s all to do with the lack of an M&E coordinator.”

# QUALITATIVE FEEDBACK - THE DESIGN AND THE CONSTRUCTION PHASE

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Generally, the design phase of the North Lab project went very well. This can be attributed to the quality and experience of the design team and also their desire to develop and implement the learnings from previous capital projects delivered at the University.

The most difficult part of the project was the construction phase which was described as being 'challenging and tortuous' and caused considerable frustration along the way.

## FEEDBACK RELATING TO THE PRE-CONSTRUCTION PHASE

### The design process

The design process was considered challenging, but enjoyable. Respondents report good collaboration and understanding of the innovative nature of the project. The M&E designer remarked on positive collaboration with the wider design team.

### The tender process

The study has highlighted the necessity for a robust tender process which produces more than two possible main contractors. This should also take into account the timeframe and the time of year the project is put out to tender. In the case of North Lab, the tender process was somewhat rushed, and an extra week had to be taken to gather two available contractors that could adhere to the timeframe specified.

During the tender process, the University and the design team were re-assured that the appointed contractor had two senior managers who had experience of working on University projects and that both managers would be involved in the project. This assurance gave them confidence that this contractor was the right choice, but these individuals did not form part of the contractors' team going forward.

## Recommendations

- Continued discussion with Main Contractor to hopefully maintain members of the contractor team who were put forward in the Tender stage

### Procurement of packages

There was some criticism of the procurement of the supply chain. It was felt that the issues sprang from when the main contractor placed the initial orders and got the packages in place. It is the opinion of respondents that this took place too late. The main contractor did not appear to have a sufficiently robust supply chain to draw on.

### Procurement of materials

There was an issue with procuring the terracotta cladding specified for the outside of the building. The cladding was on a long lead-time, so the contractor committed to placing this order on the day that they were awarded the contract for North Lab. However, this was not done, which meant that the supply chain was not in place, which subsequently caused

delays to the installation of this key element of the development. In addition, there were delays in procuring the steel framing system, which then directly impacted on the installation of M&E.

## Recommendations

- Ensure a procurement tracker is included in contractors' progress reports

### Enabling works

The enabling works were conducted by a separate contractor, appointed by the University. The performance of this contractor was highly rated by those respondents who were able to comment.

The structural alterations involved taking the building frame out and rebuilding it, while keeping the upper storeys in place. This was a complicated exercise, but it was conducted well.

Removal of asbestos from the site, which was more complex than anticipated, caused some delays and so an extension of time was granted.

## FEEDBACK RELATING TO THE DESIGN & LAYOUT OF THE FACILITY

The majority of respondents made positive comments regarding the design and layout of North Lab.

### Flexibility of the space

The original objective for the North Lab project was to provide a flexible space with movable lab benches, which can make the environment more conducive to group working and the Lab can be divided into three different zones. However, it was reported that there were limitations to this flexibility, due to the necessity to provide water, sinks and piped gases at the benches, which would prevent them from being properly mobile. Some of the academic staff interviewed for this study actually questioned the need for so much flexibility in the movement of lab benches and equipment for their use, however, it provides the university with the flexibility it requires.

### Location of plant on the roof

One interviewee voiced concern that locating the main plant and services on the roof of the building was short sighted as it would create issues when the next phase of the building's refurbishment commenced. It would be expensive to re-locate but it would mean that there was less flexibility for future projects. However, a clear instruction was given to locate the plant here by the university's Project Management Group (PMG)

## FEEDBACK RELATING TO THE CONSTRUCTION PHASE

### Understanding the demands of a live academic environment

The refurbishment of North Lab was complex and was conducted within a 'live building'. Obviously, carrying out works within a building that is occupied, not only during term time, but also during the vacations and at weekends, by post-graduate students and academics,

presents orchestration challenges. Whenever work had to be carried out on the flue stacks on the roof, or on the M&E, students were unable to use the fume hoods.

According to several respondents, the planning and management required in order to conduct such works, whilst the first and second floors of the building remained occupied, was not sufficiently taken into account by the main contractor.

It was reported in the workshop that members of the construction team were found working unsupervised in parts of the facility that they should not have entered without being accompanied by University staff or having a permit to do so.

## Recommendations

- Consider a more substantial induction process between the University and the contractor to ensure understanding of the requirements of working within a live academic environment
- Ensure main contractors make sub-contractors fully aware of the restrictions of working in a live academic environment and should sign a document to indicate that guidelines have been understood
- Ensure that all construction personnel clearly understand which areas they may not access alone, without supervision, due to the nature and function of the Lab space

## The supply chain

Several respondents commented positively on the quality of certain members of the supply chain, particularly the M&E contractors and the cladding contractor. One respondent remarked that some of subcontractors went 'above and beyond' to coordinate, to fit in and to be proactive.

Further, one interviewee said that the pipework is of good quality, showing traditional skills with soldered joints and screw fittings. Consideration should be given to replicating and specifying this type of work in other similar projects.

However, there were some quality issues as a result of poor orchestration of the project on site, meaning that the right trades were not in the right place at the right time. Very little of the fault lies with the subcontractors. The roots of the issues lie in poor orchestration and a lack of communication.

There was a lack of communication between the different trades. It was suggested at the workshop that 'Toolbox Talks' with the supply chain would improve the communication on-site.

## ISSUES RELATING TO THE PERFORMANCE OF THE MAIN CONTRACTOR

While there was a comment from a respondent recognising the capability of the main contractor, there was a good deal of feedback concerning a need for closer management of this project by the contractor, and higher levels of resourcing.

### Understanding of the academic environment and the importance of the deadlines

As outlined above, there was a failure to properly understand the challenges and management requirements of conducting the works within an occupied academic building and the impact on students working in that environment.

There were also comments from interviewees regarding the main contractor's lack of understanding of the importance of meeting the project delivery deadlines, which are dictated by the academic environment.

### Resourcing, roles and personnel churn

The majority of participants commented upon significant issues relating to the main contractor. Respondents remarked on the high level of personnel churn within the main contractor, highlighting that there were four different site managers during the construction phase. Some interviewees feel that the main contractor was under-resourced.

A number of respondents indicated that they felt that an M&E co-ordinator and a contracts manager should have been in place from the very start. Furthermore, when these shortcomings were pointed out to the contractor, the respondents perceived that no action was taken, and that the main contractor simply carried on as before, to the detriment of the project timing.

Three respondents indicated that there was a gap in the peer-to-peer management structure between the University and main contractor, with the University's main contact fulfilling too many roles. Two respondents felt that the key contact, within the main contractor, was overstretched and under resourced.

The University felt that this project was generally under-resourced by the main contractor, especially as the programme was tight. It was felt that if the main contractor had consistently put in full working days rather than partial days on site, that this may have improved matters considerably.

It was felt that attention to health and safety could have been more rigorous on this project. Health and Safety must be much clearer in induction, as well as highlighting the additional health and safety concerns unique to projects such as North Lab.

At the workshop, several participants felt that the role played by the site maintenance team leader on this project, which falls outside his usual responsibilities, has been very constructive.

### Recommendations

- Continued discussion with Main Contractor to secure the role of M&E Co-ordinator is filled where this role is considered necessary
- Try to ensure a contracts manager is in place from the beginning of every project



- Consider whether the coordination role played by the site maintenance team leader on this project should be replicated on future projects at the University
- Ensure that unique health and safety issues associated with a Containment 2 laboratory are communicated and understood from the outset by all parties
- Consider enforcing a 'signature system' to ensure that all members of the contractor's team, and subcontractors teams 'sign up to' the code of conduct/health and safety etc

### **Contractor management**

The majority of interviewees feel that the management of the programme of works was poor. There are reports that the main contractor failed to take notice of the fall-behind in the programme and refused to admit that there was a problem. There was also some feedback that the main contractor was not sufficiently proactive in meetings.

The programme was not updated when there was a delay. One respondent felt that the contractor did not interact with the wider team and had a 'head in the sand' attitude when dealing with the programme or changes to the programme. Respondents commented that nobody from the main contractor was 'on top of the process' and that this impacted on timing and cost and the quality of the building.

One participant articulated that it seemed as if the main contractor had failed to appreciate the importance to the University of the timely delivery of this project.

However, one respondent applauded the fact that the contractor did not walk away from the project and did attempt to put right the snagging and handover issues

### **Recommendations**

- Try to ensure that the central 'share point' which is in place for documents, drawings, changes, variations and communications between the University, contractor and sub-contractors, is accessed by the main contractor
- Ensure that there is enough time for a 'soft landing' to allow staff and technicians to acclimatise to the facility before lectures or demonstrations commence
- Try to ensure that the contractor provides one point of contact for the University, such as a Customer Support Manager, during the defects resolution phase

### **FEEDBACK RELATING TO QUALITY & WORKMANSHIP**

Feedback on quality is mixed, with some interviewees feeling that the quality of the finished product is positive. However, there are instances where the main contractor appeared to 'cut corners' or did not follow the specifications, such as with the ironmongery. It was felt by at least one respondent that there are issues with the 'fit' and finish.

There is an ongoing issue with a roof leak. This has occurred because materials other than those specified were used.

### **FEEDBACK RELATING TO DISRUPTION DURING CONSTRUCTION**

During the construction phase, users of the building were still occupying the first and second floors as planned whilst the refurbishment was taking place. High levels of dissatisfaction

were expressed, by users, with the experience. In their opinion, there was too much disruption and the levels of noise and dust were significant.

It was reported that the PhD students who were working during the summer could not use the fume hoods when needed, as work on the roof could not take place when the fume hoods were in operation. There were periods when it was agreed that the fume hoods would be 'out of use' to allow works to continue, but then the operatives would not arrive on site to carry out the works. Further, interviewees reported that even when they had negotiated with the contractor, services such as water, electricity and extraction had been turned on and off randomly. This is suggestive of the fact that the building contractor did not have an appreciation of the nature and sensibilities of the occupiers of the building during refurbishment.

## Recommendations

- Provide better communication and a clearly defined and specified programme for individuals who are expected to occupy buildings that are undergoing partial refurbishment
- Try to provide appropriate sequencing of works to occupiers, ahead of time, so that users can plan their own timetables
- Ensure that as much disruptive work as possible is conducted 'out of hours' where funding permits

## FEEDBACK RELATING TO HANDOVER

### Soft landings

The project over-ran and the handover was late and, as a result, the technicians, laboratory and teaching staff were concerned that there was not enough time to get to know the building before students were admitted. There was also insufficient time for the bedding-in of the AV and I.T. elements. Respondents believe that, with a technical and innovative build such as this, sufficient time should be factored into the programme to allow a soft landing and that this should not be allowed to slip.

### Recommendations

- Try to ensure that the programme allows sufficient time to provide a 'soft landing'

### Defect resolution

It was reported, by the majority of interviewees, that whilst the contractor has shown commitment to getting defects corrected, resolution of defects was slow. At the time of writing this report, there are items still outstanding.

The main issue is with the roof leaks, which have are yet to be resolved.

### Recommendations

- Continued discussion with Main Contractor to develop a pro-active programme for defects resolution

## O & M manuals

Several respondents reported that these are not complete and that some information is still missing

### Recommendations

- Ensure that the contractor updates the shared portal, which was in place, with information for the O&M manuals collated as the project progresses

# QUALITATIVE FEEDBACK - POST- OCCUPATION ISSUES

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## FEEDBACK RELATING TO THE QUALITY OF THE INTERNAL ENVIRONMENT

The quality of the internal environment is good and represents a significant improvement on the previous facility. The University has sourced high quality fixtures and fittings, such as the laboratory benches and the Romero multi-service cabinets and these are appreciated by the users of the Lab.

### Lighting

The lighting in North Lab was described as brighter and more modern than in the original facility, with good control, by those respondents who commented.

### Noise Levels

An end user reported that the noise levels were too high when there are big groups in the Lab and other user participants noted that there was a noise issue with multiple classes.

### Temperature

There has been a massive improvement in overall comfort in this space, with a reduction in glare and variance in conditions because of the previous glazing and cladding. However, one interviewee reported that the temperature was too hot in the Lab especially when wearing lab coats and when the Bunsen burners are in use. Conversely, one respondent complained that the Lab is too cold. The remaining interviewees did not express any negatives here.

## FEEDBACK RELATING TO ROOM TYPES, ENTRANCES AND EQUIPMENT

One end user commented that there is difficulty finding permanent space for large pieces of equipment, which makes the technical teams' lives more difficult because they have to keep moving the equipment around. However, during the workshop, it was recognised by the group that sacrificing the space was necessary to create the capability to house more than 200 students in the Lab. The issue was considered insignificant as the need to move large items such as water baths and centrifuges had so far been infrequent.

### Technicians' Areas

The technicians' space allows a relatively quick turnaround between different sessions and maximises the functionality of the space.

One user reported that there is no gas in the prep area which means that technicians have to carry out preparations for experiments in the main lab. However, discussions during the workshop revealed that the client had considered it not necessary for the amount of usage required, and an alternative option of Flame boys could be used, and are being used, as an alternative to fixed gases and Bunsen burners.

The technicians questioned, commented that they need more bench space in the prep area. Feedback from the workshop indicated that the original vision incorporated 'hot desking' for the technicians and that the area was not used in this way by all participants as yet.

## Recommendations

- Continue the usage of 'flame boys' as an alternative to fixed gases from Bunsen burners

## Entrances and Exits

Entrance A functions well but it was mentioned that Entrance B is not large enough to let enough students enter the facility quickly when the Lab is at full capacity. Entrance B will be reviewed as part of the Phase 2 works.

Two respondents feel that the front extension is useful as an area for students to congregate before they enter the Lab and one end user reported that there was not enough room in the waiting area when the Lab was at capacity.

It was reported that the 'breakout' spaces were bigger than in the previous facility and at least one respondent is pleased with this. During the workshop it was noted that phase two will create more space for activities such as students writing up their notes from the experiments conducted in the Lab.

## Recommendations

- Consider providing additional signage for students to inform and encourage them to enter the Lab (providing that it is safe to do so) rather than waiting outside for the start time of their session
- Consider staggering start and finish times of lectures to reduce crowding

## Equipment and furniture

There is positive feedback on the quality of the equipment and furniture installed in North Lab. Romero's furniture and the Premier fume cabinets are considered to be of good quality.

It was reported that the two new microbiological safety cabinets are constantly used by the staff and are found to be really useful. One respondent commented that they were pleased with the new Spectrophotometers.

The equipment is all of a reasonable quality specification. The fans, air handlers and chillers are all sourced from reputable brands.

In terms of further improvements, one respondent suggested that a ring main for de-ionised water should be retro fitted, which would have been more economical than three individual units which have been installed. It should be noted, however, that this was in the original proposal but there was a client request for change post tender.

## Recommendations

- Consider the possibility of installing additional storage capability under and over benches for phase 2 of the project or future projects at the University

## FEEDBACK RELATING TO DISABLED USAGE AND ACCESS

All respondents who commented, regarded the disabled access to the North Lab, to be excellent, as it is all at ground level. There was no negative feedback pertaining to the level of access for disabled users.

The respondents that commented on disabled usage in the Lab considered it to be good, providing a bench and equipment with flexible heights and including a hearing loop.

## FEEDBACK RELATING TO CLEANING

One interviewee reported that the new floor surface is difficult to clean because water pools in it as it is a non-slip surface. He also mentioned the ongoing roof leak as an issue, as there is water all over the floor after it has been raining but this is limited to one small cleaners' cupboard.

## FEEDBACK RELATING TO ENERGY USAGE

One participant reported that due to the change of glazing the energy saving for the operation of the facility is £7K per annum, which represents a reduction in energy bills of between 15% and 20%.

## FEEDBACK RELATING TO IT ISSUES

North Lab has realised the ambition to create a paperless state-of-the-art lab facility. However, there are risks associated with the technology used to run the Laboratory, both from a learning and a teaching perspective. It was acknowledged by one respondent that a review is required at the end of this academic year and that some changes may need to be made in the future.

### Paperless Laboratory

Two respondents expressed concern that there were no print offs from the equipment for the results of experiments, as the Lab is paperless. The readings that the equipment displays have to be photographed in order for the students to use them in their work.

One respondent noted that the laboratory is unable to host examinations which are paper based, but this was discussed, and these infrequent exams can be held within the lab.

### Recommendations

- Review working practices with all Lab users at the end of the academic year without losing sight of the original vision of the Lab

### Connectivity

During the workshop it was reported that the Wi-Fi to the Lab was robust and contained capacity for 100's of devices but that the main issue was indeed related to the Surface 3 tablets being unable to accept Windows 10 updates effectively or efficiently.

Frustrations were reported almost universally by respondents concerning the inability to achieve full connectivity when it is needed.

One person noted that implementation of I.T. was not as smooth as had been hoped

One respondent commented that the usage of the Laboratory was not as flexible as it was previously because the academics have to teach 'to the timetable' and it is not possible to change the lecture or demonstration at the last minute because the I.T. is all in place beforehand.

## Recommendations

- Escalate the issue regarding the tablets higher up within IS to examine the current difficulties.
- Consider putting together a working party to examine future IT requirements for the North Lab and the other facilities within the University as a cross-functional group
- Consider communication with the users of the Lab to explain the issues so that erroneous perceptions do not occur

## Ease of use

One respondent pointed out that some students struggle with technology and don't find it as simple to use as is assumed.

One respondent noted that it was very 'fiddly' to log on if you have guests or short courses.

## Timetabling & Registration

One respondent complained of the lack of ability to record students as they come into the Lab and the fact that it can take a laboratory technician forty minutes to take the register on a tablet, in some cases.

During the workshop it emerged that teaching staff have found ways around the issue such as using laminated sheets and scanning.

## AV Screens and Lab Coat Technology

Three respondents called for more screens around the Lab because there were not enough when it was at full capacity.

One respondent noted that there is only one screen which is used as the master screen and you can't use different screens for different things when there are more than two faculties using the Lab.

All of the respondents that commented praised the lab coat speaker technology and reported that it works well, allowing students to access the whole lab while listening to the lecturer.

## Recommendations

- Consider the use of a 'repeater' screen on a 'spider' circuit for more flexibility if budgets allow

## FEEDBACK RELATING TO SECURITY

Three respondents feel that security regarding the Lab is good, although one individual reported that they thought it would be easy to walk into the Lab by tail-gating the students.

However, attendees at the workshop felt that this was not an issue requiring a recommendation.



# QUANTITATIVE FEEDBACK

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Quantitative satisfaction ratings were collected during the face-to-face and telephone interviews. Respondents were asked to rate their satisfaction with various aspects of the project on a scale of 'zero' to 'ten', where 'one' is very poor and 'ten' represents excellent.

Bar charts displaying the percentage split by rating are shown in Appendix I. It is very important to emphasise that these quantitative results are drawn from very small samples and are therefore not statistically significant.

The majority of respondents indicated a high degree of satisfaction with the features, equipment and the new facilities at the North Lab. The function and the flexibility were considered to be a major improvement on the previous facility.

The majority of interviewees consider the lighting and the AV equipment to be good, whilst the toilet facilities and the air quality were considered very good.

60% of respondents consider that there is good provision for disabled users.

More than 50% of interviewees gave a rating of 'ten' for security whilst the remaining 50% was split equally three ways.

The primary source of dissatisfaction in this study is the performance of the main contractor of the project. The handover and defects resolution stage were considered to be poor and badly managed.

Most of the remaining quantitative ratings were mixed including the relationship and the collaboration between the University and the extended team, temperatures and noise levels within the Lab.

## **Overall quality of the Facility**

The majority of respondents were highly satisfied with the quality of the facility and this is reflected in the quantitative ratings. Ten out of sixteen interviewees awarding ratings of 'eight' and over. Five more interviewees rated 'seven' and one respondent awarded a 'six'.

## **Understanding of the vision**

The quantitative ratings suggest that respondents feel that the vision for North Lab was clearly understood by the consultant team. Ten respondents rated between 'seven' and the top score of 'ten', when asked whether the consultant team understood the University's vision for the project. Two respondents rated 'ten'. There were four ratings of 'nine', with two each for 'eight' and 'seven'.

## **Functionality of the space**

The majority of fifteen respondents expressed a high degree of satisfaction with the functionality of the space. One respondent rated 'ten', there were three 'nine's', nine 'eight's' and two ratings of 'seven'. This variation reflects the fact that several interviewees question whether such a high degree of flexibility was actually necessary for their use, but it is required by the University.

## **Flexible space**

More than half of the 15 respondents, nine in total, reported high levels of satisfaction with the flexibility of the space at North Lab, awarding a 'ten', three 'nine's' and five 'eight's'. However, four respondents less positive, recording three ratings of 'seven' and one 'five'. Lower ratings were given by respondents who did not think the degree of flexibility delivered was necessarily required, again for their needs, however, this was required by the University.

## **Design & room types**

Only two interviewees were asked to answer this question. They are both proud of the design, rating it at 'eight' and 'nine'. The same two participants awarded the same ratings to the type of rooms delivered.

## **Features and equipment**

A high level of satisfaction was recorded with regard to features and equipment in North Lab, with the majority of the fifteen respondents awarding scores of 'eight' and 'nine'. The remaining two respondents gave ratings of 'seven' and 'four'. It must be noted that the rating of 'four' was given by the interviewee who had designed and specified the plans for the original equipment and it is felt that he felt that the facility could have gone much further. This score is an outlier, with the nearest score above it reflecting satisfaction with the features and equipment of the North Lab.

## **Satisfaction with the work of the main contractor**

Some dissatisfaction was expressed with regard to the performance of the main contractor. The ratings given by the seven respondents ranged from 'eight' to 'three'. This is supported by the qualitative feedback. Only two respondents rated a 'seven' and an 'eight'. The remainder gave two 'fives' and 'fours' and one rating of 'three'.

## **Satisfaction with the work of sub-contractors and suppliers**

Ratings of between 'seven' and 'ten' were given to the work of the sub-contractors on this project, supporting the qualitative feedback that there was a good performance, particularly by the M&E and cladding contractors. There was one rating of 'ten', 'nine' and 'seven' and four ratings of 'eight'.

## **Collaboration between the different members of the extended team**

A very mixed response to the question concerning collaboration was received across nine interviewees, with ratings ranging from 'nine' to 'four'. There was no consensus with ratings of one 'four', two 'fives', two 'sixes', one 'seven', two 'eights' and one 'nine'. The lower ratings are concerned with the standard of collaboration received from the main contractor.

## **Quality and clarity of the communication between the different members of the extended team**

Again, there was a relatively mixed response to the question on communication, with nine respondents opting for ratings of one 'nine', four 'eights', three 'sevens' and one 'six'.

### **Relationships that were built with the University and with the extended team**

Although three of the nine respondents awarded a rating of 'nine'. The remaining six were between 'eight' and a low rating of 'four'. One respondent awarded a 'four' and another 'seven', whilst two each opted for an 'eight' and a 'five'. Relationships between the consultant team and the University were good but the relationships with the main contractor were considered to be less successful.

### **Handover of the facility**

There was dissatisfaction with the handover amongst the respondents who were asked to rate their satisfaction. This was due to the rush towards the end of the project and there was insufficient time to provide users with enough time to get to know the building, particularly with regard to AV and I.T. Ratings of 'six', 'five' and 'four' were given.

### **Satisfaction with the way defects have been handled**

Again, only three respondents were asked to rate the question on defects, and awarded ratings of 'seven', 'six', and 'four', reflecting frustration with the speed of defect resolution.

### **Provision for disabled users**

Ratings for disabled access to North Lab are high as the Lab is located at ground level. Two out of the five respondents asked to give a rating for their satisfaction with the facilities for disabled users, gave a rating of 'seven'. Two of the remaining three individuals rated this 'nine' and the remaining one gave a 'ten'.

### **Security**

Most respondents are satisfied with the level of security at North Lab. Interviewees reported three ratings of 'ten' with the remaining three respondents reporting a 'nine', 'eight' and 'seven' rating respectively, with regard to security.

### **Audio visual equipment**

Respondents ranged from one 'ten' to two 'eights' and three 'sevens'. The lower ratings reflect the desire for more screens positioned around the Lab.

### **Data connectivity**

The question regarding data connectivity received the most polarised response with six individual ratings in the range 'ten' to 'four'. One individual gave 'ten', whilst the remainder were 'six' or below. There were two ratings of 'six' two of 'five' and one of 'four' suggesting that this is the most contentious issue that remains with the running of North Lab.

### **Disruption & noise**

The single individual, an end user, who was asked to rate this question gave a rating of 'three', reflecting the frustration with significant noise levels during the construction phase.

### **Air quality**

There are no issues with the satisfaction with the air quality in North Lab. Four out of six respondents awarded a rating of 'ten' whilst the remaining two reported an 'eight' and a 'nine'.

### **Lighting**

Similarly, satisfaction with lighting is high. Three respondents reported complete satisfaction with the lighting in North Lab with a 'ten' rating. The remaining two respondents rated their satisfaction at 'nine' and 'eight'.

### **Internal room temperature**

The majority of respondents were entirely satisfied with the temperature of the facility giving two 'ten's', and two 'eights'. One individual gave a 'five'.

### **Operation and Management of the Facility**

The two relevant respondents recorded a 'seven' and 'eight' rating regarding the operation and management of the North Lab facility.

### **Cleanliness**

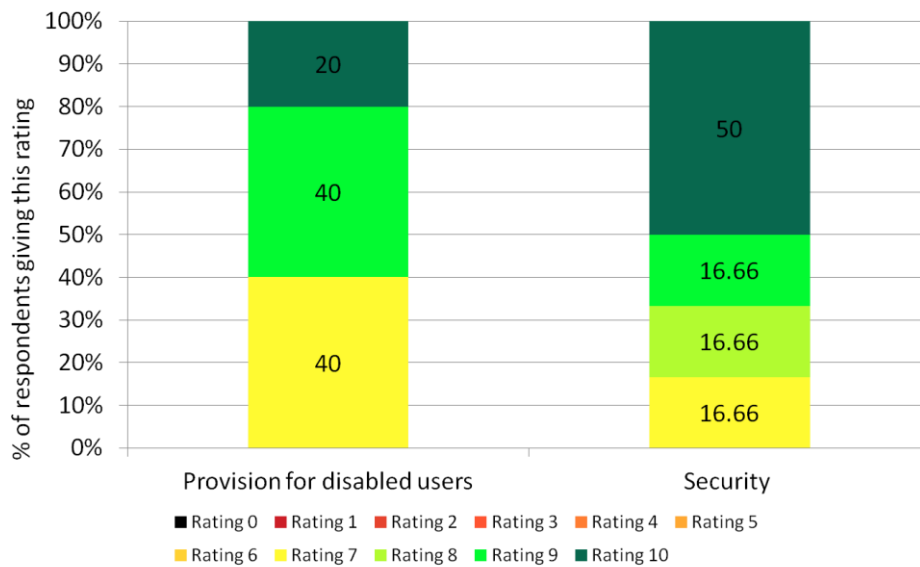
The one individual who rated this question awarded an 'eight'.

### **Provision of toilet facilities**

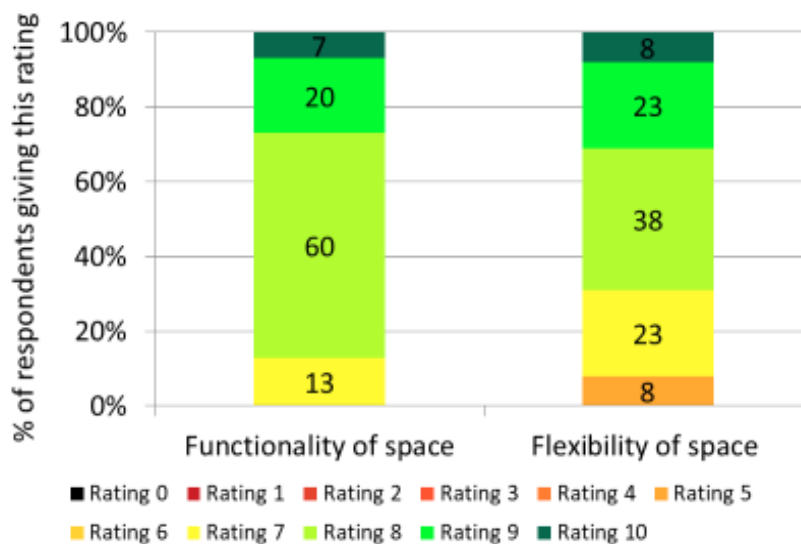
There are no issues with the provision of the toilet facilities. Four out of six respondents gave a rating of 'ten'. Whilst the remaining two gave a rating of 'nine' and 'seven'.

# APPENDIX I: QUANTITATIVE RESULTS

## 1.0 Satisfaction with North Lab's accessibility



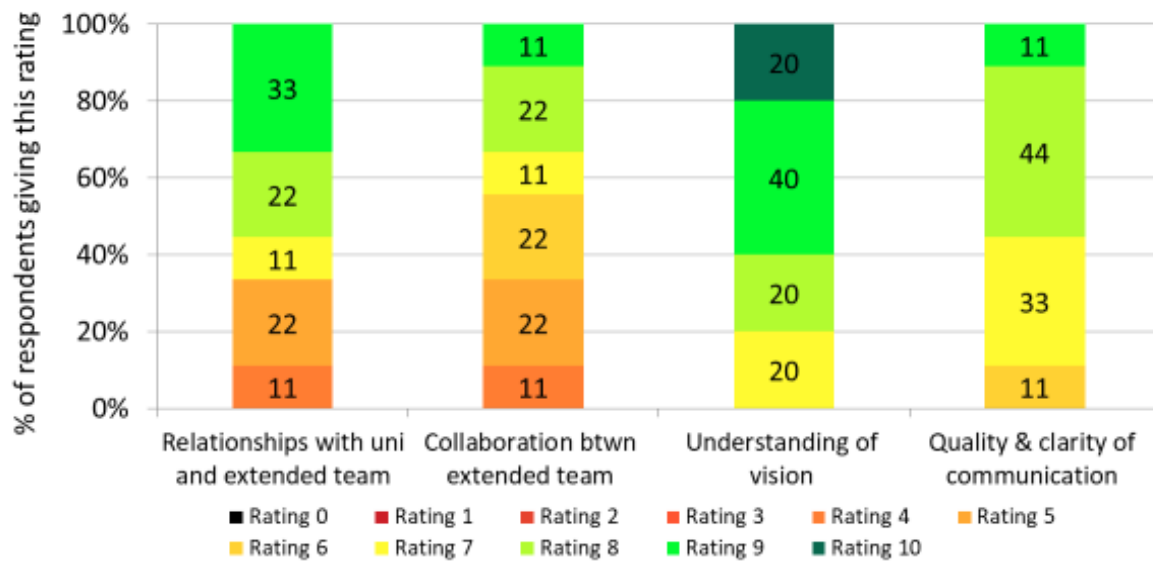
## 2.0 Satisfaction with the space in North Lab



### 3.0 Satisfaction with the handover of North Lab and the team involved in the programme



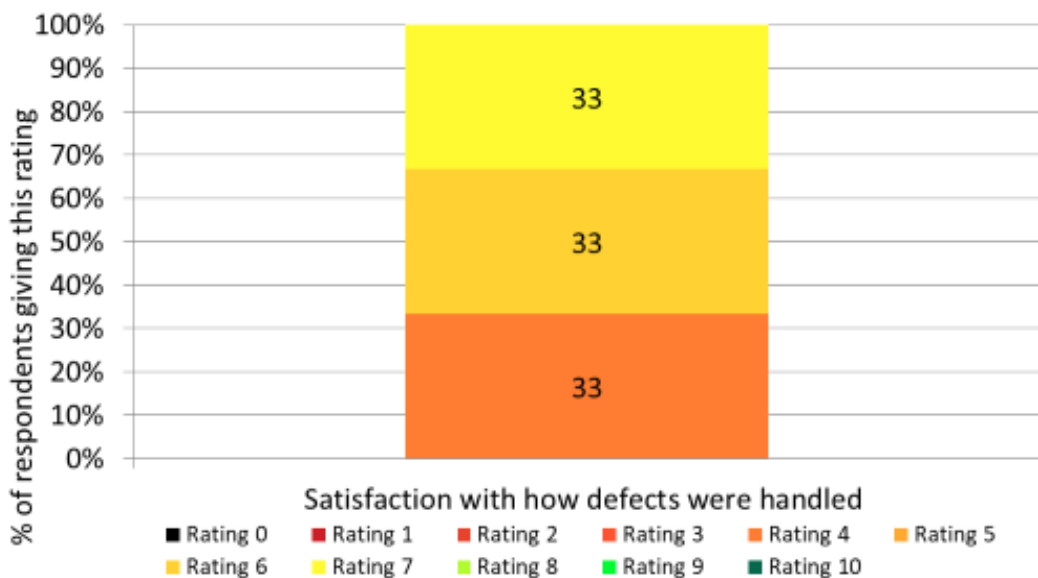
### 4.0 Satisfaction with relationships between members of the project team



### 5.0 Satisfaction with the quality of North Lab



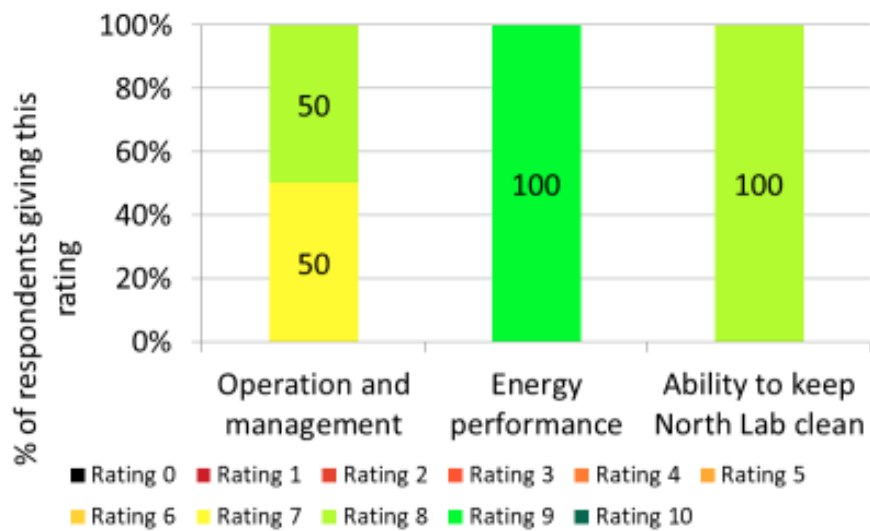
### 6.0 Satisfaction with the how defects were handled



## 7.0 Satisfaction with North Lab's accessibility



## 8.0 Satisfaction with the operation and environmental performance of North Lab





### 9.0 Satisfaction with North Lab's internal environment



# APPENDIX II: SUMMARY OF RECOMMENDATIONS

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## RECOMMENDATIONS FOR APPLICATION TO FUTURE PROJECTS

### The tender process

- Continued discussion with Main Contractor to hopefully maintain members of the contractor team who were put forward in the Tender stage

### Procurement of materials

- Ensure a procurement tracker is included in contractors' progress reports.

### Disruption during construction

- Consider a more substantial induction between the University and the contractor to understand the requirements of working within a live academic environment.
- Ensure main contractors make sub-contractors fully aware of the restrictions of working in a live academic environment and should sign a document to indicate that guidelines have been understood
- Ensure that all construction personnel clearly understand which areas they may not access alone, without supervision, due to the nature and function of the Lab space
- Provide better communication and a clearly defined and specified programme for individuals who are expected to occupy buildings that are undergoing partial refurbishment
- Try to provide appropriate sequencing of works to occupiers, ahead of time, so that users can plan their own timetables
- Ensure that as much disruptive work as possible is conducted 'out of hours' where funding permits

### Resourcing and Personnel

- Continued discussion with Main Contractor to secure the role of M&E Co-ordinator is filled where this role is considered necessary
- Try to ensure a contracts manager is in place from the beginning of every project
- Consider whether the coordination role played by the site maintenance team leader on this project should be replicated on future projects at the University
- Ensure that unique health and safety issues associated with a Containment 2 laboratory are communicated and understood from the outset by all parties
- Consider enforcing a 'signature system' to ensure that all members of the contractor's team, and subcontractors teams 'sign up to' the code of conduct/health and safety etc

## **Contractor Management**

- Try to ensure that the central 'share point', which is in place for documents, drawings, changes, variations and communications between the University, contractor and sub-contractors, is accessed by the main contractor
- Try to ensure that the programme allows sufficient time to provide a 'soft landing'.
- Try to ensure that the contractor provides one point of contact for the University, such as a Customer Support Manager, during the defects resolution phase

## **Defects resolution**

- Continued discussion with Main Contractor to develop a pro-active programme for defects resolution

## **O & M manuals**

- Ensure that the contractor updates the shared portal, which was in place, with information for the O&M manuals collated as the project progresses

## **Entrances and Exits**

- Consider providing additional signage for students to inform and encourage them to enter the Lab (providing that it is safe to do so) rather than outside waiting for the start time of their session
- Consider staggering start and finish times of lectures to reduce crowding

## **RECOMMENDATIONS FOR POST COMPLETION CHANGES, IF THE USER GROUPS ARE ABLE FUND AND ACTION THEM**

### **Connectivity and IT Issues**

- Escalate the North Lab IT issues higher up within the IS team to examine the current problems as they are happening in the live environment
- Consider putting together a working party to examine future IT requirements as a cross functional group. Not only for North Lab but for other projects
- Consider communication with the users of the Lab to explain the issues so that erroneous perceptions do not occur

### **AV Screens**

- Consider use of a 'repeater' screen on a 'spider' circuit for more flexibility if budgets allow

### **Equipment and furniture**

- Consider the possibility of installing additional storage capability under and over benches for phase 2 of the project or future refurbishments

### **Insight Review of Working Practices**

- Review working practices with all lab users at the end of the academic year without losing sight of the original vision of the lab