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Web and Internet Science Group

Focus Group Transcripts

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1 Physics Focus Group

This focus group was conduced on 10/11/2015 and comprised of 6 physicists (Participants A-F). The following colour key is used for the Participants and **Focus Group Leader:**

Focus Group Leader
Participant A
Participant B
Participant C
Participant D
Participant E
Participant F
Group

1.1 Question 1 - What methods do you use to record your notes?

Participant A: Normally Lab Book or in file extensions, that's pretty much it.

Participant B: Yeah, lab book, occasionally using laptop for note taking purposes but predominantly lab book.

Participant C: Lab book, definitely files on the computer especially in computer controlled experiments as well.

Participant D: Yeah, same. Lab book and some stuff is recorded on computers and analysis on computers as well, with some extra notes in the logbook.

Participant E: Yeah, I don't know how much you want to distinguish between like notes and what I would call analysis, because I guess they work differently. Because if I'm having a meeting with someone and talking about theory, then it goes in a notebook, but then obviously whenever I'm taking data it's all on a computer.

Focus Group Leader: Just to clarify, when you guys say lab notebook, you mean a paper lab notebook.

Group: Yes.

Participant F: I very much I don't even remember where my paper lab book is at the moment because I've literally all my, everything I write down, all my data even if I write it down or something first on paper I always transfer everything onto the computer because that's where I know where it is and where I can find it, whether I'm at home, whether I'm at work, and I write loads of comment files next to it, like a comment text file or something so I don't have everything in two different places. It's actually just the lab book, as you've kind of said when you're in a meeting you write down dunno er, what the meeting notes are to do this, but even those going on Google Keep or something like that.

1.2 Question 2 - For each of these different types of work, what pieces of information do you currently record and how do you record it?

1.2.1 Question 2a - Doing an Experiment in the Lab?

Participant E: Well this is quite easy for me to answer, because all my stuff at the moment is simulation, so you know, mostly graphs outputting as data files, csvs things like that.

Participant D: For stuff that's actually in the lab, like what conditions are used for the experiment, but then obviously that's very experiment dependant, so I dunno like what laser energy and that kind of thing, what pressure you're doing the experiment at.

Participant C: What date the experiment was done.

Group: General agreement.

Participant F: For me then the actual data, kind of trying to keep the, starting usually with the raw data but then quite often especially with the automated experiments these days we kind of don't record the initial stages after a few weeks anymore, we just record the end result, the final graph as such. After a few iterations, rarely any photos or anything like that.

Participant C: But again that's very experiment dependant.

Participant F: Kind of dependant on what you do as such, I dunno.

Participant D: If anything weird happens, that'll be noted down. Things like, this went wrong.

Participant B: For my stuff, it's mostly because it's automated experiments. I record the date and then the parameters I'm going to sweep for the day, and then if there is anything extra it might be a diagram or in very rare cases a photo of what I am looking for on a computer.

Participant F: Actually sorry, I was wrong, we do use photos in order for spots on the samples and things like that. I'm trying to implement at the moment a database for our samples and these kind of things. So it's not necessarily recorded in, rather than recording it in my personal lab book and trying to record everything kind of like in a group folder as such, so if I use sample A and someone else uses sample A they can also look at the same information that I ever had on that. So even then we start having a little log for that sample, that every day every time that sample it has been used, we can write in today it was s**t, yesterday it was better, blah blah blah. The next person who uses it can see that information. Rather than having to ask me and find my lab book and for me to remember where my lab book is.

Participant A: Erm I pretty much write everything down in terms of parameters in my lab book, and then have ASCII or TEX files of all of the data, and have it saved somewhere in like a database. Even if it's a picture that's normally text first and then converted into something that's like igor into a picture later. But I'm paranoid about losing data.

1.2.2 Question 2b - Doing an Experiment outside the Lab?

Participant A: Is that cleanroom, would that count?

Participant C: It's still a lab.

Participant F: Is it outside the building, or is it like sitting in the office while the experiment is

Focus Group Leader: Yeah it's more something where you're not physically inside the lab.

Participant F: I think it's pretty much the same, again for us because most of the time those are the automated experiments where the computer will log all the data, and it doesn't, apart from the experiments where I physically tweak something and then have to save a couple of, on different instruments, it's the same whether I'm in the lab or not, kind of the same things happen for most experiments. The experiments where I have to be hands on there, it's again saving individual data files, and then putting them in a folder to that sample with the date and so on, and a small comment file saying whatever have you done.

Participant B: I think, for simulation I prefer having a handwritten record of what I'm changing for each iteration of the simulation. So if I am sat at my desk trying to run whatever simulation I'm trying to run, I do use the same lab book that I use in my lab in the office to just write down changes.

Participant A: Yeah I do the same, pretty much. And then print out usually all the graphs, and if it's usually the simulation I do is equations of some sorts, so i'll physically write out all the equations and then make sure that they all work and keep doing that to make sure that if I change something it doesn't really b******s it up.

1.2.3 Question 2c - When you're looking at your literature?

Participant E: Almost always handwritten, to the extent that I quite like printing out papers and doing the physical writing on them, and I've got a massive folder of them in my draw. Which is a bit old fashioned because I do have Mendele, I just find it easier to annotate by hand I dunno.

Group: General agreement.

Participant C: For me it's as soon as you find the paper, download it, it goes into Mendele and gets printed off.

Participant E: Yeah, exactly, I do the same process.

Participant D: Yeah, normally print and highlight.

Group: General agreement.

Participant F: Definitely print out, read it and so on.

Participant C: And swear when it's behind a paywall.

Participant A: Oh Yeah, I go one step further and print them out and put them in chronological

order, and put them in ring binders depending on...So I've got two supervisors, so two big ring binders for one supervisor and then two for the other, because I like to have them chronologically.

Participant E: Because you're a bit neurotic.

Participant A: I like to know how things develop over time Participant E, it makes sense if it's chronological. You can just be like, how long ago did I print this paper out, how far back do I need to go?

Participant F: The problem I find with the paper one, because I always I prefer reading it on paper and then highlighting and making notes and so on, whilst I work on that thing and keep thinking about the paper I know where it is. And then I probably put it in a folder and then if I need it a month later or something then I don't pick up my folder and get it out again, I usually print it out again or I just by that stage I just look on a PDF or something.

Participant A: Whereas I go back to my volume of knowledge.

Participant F: Extremely commendable, but I can't.

Participant D: I kind of always find them and then end up with double print-outs, so it's like oh I've got two of this one now, never mind.

1.2.4 Question 2d - When you're thinking about your work?

Focus Group Leader: So planning something or thinking about what you're gonna write next, or even thinking about what your next experiment is going to be?

Participant A: Some form of spider diagram that is basically just mental vomit onto the page

Participant E: Same, lots of, tend to, well you know a little bit about what I do, but a lot of diagrams in that case, because i'll try and work from what I want the uavs to do physically back to how I program it, not the other way around, erm so yeah, mostly scribbly pictures and then hastily added bullet points so that I don't forget, and sometimes I even update the index in my lab books so that I know what I've written, sometimes.

Participant F: I tend to use a lot of er things online these days, for example Google Keep, something where you can just kind of have little notes, to do lists and so on, and so on and then I just put on the notes the various different experiments that I have in my mind that I want to do so I can even tick them off and feel better that I've actually done them or kind of little notes of what I think that I need to do next, in terms of what I need to read up on or something, trying to keep everything online because I keep forgetting, when I had a lab book I just forgot it at work, at home, in the lab, couldn't find it, then write it on a piece of paper or something, whereas if I have everything online I can just find it then, and if I for some reason don't have access to Google Keep I even send myself emails or something.

Participant B: Yeah I do the same but with Evernote, but in general I would prefer to use my lab book because it's like my hard copy of everything.

Participant F: Google owns me.

1.2.5 Question 2e - When you're performing calculations for your research?

Participant A: Piece of paper, work it all out. For me that's pretty much the only way one of my simulations that I did, the transfer matrix and the actual equation took up ten pages, and to make sure it all worked I had to go through crossing out every one of the terms repeatedly until i got everything that balanced, and if I hadn't printed it out I would have just kept messing it up until I did that, which I did and it slowed me down for about a month.

Participant B: I think calculations that I've had to perform, it's pretty much always written down method by hand and then put it into whatever software I'm trying to calculate it with, be it matlab, console or whatever.

Participant C: Check that the equations do what they should do in the lab book and then put them into some form of software.

Participant F: I quite often use Wolfram Alpha just to check whether equations work or not.

Group: General Agreement.

1.2.6 Question 2f - When you're writing up your work?

Participant E: You mean for neat purposes.

Focus Group Leader: So either generally, either in a paper or for the next report you need to do for your PhD or even just in general if you guys do write things up, I don't know if you do, once you've done your experiment do you write it up?

Participant F: Occasionally we have sample reports, so we have this, it's probably quite specific, but we get samples from someone else and then we usually write a report where we summarise our data and our findings so that you can send it back to them and say hey look this is what happened and try and share it amongst the group again in specific group folders which are shared between everyone so everyone has access to it as such.

Participant C: Usually it's Word.

Participant D: LaTeX.

Participant A: LaTeX is the way forward.

Participant E: LaTeX or Lyx.

Participant B: I occasionally for reports use my lab book as a way of writing down a skeleton for whatever report I'm trying to do but never anything that detailed.

Participant E: I do the odd diagram showing examples of simulations, in test environments that I've done, things like that. Which I guess is somewhere between a graph and a diagram really. The writing is same as everyone else I guess, LaTeX or Lyx.

Participant D: A lot of the writing doesn't actually come from the stuff that's in my log book, it comes from the data, so the data has either been written in my logbook and then put onto a computer or has been straight on the computer and everything else is done on computer, and then written up, but the logbook is always useful to be like...might need to check what the details were to then write up as well.

1.3 Question 3 - When you're taking notes how do you organise them?

Participant A: Chronologically, always.

Participant E: Is that by the date of the paper or the date that you printed it?

Participant A: No by the date the paper is published, not the date it was submitted, I'm very stringent. For some reason, chronological is the only way that kind of works in my head. If I can't think of how an idea evolved in time then I find it very hard to grasp onto it. So if I know how everything kind of spans from one thing to the next, then mentally that makes sense to me. So my lab book is chronological and all my lit review I do is chronological as well, and it makes sense.

Participant E: Whereas on Mendeley I separate it into categories more than that, rather than chronological. Because I have different aspects of the simulations that I'm running, and the algorithm that I'm making has influences from three or four other areas so I tend to split it into those areas, so when I'm writing up, you know, I go I'm writing up the coordination side of my algorithm, there's my folder coordination, there's all the papers that I need.

Participant A: Well I do it like that as well.

Participant C: Certainly when taking data, or storing on a computer as well it's divided up into project and then chronologically. But in the Lab book it is just chronological.

Participant E: I suppose for like filenames I tend to use the parameters of the experiment as the name of the file, because for me that's much more important than when I did the experiment. So if I'm running a certain simulation with a certain number of iterations over a certain environment with certain conditions I'll just have a very very long file name that encapsulates all of that for the data or the graph. It just seems that way I know what I'm putting in.

Participant F: I very much go with the chronological aspect, so I have a folder for each day I'm working on and then in that folder I have the stuff...if I work...obviously if I just have the generic data it doesn't help me what I was working on on that day, so I have in brackets behind it I was working on whatever particular, because we keep working on so many different experiments, kind of just write the experiment name on it so I know on that day I was working on this and so on in there. But as I said, always try and have a little comment file next to it where I write the things that are, if they are not in the raw data already. Like what temperatures I was working at and all these kind of things because otherwise I'll never find that again.

Participant D: Yeah lab book is definitely just you know, day by day what you do and then all the stuff on my computer. In my case it's normally by sample material, so i'll make a folder for this and

another one for whatever and then sort of yeah, gradually divides up, so different host materials and different doping materials.

Participant A: I have a kind of like file-o-fax but not type diary that kind of organises my lab book and my papers as well which I kind of do in terms of academic weeks, so week 1, 2 3, duh duh duh, and that's kind of the summary of what I'm doing that week entirely, with references to my lab book, and my lab book references files and the files reference papers and that kind of stuff.

Participant D: I feel unorganised.

Participant A: Everything is colour coded.

Participant B: Yeah, I think, for my PhD because it's across two disciplines, I sort of divide it across the two disciplines, and then one of them can be relatively easily organised chronologically, the other one requires too many different sampes for it to be meshed.

Focus Group Leader: Are these two physics disciplines?

Participant B: Yes, two physics disciplines, so the laser bit can be organised chronologically because it's relatively simple sort of this is how it's developed in the field, but the nanophotonics because it's across multiple samples and all of them behave differently and some of them interact with my laser in different ways I have to divide them by type rather than by date because they mesh together in some higgledy piggledy manner.

1.4 Question 4 - Do you use any technology to aid with your note recording?

Participant E: We've kind of covered that haven't we? I guess one thing that I haven't mentioned is that very occasionally if I'm having a large in depth brainstorming session with someone else in my office I'll take a picture of the whiteboard at the end of it.

Participant A: Yeah.

Participant E: Just because it's easier than copying it all up. Cos often they can be, impromptu and I might not have my lab book even with me if it's something that develops from a chat in the coffee room, so then I'll just take a picture of it, and then, you know, copy it up from there, into my lab book or whatever.

Participant D: Sometimes I take photos on my phone, if I'm using a different material, I've got a couple of different pictures just to be like here's one material, here's another material if there's different colors in it and it looks pretty, or like how much the sample is glowing depending on how much I've heated it. I'll just take a picture for reference.

Focus Group Leader: Do you guys use your phones or tablets to actually take notes at all ever?

Participant D: No.

Participant C: No.

Participant A: No.

Participant E: Normally, no.

Participant B: Really sporadically. I'd have to not have my lab book with me and it might be something like a presentation that I'm particularly interested in, I'll take some notes but broadly speaking no.

Focus Group Leader: And just what about when you guys go into supervisor meetings, what equipment do you take into that, do you take a paper notebook or do you ever sit there and make notes on your phone or your tablet?

Participant C: Lab book.

Participant E: I only ever do phone for dates, that's basically it, next supervisor meeting in the calendar on my phone, otherwise lab book.

Participant A: Having said that a lot of supervisors do have tablets and they take notes on their tablets, that's fairly common. **Participant B:** I have taken tablets into supervisor meetings before to show diagrams, where there were too many for me to print off and rifle through.

Focus Group Leader: Any recording equipment, so do you ever record your conversations with your supervisors?

Participant B: No. **Participant F:** Sometimes I wish I did.

Participant A: Very rarely if someone is taking you round the lab and telling you how to use something, it's usually useful to record them because certain people go a little bit too fast. Apart from that no.

Focus Group Leader: Any do you ever, (At **Participant F:** I think you covered this when you said you send yourself emails) but do you guys often email yourself notes or links or papers or anything.

Participant D: Yeahhhh, sometimes.

Participant E: Mostly not, because I use dropbox.

Participant C & **Participant B:** Yeah dropbox.

Participant A: And Google Drive.

Participant F: I keep all my data and everything in dropbox or on the shared J drive and these kind of things, but in terms of to do list if I'm in a meeting I write it down and in my lab book or a piece of paper if I've forgotten my lab book again, but then when I come back to the office I usually, because whilst I'm in a meeting my notes are not always quite coherent or something, I then sit down on Google Keep or something like that and make myself a todo list with those things I need to do, and if there's anything that, for example email I use all the time because email is the only thing that I consistently check several times a day so I email myself if there's something urgent I need to do, if there's emails I need to reply to, if there's things I need to do I basically in my gmail inbox I can have

things that are starred that I know I need to deal with, the other ones I don't care about. As soon as it's done I archive them so I usually only have a handful of emails in my inbox and that's my to do list because without that I'm literally...take my emails away and I'm lost, which is probably a dangerous thing.

Participant E: I think if I had something urgent like that I'd probably rather set it as a calendar alert, cos I use my calendars for most work related stuff anyway, and there's the other app that apple has that I can't remember the name of, the little checklist thing. I use that very occasionally. If it's really urgent I'll tend to just stick it in my calendar. Just because then I have it on my phone, and on my laptop, as well.

Focus Group Leader: So Participant F you've asked this but you raised an interesting point, do you organise your emails to do with your work?

Participant D: Yeahhhh.

Participant E: No.

Participant A: I have the best intentions

Participant F: I think I'm really anal, right from the beginning whenever my brother 12 years ago showed me gmail.co.uk can have labels for emails and filters and all these kind of things, right from the beginning I've started that, and so that if I have certain projects I have folders for that, automatically go in there and, because everything, oh thats why I also have my university emails going through my gmail because then they get also sorted into the system because then the university emails I basically don't ever use it, because it's not as convenient, quick to find anything as in gmail. And as I said because then I have in my to do list and if my inbox is empty I can go home, if not then probably things I should be doing.

1.5 Question 5 - If at all, how do you link any digital resources or notes to your paper based notes?

Participant F: Date.

Participant C: Date.

Participant E: I don't so much.

Participant D: Occasionally I'll write a note in my lab book saying where I have saved something but yeah, not that often.

Participant E: I guess yeah it's, the thing is if I'm using the notes in my lab book, it tends to be because I'm coding from them, in which case, I'm doing one bit of code and looking at one bit of my lab book and when it's done it's done, so I don't tend to need to have to back reference things in my log book so much.

Participant D: Mine's just if it's something that's a bit different and obscure that I won't go oh this will be in this folder to do with this material, and would be somewhere weird mentally. It's just kind of random so it's here, and note it down.

1.6 Question 6 - Where is your data or research output stored?

Participant A: J Drive.

Participant E: Desktop, Dropbox, Desktop Backup, Laptop, Laptop Backup, Git pushes. Do you think I have enough? And in theory I have VMs on both machines and when I open those up they have my dropbox folder in as well so the VM has a copy with all my stuff in.

Participant D: It's the J Drive from the University resource which then has a folder.

Participant E: Weirdly we don't seem to be involved, we don't seem to have the J Drive, or it's not something I've ever felt the need to have.

Focus Group Leader: But we have the H Drive. **Participant E:** I don't even use that.

Participant D: Well J is ORC Research, and then within that there's all the different research groups that you have your work in.

Focus Group Leader: Maybe every faculty has a letter, or every school.

Participant E: I've just never even used it. I'd never even asked, never felt the need.

Focus Group Leader: Well I used H constantly when I was an undergrad.

Participant D: There used to be a different letter as well. It changed at some point since I started.

Participant C: It used to be the S drive.

Participant D: And then it changed to J.

Participant F: Very much, all the personal work and everything to do with conferences or presentations, all these kind of, my work is all on dropbox and then the things I share or kind of that are more interesting to the rest of the group kind of like, which is probably more like the end result of a sample or something. That all goes into the shared folder of our group on the J drive.

Participant C: Although we do have a shared folder on dropbox where other stuff goes anyway.

Participant F: But the problem with dropbox is because not everyone is paying for dropbox we've run out of space.

Participant A: That's why we had to stop using dropbox.

Participant F: That's why we had to go back to J drive.

Participant A: Personal computer as well so, the nice lovely computer that they gave us, and external hard drive, J Drive, Google Drive, all of the drives.

Participant D: A lot of mine is on my laptop as well, as well as the University drive.

Participant F: I think apart from the very raw data on the experiments that run on a particular laptop because that computer that is sitting with the experiment, that saves the raw data files chronologically, and I just leave it on there and then I copy it from there into my folder on dropbox, or something, where I can work with it and where it's a bit more of a reference around it and work with it, but there's always a copy on the actual local computer as well, as a reference. But that's probably because the data is not very big.

Participant B: Yeah i'd go with local copies on computers but primarily backups to dropbox or Google Drive, and then there's a separate hard drive I use to back up every month or so. And then there's the hard copies of all my lab books.

1.7 Question 7 - Are you guys concerned about Intellectual Property?

Participant A: Nope.

Participant C: Nope.

Participant E: Not really.

Focus Group Leader: That's odd as I think chemists are concerned about it.

Participant A: Really?

Participant E: No it's not something, I know there's the bit at the bottom of the lab book which you can get somebody to counter sign if you want to protect it, but I've never used it and I don't, I just dunno it never really occurred to me.

Participant A: Yeah if someone could make head or tail of my notes they probably deserve to steal them, good job.

Participant E: Maybe it's a confidence thing, I'm not entirely convinced what I'm doing will ever be useful.

Participant F: There's actually one thing that recently, because we started a new big project which is all about making a product out of all the things lots of Universities are doing. Have you come across something called itar. And that basically is a thing from the Americans that they forbid you to export certain things to lets say Russia etc etc, and that includes data, and they said for example because we had a big workshop on it, and they said that, for example it's a big problem for me, it's that we shouldn't store our data on dropbox, because that or Google Drive or any of these because they're some of their servers are in the states, that means your data is being imported there and exported again which means that technically they have rights to your data and you could be sued under itar

that you are exporting your data to Russia blah blah. So say that for example a conference, they say that you were not allowed to take anything but just a power point, no data on the laptop in the states or out again for the same reason. So that's actually now something we start thinking about using the J drive a bit more as well, because that's on the University, that's kind of not related to dropbox or anything so they have no rights to it whatsoever. But it's definitely something we have to think a bit more carefully about because, especially, another work where I'm working directly with the company and their data or some of their samples are stored in dropbox as well, which I probably shouldn't because again it's the same problem as such so it's something to start thinking about how to deal with that, which is probably the University shared drive or something.

Participant D: I didn't know that.

Participant C: It's a big thing, that's coming in I think, soon.

Participant F: Which is why a lot of other Universities actually have things like, Strathclyde have the Strass Cloud which is basically the same as dropbox but just for the University.

Participant E: Is their server in the UK?

Participant F: Yes. Just to kind of completely avoid that kind of thing.

Participant C: That's what all of our local profiles have a space to store your stuff right? Because that is kept within the University.

Participant F: And backed up.

Participant E: It's funny that the Computer Science department are the ones that don't seem to follow this.

Participant F: It's something I only came across whenever we had this big 20 minute technology hub meeting where they said like by the way, don't use dropbox, and we said, what? why?

Participant C: Isn't it also with the new publishing laws as well.

Participant F: No, so that.

Participant C: I thought that was you have to, you're not supposed to store any of your data that's going into those papers anymore, anywhere else, like dropbox, for similar reasons.

Participant F: Er that I'm not sure about, I'm not sure about that.

Participant C: I might be completely wrong but I thought that, that was another kind of side to it, having to make sure that all of your data was actually staying within.

Participant F: Yeah and the bigger problem was your data has to be accessible for ten years, so even if you leave or something your data is owned by the University, they have to be able to access it for at least ten years. So that's again, probably an easier habit than dropbox, as even using your personal dropbox and these kind of things. Which is why whenever someone leaves, we copy their data usually into our shared J drive with their name so we have all of their data in there.

1.7.1 Question 7a - Have you got any notes or records that you have to keep secure?

Participant A: From my ex supervisor, but only him probably, but that's the only thing I worry about. I don't worry about other people stealing my notes, I worry about the people in my previous group taking work that I've done and then either using it without me or putting it in something else that I don't know about. Which has happened.

1.7.2 Question 7b - Are there limits on who you can share your data with?

Participant F: Yes.

Participant A: Is there?

Participant F: No, it's because of the collaboration with the company and the big quantitative knowledge that we have that we're not allowed to share data with people outside of it, and they can just with the things, for example the company I'm doing, I'm technically not allowed to share what I'm doing with Participant C and Participant B because they haven't signed a nondisclosure agreement for these kind of things.

Participant E: I don't think there's anything like that from my project, although given that one of the backers is a defence company I wouldn't be surprised if there was something in the small print. But I don't know.

1.7.3 Question 7c- Does your data need to be kept for a specific period of time?

Focus Group Leader: [To Participant F] so you said that your data needs to be kept for ten years, is there anyone else where your data needs to be kept for a specific period of time?

Participant E: I think that's true.

Participant C: If that's University wide then.

Participant F: It's not very well known but that's the

1.7.4 Question 7d- Does your data require any 3rd party sign off?

Participant E: Nope.

Focus Group Leader: Not even if you're working with a company? Or working with another group?

Participant F: What do you mean by sign off?

Focus Group Leader: I mean does anyone external to your supervisors need to sign off your data.
Participant F: To do what with it? Because in order, I mean once I've taken it I've taken it. So, if I wanted to publish anything with it or put it somewhere for sure then I need to speak to them and get their agreement that they're happy for me to put that in the open space.

1.8 Question 8 - Who do you guys collaborate with and share your work with?

Participant B: Participant C and Participant F.

Participant C: Yeah, for us obviously because we're part of a group, and we're just down this whole sample route of everyone uses the samples, we have to all share that information so that there's got to be the framework for sharing all of the data and what the samples performance is at any time.

Participant B: Which is useful in particular for me because my project is an application driven of the lasers that basically they characterised, as much as I have to do it myself at some point, knowing that there's a baseline that they've recorded and that I can access that is very important.

Participant E: My end it's mainly supervisors, and a couple of other people in the lab who are doing similar work to me who I either share stuff with to make sure that we're not doing exactly the same work at the same time which can happen, or in order to brainstorm or share common data sources if we get a large data set from some big disaster we tend to share that around.

Participant A: Yeah, basically, people in groups, although I have worked with some people, so working on a paper at the same time as other people when you're writing it together is a bit of a pain.

Group: general agreement.

Participant A: So I had to do that between some guys in St Petersburg and some guys in Paris. But there's a website called Overleaf where you can workspace a LaTeX thing you can edit.

Participant E: There's also ShareLaTeX that one guy in my office swears by.

Participant A: That's the one we use, so you can write notes and stuff. But otherwise just call them up, skype them, here's your data, here's my data. Are we doing the same thing? No. We are doing the same thing! Why? Pretty much.

1.8.1 Question 8a - Do you share your work for feedback?

Focus Group Leader: Particularly with Supervisors or anyone else?

Participant C: Supervisors.

Participant E: There's one guy in the office who's kinda like a sort of quasi supervisor because both my supervisors are often not here, who I talk to a lot about stuff. So, him I guess.

Participant A: Post docs, yeah, if you're lucky enough to have them.

Participant B: I have to share my work with the two post docs (Participant C and Participant F) because basically between the supervisors being busy it's useful to have feedback from people who are around and know what they're doing, or have a more informed opinion of whatever data I've collected.

Participant A: Which is usually not the supervisors.

Participant B: Yes.

Participant D: Friends that are also PhD students, post docs etc, just because they might have a slightly different take on it. Occasionally the post docs in my group won't be able to help with whatever it is that I don't know so I'll be like other postdocs, can you help me with this? Normally there is someone that can help out.

1.8.2 Question 8b - Is sharing your work useful?

Participant C: Yes.

Participant E: Yes.

Participant B: Yes.

Participant F: Yes.

Participant E: Mainly for feedback.

Participant F: Even if it's just confirmation of my thoughts already, I kind of generically bother my office all of the time, hey look at this, what do you think about this, and then if it's the same what I'm thinking or not or something, because a different pair of eyes sees different things and ideas and so on.

Participant D: Even someone to question it, why did you do this?

Participant B: In particular in the office it's useful to get technical input because the supervisors often don't know the hands on aspects of a particular experiment so it's sometimes useful to have people who do it on a daily basis.

Participant D: They sometimes have unrealistic views of how stuff happens in the lab, occasionally.

Participant A: Yes.

Participant D: It's like no, no these things take this many hours to run, no I can't do it in a day.

Participant A: Yup. It's almost certainly good to share it, and even if you share it with someone who doesn't really know what's going on, to have them ask the innocent obvious questions, is always a good way. The only time where it's not good to share things in my experience is where you give someone a program and they delete your name from the top and pass it off as their own, that's not fun. But if you can trust your group it's absolutely fine.

1.8.3 Question 8c - Are there people you need to be able to share your work with

Participant E: The aforementioned.

Participant C: Supervisors, and people in your group.

Participant E: Supervisors are probably the top ones.

Participant F: As I said, like in the ORC, as I said earlier, because we all share the same samples in the end, it's extremely useful if we all shared because otherwise, it should be a have to kind of thing

because otherwise we'll just reinvent the wheel over and over again kind of thing.

Participant D: This sample doesn't work someone else can try it, oh it doesn't work.

Participant A: Ah how strange.

Participant D: If only someone had told me.

Participant F: Very much so.

1.8.4 Question 8d - Before you share your work, do you write up your notes or change the format first?

Participant A: Usually put it with a powerpoint of the data that I've got with explanation around it. **Participant E:** That depends, I tend to, I would think mostly I'm doing it because I want them to feedback on either a report or something like that, in which case obviously it's written up to that standard as a first draft. If it's a thought about the experiment then there's a good chance that I've come to them with my lab book and I'm talking to them face to face and saying here's something I've thought of, and draw it on a white board. So, I don't think I'd ever need to be in the situation where I'd be writing up my lab book notes first and then sending them, it would tend to be either face to face over a copy of them, or something that's already been written up like a report.

Participant D: I just take printouts of graphs and data and then just discuss it rather than having written it up, in a group meeting. It only gets written up or whatever if I'm going to a conference and need to make a poster or presentation. And then, it gets properly written up.

Participant C: I would say in regards to changing the format, yes. Because certainly we have it where people use different programming languages and if you output say a matlab file and not everybody uses matlab to store the results or model that might be useful to someone else then you try and make sure you change the format to just a text file or something with the relevant information, but aside from that not really, aside from making sure that all the relevant information is there with the work that you're sharing.

Participant F: Yes, probably only a sample report, where we kind of do write up actual mini report as such and change it so it's obviously not just the raw data, it's not all the data, we just select the bits that are interesting and a graph that shows what we talk about as such. Because that's probably the same for when I share the work with the company or something, I just send them the graphs I don't send them the raw data as such and with little notes, I normally try and have it in a PDF so it's in a way also non changeable, semipermanent.

Participant C: Also normally change it to PDF as well, so it's harder for just people to take the data out of it.

1.9 Question 9 - Do you use reference management software and if so what?

Participant E: Mendele.

Participant B: Mendele.

Participant C: Mendele.

Participant A: Zotero. It's awesome.

Participant D: I have used some.

Participant F: Not really, I dunno. Even when I was writing my thesis or something I used a program called Jabref. But that was just to make the referencing in LaTeX easier, but other than that really don't because every time I write a paper or something I think about it, I don't go back and go through my notes and see which of these ten papers should I reference, it's a kind of while I write it's ok this paper I should reference here and so on. I don't just recycle the same references for every single thing.

Participant E: I shamelessly recycle references for everything.

Participant A: So do I.

Participant F: Unless it's my own work and then obviously it has to be cited every time.

1.10 Question 10 - Imagine that you are trying to locate a piece of work or some notes from 6 months ago, how would you locate these notes and the associated data?

Participant F: Go to the folder with the date.

Participant C: Yeah.

Participant B: Yeah.

Participant E: On my computer, list view, sort by date. Or if it's in my lab book, like I said my contents page at the front is sort of kind of filled in so I'd know roughly where it was anyway because I occasionally go there and scribble the date.

Participant D: If I knew roughly when I did it date wise I could look back through my about five logbooks that I've got now to be like, I've got from this date to this date written on the spines of each of them, so it would be right it's gonna be in here somewhere and obviously I've got the dates written on pages. If it was I wanted to look up something from a specific sample that could have been done at any old date and I'd be looking on the computer, because if I tried looking in my lab book not knowing when I had done that particular thing, I would probably be looking a long while. But yeah, probably be data that was stored on a computer so it would be fine.

Participant B: The pages in my lab book are dated so I'd just go through that index so for everything else as I described before, if it's for one project then I'd just sort by date. If it's another project then presumably I'd be searching for a particular sample so I'd just look for that sample and then sort by date.

Participant A: Pretty much the same thing.

1.11 Question 11 - Imagine that there is a fire in your lab and all of your paper notebooks are destroyed. How much of your work would be lost and how could you go about recovering this work?

Focus Group Leader: (NB: This happened at our university, in their department, 10 years ago).

Participant F: Pretty much nothing. That's because the only thing I write in there is meeting notes, and everything else is on the computer, as I said at the moment I don't even know where my lab book is. Doesn't bother me.

Participant D: If my lab books were in the lab then yeah quite a lot would be lost and I'd be like I'm screwed, but as it is I've got them all at home now because I'm at that sort of I need to writing up stage and yeah in the event that something horrendous did happen to the ORC again, yeah they're at home. **Participant A:** I'd still have all my raw data and all the ASCII and TeX files, but it would be the procedure that I would have done that would be lost, and the progression of what happened. But if I rack my brains I could probably remember it having taken the same data repeatedly kind of thing.

Participant E: Yeah, it would mostly be notes on papers and stuff, which one would hope wouldn't take too long to reproduce by reading through the papers that you hopefully remember that you were looking at, so like at least I would have all the papers still as obviously I've got them in software form. So it would just be handwritten stuff on papers. Stuff in my lab book tends to be either forgotten about or coded pretty quickly, so that shouldn't set me back too much. Yeah I think mostly it would be the research side that would take a hit.

Participant B: Yeah I think mostly it would be i'd lose a couple of notes on procedures or maybe some experimental diagrams that were a couple of iterations before the final one that I'm using at the moment. But broadly speaking everything is written up for reports at some point so I have a neater and backed up version of everything.

Participant C: I would probably lose some working through derivations of equations and models and things like that. But again you'd hope that it would be pretty quick and easy to get back once you've done it at least a couple of times, and the end product is normally stored in some formal model anyway so it would just be the working.

Participant A: Lots of pages of things I did that didn't work before the thing worked at the end.

Focus Group Leader: So do you guys think you could recover this work and how would you do that? Some of you have talked about essentially re-doing it.

Participant D: Dash into the fire.

Participant E: Yeah pretty much, redo the notes on papers would be all it would be so that's maybe a week.

Participant A: Yeah, and all the raw data would survive.

Participant F: Because a lot of the things once I've done it once or something, and the experiment is over or even if the experiment is running as long as I still have the end result, unless I really need it for a paper or something, there's maybe no point in actually redoing it again.

1.12 Question 12 - If you fell under a bus tomorrow, you don't die, you're just indisposed for a while. How would your supervisor access your work?

Participant E: They wouldn't. You laugh but actually they couldn't.

Participant B: Yeah, same, they couldn't.

Participant C: Well aside from some of the stuff that's stored on the J Drive, that's not backed up anywhere near as frequently as I should do. **Participant A:** Yeah the J Drive stuff.

Participant D: There's a lot of stuff on the J Drive.

Participant B: They could walk into my office and steal my lab books and try and decipher my scribblings but other than that no.

Participant E: I don't know what Apple's security on time machine would be like, in principle they might be able to recover it from a backup on the time machine server that we have in the building but that's all I can think of.

Participant A: If I were capable of speech I could give them the password to my computer and then they could do it. Otherwise, no. If I was in a coma.

Participant F: Generally, I'm trying, all the things that are kind of applicable to what's needed to other people, like the various different samples or things, then I really try to put them into those folders at the end of the day kind of thing. But other than that yes, because it's on dropbox.

Focus Group Leader: So seeing that the three of you (Participant F, Participant C and Participant B) work together, if one of you guys fell under a bus how would the other two of you go about accessing each other's data.

Participant B: Largely unchanged.

Participant C: Yeah.

Participant F: Yeah.

Focus Group Leader: So you're saying that your supervisors don't have access to your work but you guys are in a group together, so say if Participant F fell under a bus would you two be able to access his work, how would you be able to access that.

Participant B: Yeah, I think everything that we need has been very careful to make it accessible.

Participant C: And certainly all of the stuff say programs that are required to run lab stuff, all of the computers in the lab operate under the same password, username and password so actually being able to do experiments and access all the raw data on those computers that's fine, and most of the important data that's shared within the group is shared in a central thing that we all have access to.

Participant A: Yeah it's the same for our group.

Participant F: I shouldn't have implemented these things I've made myself very disposable.

Participant D: The supervisors could ask the post docs, because they work with the students and know where all the data is.

Focus Group Leader: So if you fell under a bus (Participant F) and your supervisor asked these two then they'd be able to gain access to your files.

Participant F: I think the important bits yes. **Focus Group Leader:** So you three aren't presumably in the same group together (**Participant D**, **Participant A** and **Participant E**), is there anyone that your supervisors could ask who would have access to your work?

Participant A: Yeah so there's a person I work with in my group, Participant A's Collegue, would basically, only the terahertz work tho. The work from my other supervisor he'd have a job. But everything like programs and labs and data that we've taken together is on the J drive that they can get.

Participant E: Wow I feel like some kind of hoarder.

Participant D: There's stuff on the J drive which my supervisor has access to but probably would be like well I don't know where this stuff is, and probably just ask the post docs, and then, as for my lab books, as I said they're at home. If they were at uni they could just go and attempt to work out what was going on.

Participant A: They probably wouldn't bother.

Participant D: No, exactly.

1.13 Question 13 - Where are all of your notes backed up, electronic and paper?

Participant E: To recap: Paper - not.

Participant A: You speak for all of us.

Participant D: I dunno, paper isn't.

Participant E: Desktop here backed up to time machine, and obviously does local backups too. Dropbox does version control. If I open the Vm it's backed up in the VM as well because it all syncs with dropbox. I do git pushes of most of my raw data and my code. And then my laptop is pretty much the same, I have a backup hard drive and it does local backups and all the other bits that I just

said and another virtual machine on it as well. So I don't really have any excuse ever.

Focus Group Leader: Out of interest, do you pay for private git? Or do you push everything publically.

Participant E: No I use source kettle, the university one. (NB: private source control based off git within UoS).

Focus Group Leader: So that then is private repositories? So noone can access it.

Participant E: Yeah.

Participant F: That's the problem probably with dropbox because there's definitely no one that can access it and yes I pay for it to have the extra space for it and these kind of things but everything else is on the J drive. Not paper. Occasionally we try, we have some bits that we have on paper that I'm trying to scan in like we have some reports that we get from the other people that we get, I scan them in and again put them in the J drive under the respective sample as such, but other than that.

Participant C: I mean most of the notes that are relevant will get backed up in some form of report or something like that, so actually there does end up probably being a digital copy at some point.

Participant B: i'd agree that paper doesn't really get backed up, I think there are a couple of pages of my lab book that I've taken pictures on my phone, if I think it's particularly important or if it's something that I need to be thinking about, say if I've got a train journey and don't want to take my lab book with me. But yeah, all the backup systems that have been mentioned plus that very sporadic use of phone.

Participant D: I think I need to back my stuff up more.

Participant A: I'm starting to feel that way too.

Participant D: Laptop and J drive and I think the University has backup?

Participant F: Yeah the J drive is backed up.

Participant D: So the University has my stuff backed up..

Participant E: Is there a time machine access? Because we have one in ECS don't we?

Focus Group Leader: I'm pretty sure we do.

Participant E: But I don't know whether the University has one, I think it should.

Participant F: Aside from the J drive I don't know, I don't think so. I think it's literally just the data itself, whatever is on there.

1.14 Question 14 - Have you guys used an Electronic Lab Notebook before?

Participant A: Not entirely sure what they are.

Participant C: Nope.

Participant B: Nope.

Participant F: Do you mean something like Evernote and so on.

Focus Group Leader: I would classify Evernote as a standard Electronic Notebook, typically an Electronic Lab Notebook will have additional domain knowledge for specific subjects or generic lab additions to it.

Participant C: I don't think they're that prevalent in physics at all. I know they're used quite widely in pharmaceutical stuff.

Focus Group Leader: I found over 100 Electronic Lab Notebooks when I surveyed what was out there in the market and there were none that specifically said they catered for physics. A lot catered specifically to chemistry and biology and pharmaceutical sciences and life sciences, but there were several generic lab ones that said they would cater to all of your lab needs, and were for research and development and for quality access and quality control so I wondered if anyone would have used one.
Participant C: Do they tend to cost money?

Participant E: I weird, think doing what we do, physics might be easier than chemistry in some ways, as physics is mostly notation. Whereas chemistry you'd need potentially support for diagrams.

Participant A: Is it like a hand on a tablet kind of thing or is it a typey thing.

Focus Group Leader: There's lots of different ones.

Participant A: Okay.

Participant E: Yeah I think hand tablet could be useful.

Focus Group Leader: And Participant C most of them do cost.

Participant C: Yeah that would be why.

Participant D: Plus I think it's kind of easier and nicer to write on a page than on a screen, because if you try and like, I dunno you do all these things where you have to sign in whenever you go. Went climbing recently and they've got this screens where you have to give an electronic signature. And trying to write your signature on a screen with your finger, it's like ehhh.

Participant B: I think given the amount of equations I jot down and diagrams that I draw in my logbook over just text, I find it easier to just jot things down.

Participant C: There is very good software providing that you have the right hardware

Participant B: I think the problem is, none of the interfaces I've found have been able to do it

properly.

Participant E: So a tablet writey thing could be good for that.

Participant B: Yeah.

Participant E: Like digital artists use. That might be Wacon.

Focus Group Leader: So as a step away from Electronic Lab Notebooks, some of you have mentioned Evernote, do you guys use things like Evernote and Onenote.

Participant C: No.

Participant B: Yes.

Participant E: Very occasionally.

Participant F: I tried to use Onenote for quite a bit but I find it too, I need to use a computer to get into it and not just be on my phone or something, that's why Google Keep because it's so simple because I can literally just have it up in a second or something, and jot down things quickly and so on. I mean it's not like a lab book as such because it doesn't have, you can't have huge amounts of text or something in there as such, only things for to do lists and small things like that. But Onenote I tried to use but didn't stick to it. **Participant B:** And Evernote I find I do occasionally use, but I still find it a bit clunky, so it's not quite as nice to do freeform notes as paper.

1.15 Question 15 - What would you expect that an ELN would be able to do for you?

1.16 Question 16 - How could an ELN make recording your work better?

Focus Group Leader: So if someone were to provide you with some software to take your lab notes or to use in the lab, what would you expect from that.

Participant C: It would be that interface between backing up your handwritten notes, to electronic basically. If it could replace anything you're going to write down in your notebook, then you'd have it stored electronically so you'd have that backup automatically. But only if it did that well.

Participant E: In terms of like requirements as well it would need to, either, I think one of the difficulties is when you're doing particularly physics, you're not going to be writing line after line of text, so it's either going to be equations or diagrams or things like that. So you either need some kind of handwriting interface which then has the problems of hardware and the fact that you're writing on a screen. Or some kind of really revolutionary way of doing it via the medium of keyboard. But I can't really see that working. LaTeX sort of solves that problem but even that isn't exactly easy. You don't always get it right the first go. I certainly don't. I find it much easier to just scribble the equation out by hand. And then diagrams are just, yeah. I do diagrams on the computer and I tend to use pages just because it's publishing software and it works very well. But it's still rough and

ready notes. You'd need something like that. So I think a lot of it would come down to I guess the hardware, like being able to do that and type it up would fill a niche I think.

Participant D: If you could write on it and it would be as easy as writing in a lab book without being a mess, which mine quite often is at the moment then that would be useful to be able to back it up, but otherwise it's like no.

Participant A: Yeah that's the only reason I can think of that I'd use it. If I died and someone needed my lab book or if that fire did in fact happen.

Participant F: Even if I could scribble everything down and it was backed up, if I wanted to use it for anything more than just my to do lists or my meeting notes or something if I wanted to have it joined up with my data. The problem is that then the data, for example I use igor pro or something or matlab. On that tablet I don't have access to these bits of software. It becomes inaccessible because that means that I have to write the note, then go onto my computer and copy the graph in there, and it just becomes so clunky. Again I probably would stick back to have my data in the folder, have a comment file next to it, and that would probably be way quicker than, and revert to just taking my meeting notes.

Participant E: I don't know if you could do something to solve that like hyperlinking in files or something.

Participant F: But I need to copy and paste.

Participant C: Yeah.

Participant F: I dunno, because I tried it even with Microsoft Database, I tried to use that but there's the thing, if you have hyperlinks in it then, depending on which computer it is then it doesn't' always go to the sub folders. It really doesn't work very well. I'm sure there's probably better ways of writing your own website or something with a proper database, and the same folders and stuff but there's no convenient way as such I don't think. Because obviously every database file, people have different parameters and different samples etc etc that the time spent on building that, and especially if you then retrospectively had to change an aspect because there's a new variable, without screwing everything else up. Sometimes, we have sample numbers and now we start having the sample number and writing brackets behind what type of sample it is, that then breaks a lot of the hyperlinks that we ever had because they don't have that in there. That's why just almost go back to the stone ages of just having these text files.

1.17 Question 17 - What equipment are you guys allowed to take into your lab?

Participant F: Everything.

Participant C: Everything.

Participant B: Everything.

Participant E: N/A.

Participant A: Unless it's a cleanroom.

Participant F: Even then, maybe I've just been naughty but I've taken my phone and these kind of things in the clean room.

Participant A: Physics cleanroom, they're a lot more slack.

Participant C: It's not even a clean room.

Participant A: It's not even clean.

Participant D: Even the other clean rooms generally are okay with phones as long as it's non fibrous it's fine. So you're not allowed to take a normal lab book in, but you can get special clean room lab books with the non fibre paper. **Participant A:** Otherwise we probably shouldn't take food in there, but I imagine some of us do, otherwise we'd die of boredom.

Participant F: I guess we're allowed to take pens for writing down but that's probably it. Generally in the clean room, I was allowed to have my phone but I wasn't allowed to take it out and touch it with the gloved hands because I'll just transfer everything onto there. Then we reverted back to writing on pieces of paper I think, unless we're allowed to work on a computer.

Participant A: Provided we're trained on whatever it is, so it's you know something it's as graphic as cryogenics, we pretty much don't do anything in there. As long as our supervisors don't think we're going to try and kill ourselves accidently.

1.18 Question 18 - Does anyone have any other comments on ELN's or note taking in the lab or anything?

Participant F: Make it free and we use it.

Participant A: Even if it was free I probably wouldn't use it I like writing stuff down.

Participant F: If we would get a tablet that can take notes like the sample notes or whatever.

Participant A: If we could get a robot on a segway that would follow us around taking notes for us, that would be fantastic.

Focus Group Leader: So you said make it free, what about open. So what about something that you can collaborate with other people on?

Participant F: So as long as it's still safe, because then the problem is as soon as it becomes an online service that backs up everything, if it then doesn't comply with these itar things then it's completely ruled out for a lot of things. So it almost has to be something that is open, but then the University has to be able to adapt it to use it for itself and build it there. Because otherwise legally it becomes a problem.

Participant E: More broadly open's good because

Participant F: It's science and it should be.

Participant E: Yeah exactly.

Participant A: But where would the servers be.

Participant E: No I'm thinking of an interface and what's available to it. You might think, ooh I'm constantly doing some kind of equation and then you build in a template for it, I dunno. You could just collaborate to make the interface a lot more intuitive because people would be doing the same things as you.

Participant D: I don't think I'd want stuff that I write in my lab book to actually just be open for everyone to look at, because sometimes I will do something and it will go wrong and I'll be writing all the mistakes down as well, which might be useful to other people but something it'll get to the point where I'm writing slightly angry comments that I don't want broadcast to everyone.

Participant A: You might make some poor postgrad feel better about their lives.

Participant D: But this is the reason for publication, that's you being like, I actually have these results that are actually worth putting out there, and you don't need absolutely everything that's in your lab book.

Participant E: I assume, did you mean open in terms of open source.

Participant D: I assume you mean open for just people to kind of look at.

Participant E: I assumed you meant open source.

Participant B: Yeah.

Focus Group Leader: Yeah, Open Source, so everyone can collaborate on it and develop it together.

Participant C: For IP reasons I don't think you'd ever be able to have one that's open.

Participant A: Yeah, no more papers ever.

Focus Group Leader: But what about something that's like Google Drive, because a lot of you have mentioned Google Drive. So you go in, you collaborate, you have your own private documents, you collaborate with each other and you share your documents, but essentially Google has access to your information.

Participant D: But then again surely that's information you've processed and analysed rather than your notes from the lab.

Participant E: I think the only problems might be everything that Participant F said.

Participant D: Yeah.

Participant A: Yeah. **Focus Group Leader:** You use Evernote and people have got stuff stored in Google Drive, if you were to use something like that but to replace that lab book process would that then have, apart from the other things, IP openness issues, or not.

Group: Hmm.

Participant F: I think as long as it's stored at the University or something it's fine.

Group: General agreement.

Participant C: Or even in the UK it's fine.

Participant F: Again because it depends who you work with or what the particular nature of your project is. It's usually safer if it could be something University based like for example, because the University technically has a right to your data and these kind of things, so they should be stored there. That's why StrassClyde has done the thing with the Strass Cloud, because they realised everyone is using dropbox and none of our things, let's make something like dropbox and have it here. And then a lot of these issues are solved. They obviously haven't implemented anything to facilitate note taking better or anything like that but if that also included an app or something, that would be amazing.

Participant E: Probably worth saying that given that none of us are experts it's almost certainly a better idea to ask someone who actually knows about IP from the University.

Participant F: Yeah, what the real requirements are.

Participant E: Yeah exactly.

Participant A: Like if we wanna share with a group in a different country, can we do that?

Participant F: What they do for example in StrassCloud when you share, for example, if they want to share data with me, obviously I don't have a StrassClyde account or something, they can create an account for me that only gives me specific access to specific files. **Participant A:** But would that be the same for someone outside the UK as well?

Participant F: Yeah.

Participant C: Because the data never leaves the University.

Participant F: It's me reading it as such, I can't edit it, I can just view it.

Participant A: Ah ok.

Participant D: If you're collaborating with people in the universities that are outside the UK, surely you're gonna be talking to them via email or whatever, or having skype chats with them. And then you can just email them the data that's, you know, the necessary data rather than them getting everything and having to work out what they might need.

Participant F: It works, there's certain people who've done that but also if we write a paper together or something, there are some people who really swear by having something, that you can access it and

work on it, not necessarily at the same time but the same file that's been worked on, so you don't kind of, two people rewrite the same paragraph and these kind of things. So you can see what the other person's done and that kind of stuff.

Participant D: Yeah.

Participant F: So that's why a lot of people, again, for example, one of our students works with a guy in Dundee, and he, they use dropbox again, because he can see the data and see ah you've worked yesterday really late and you've taken all this beautiful data I can see it now, without him actually being there or something. Rather than having to wait for an email or something.

Participant D: I suppose it depends on what kind of collaboration.

Participant F: Yeah of course. Like I said with the company I don't send in the raw data I just send them the graphs unless they ask for it. As they probably don't want to spend the time.

Participant D: Again even if you are doing a paper where one person has done something and then you've done the rest, they don't need to know all the data you've taken just the end output. You can write the bit on your bit and then can write the bit on their bit.

Focus Group Leader: Are we done?

Group: General agreement.

2 Chemistry Focus Group 1

This focus group was conduced on 24/11/2015 and comprised of 8 chemists (Participants G-N). The following colour key is used for the Participants and Focus Group Leader:

Focus Group Leader
Participant G
Participant H
Participant I
Participant J
Participant K
Participant L
Participant M
Participant N

2.1 Question 1 - What methods do you use to record your notes?

Participant G: I use my lab book.

Participant H: I use scraps of paper, and a lab book.

Participant G: I use scraps of paper also.

Participant I: I have a piece of software called KeepNote which is an open source notetaking application, it's like Microsoft OneNote but free, so I use that day to day when I can be bothered. Otherwise it's just scraps of paper.

Participant J: I use a variation. I used to try and use blogs, so I had used the Chem blogs and I also tried to use blog3, but each of them have their drawbacks so most of the time I end up defaulting to either having it in typed documents or on paper when it's easier.

Participant K: Depends what kind of notes it is, all my lab stuff I keep in my lab book. Any calculations I do I have a separate little notebook where I do my calculations in and if I have notes on a paper or day planning I have a notepad.

Participant L: Yeah, similar, I have a lab book for the lab experiments, calculation book for the calculations before the experiment and a notepad for all the meetings and everything.

Participant M: Yeah I'm the same. I have my lab book, my calculations book, and then just a notepad for meetings and ideas or whatever.

Participant N: I have a lab book for my chemistry work, and I have a book for my biological work. It's not as formal as a lab book, it's just a notepad where I keep my records.

2.2 Question 2 - For each of these different types of work, what pieces of information do you currently record and how do you record it?

2.2.1 Question 2a - Doing an Experiment in the Lab

Participant G: For doing an experiment in the lab, I'm a computational chemist so it's all on excel really. What pieces of information do you currently record? It's usually energies. Is that what you meant?

Focus Group Leader: So what types of information? Do you take dates, times, what parameters do you have?

Participant G: It's literally just numbers and a few values. And then differences between energy values. It's just that, and then linked in with that is the system I'm studying. And then usually the information of what the calculation is will be the name of the excel file that I'll save it as.

Participant H: I'm similar, we do calculations on the computers in the lab, normally text/data files with energies and observables in it. Some select screen grabs and input files, and possibly saving some of those as raster images, maybe an excel file as well.

Participant I: I'm also a computational chemist, I try to use tools like git to keep a record of what simulations I've run and the version that was run. Or when I'm writing a python script, try and create some sort of record of what parameters were used. Once I've got the data I can store it in an excel file or literally going straight to the point of trying to write it into the form I'm trying to create like a paper or something.

Participant J: I'm also doing computational stuff, so I'll be running, not simulations but models on datasets, so i'd have the dataset I'm running it on, and then I'd try, whatever models I'm running and the outputs (which is usually a set of values for the parameters that are the output from that). Often it will also be some set of images, a plot or a graph associated with that. It's usually either, everything is saved on the computer and then potentially a document or a blog post associated with that that's essentially a record of what I did.

Participant K: Obviously I do stuff in the lab rather than just at a computer. Everything that I'm doing I write down in my lab book, I date everything, I have a heading for every synthesis that I do. Depending on the time of year, sometimes I also record the temperature because that can fluctuate quite a lot in our lab. I write down everything I do, all my observations, sometimes I take pictures of some things if they are nicely fluorescent. I take graphs that I carry on a memory stick, and then after I store them in the research folder.

Participant L: Similar, I use my lab book for the protocol. Date, title for the experiment, all the reagents I use, all the quantities, the protocols. And observations of course. I take pictures when I want to show them in presentations later, the colour or everything. We have a lot of quite visual stuff. After all the graphs and everything else, we normally make a presentation and put everything in powerpoint and in a folder in my computer. When it's thinking about my work I have a separate book with notes. For the literature I use EndNote. We also have a folder for the group with all the literature.

Participant M: Pretty much the same, all the experiments that I do in the lab, I have a lab book, I basically do the same, date, heading, all the quantities and reagents, observations, any graphs I plot on excel and I store them in my folder on my laptop or computer. All the calculations are in a separate book and there's a heading for that and I also write down what page corresponds to my lab book for what experiment.

Participant N: It's also similar. I have all my experimental protocols in the lab book. Usually I also use some diagrams to think about my biological samples and how to prep my whole experiment. I have a lot of pictures and images, usually I store it in a separate folder in my computer. And also all the graphs and everything in the raw form initially, and take it back and process it. All the rest, the literature I also have a folder on its own. All little notes I put them in the side notepad.

2.2.2 Question 2b - Doing an Experiment outside the Lab?

Focus Group Leader: this might apply more to you guys perhaps (Computational Chemists), if any of you do experiments outside the lab?

Participant G: All our experiments are probably outside the lab I think, well it's as I say with the excel spreadsheet, and then saving those. But I also use XMGrace for graphs, sometimes rendering systems are quite useful. If I render a system sometimes it's electronic densities and things, these kind of properties.

Participant H: I'd interpret this to mean doing a simulation or a computation on one of the supercomputers. It is a little bit different when we do that. Quite often we've got huge data piles, and they clog up the file system, so we tend to bring them back onto the local machines and put them in the file system. Wave functions, coordinate files, density of states plots, which aren't so big but often have just got a hierarchy of directories which have lots of graphs and things in them. Maybe 3D plots of orbitals and things. That's about it really.

Participant I: Yeah I think I can't add much because my previous answer being computational was probably the same.

Participant J: Yeah the same pretty much, pretty much all of my experiments are done in the same environment so everything is pretty much the same.

Participant K: Depends how you define lab, I do experiments outside the chemistry lab because I work over in the General Hospital in another lab. For that I do pretty much exactly the same, I jsut have a separate notebook, but it's exactly the same as I would do here in the lab.

Participant L: The outside when I work on the lab, because I work in France also. It's another lab but completely different, it's not really a chemistry lab it's optic stuff I do there., so I normally just write in just a book, and when I come back here I transfer everything into back into my actual lab book and make sure I have everything in the same place.

Participant M: So I work at the General Hospital as well in a separate lab so I have a different lab book for the biological experiments that I do there, but it's pretty much the same thing, same procedure.

Participant N: Besides all the lab work I also do some rendering and 3D imaging, so whenever I'm dealing with that I basically have some USB sticks that I just move my data around and everything. But usually since it's stored in the data file what I do is just take a block of notes and some procedures that I found, or I write as I do the rendering and everything. So it's basically similar to what I do to the other but complementary to the work.

2.2.3 Question 2c - When you're looking at your literature?

Participant G: I usually will note the citation reference, and save it into PDF onto my computer if I can. Obviously if it's really old I'll have to go to the library and scan it in. If I want to use it afterwards I'll condense it into a PDF. So I'll scan it in and condense it like that.

Participant H: I tend to download the PDF into a directory, I have a directory just full of files with useless filenames. If it's really boring then I print it out and read it through, and usually I've got a BibTex file with the citation in case I ever need it.

Focus Group Leader: Do you make notes on the papers by hand on or via a reference manager or in a document or anything.

Participant G: Usually if it's quite heavy theory then I'll have to print it out and make notes as I go because I need to know how to understand it again later. So usually if it's heavy theory I'll print it out and then write on it. It's not like I'll scan it in again I'll just keep the printed copy.

Focus Group Leader: And you don't have computer notes of any of it?

Participant G: No.

Participant I: I use Firefox and Zotero to manage my references. and when I find a paper I click a button and it saves the PDF to the Zotero along with the metadata. If I do write notes, some simple notes I'll add some notes on the computer for that, but if it's something very complicated I generally find that that isn't good enough so I tend to make a separate computer document, a word document, and write out whatever my thoughts are with references to the paper, a sort of document.

Participant J: I use mendeley to manage my stuff, so most of the time when I find a PDF i'll download it into one folder and it'll hopefully bring all the metadata into it. I'll try to tag it with certain things so that if I know it relates to a certain thing I'll use keywords and tags for it in mendeley. Sometimes you can do highlighting and stuff in the paper itself. If it is something that I want to annotate a lot usually I'll print it out and then annotate it on the paper copy and then file it in, cus I have a big folder with lots of papers that I've printed out, and I'll try and file it in a section of that. But I won't scan it back in again and put the annotated copy into mendele which I possibly should but I don't.

Participant K: I use EndNote if I find something that looks relevant I download the PDF, I generally save it into, so we have a separate literature folder in the research drive and we've got loads of sub folders so depending on where it falls into I'll save it with the year and the first author and the title normally. And if I need to print it I'll print it and I'll make hand notes on the copy. We also do a journal meeting once a week so if it happens to be my journal meeting then I'll prepare a powerpoint presentation with all sorts of notes in it so that helps as well and I keep that. All the printed copies

I'll also keep in a massive folder depending on what subject it is. So i've got like 5 massive folders.

Participant L: Yeah exactly the same, so presentation for journal club, in folder, in folder in my computer with sub folder for kind of like, I try to make categories. When I need to, when it's like quite physics like I print it and I make notes on the paper.

Participant M: I save everything as a PDF in a folder that I have on my laptop. I usually print all the papers out, I can't read off a computer or a laptop. So I print everything out and I annotate everything and then I store it in a folder with my other papers and I try and categorise all the papers that I have in different sections.

Participant N: Basically it's the same way. Just having the paper, so in one way having it in the PDF form and storing it in the folder with subfolders and organising them, and on the other hand if I find that the paper is really important to read I'll print it out and make those notes on the printout and I just keep those printouts in a folder.

2.2.4 Question 2d - When you're thinking about your work?

Focus Group Leader: Maybe the next experiment you're planning to do or just generally jotting down notes about what you're thinking about or if you have a conversation with somebody and you're discussing your work.

Participant G: Well for me it just goes in the lab book really. Yeah, I think it's pretty much just the lab book, any thoughts. Or on a paper if it's applicable to the paper I guess I'd write it on the paper. Like I think this is wrong etc etc.

Participant H: I think most of the time I'm just thinking I write on the back of papers and then if it ever amounts to anything then I might stick it in a lab book if I remember to I think.

Participant I: Very similar, if I'm thinking about my work then normally i've just thought of something like oh I should do this or something quite small then it will almost always be just on the back of a piece of paper or an email to myself or a little google tasks bullet point. But if its something important then I do try and put it into a document.

Participant J: If it's things like say I'm having a meeting then often I type mine because I find it's faster to type it when I'm in a meeting. So i'll have a document that's dated as to when the meeting was and then that would have all the things that wouldn't necessarily make sense after the meeting but that's what I've written at the time. And then other stuff if I'm writing on paper i'll try and write down the notes and try to colour coordinate it depending on what sort of project areas it's related to so I can flick through and easily find it.

Participant K: Generally if I've got a meeting or conference or anything I just have a notepad that I keep outside. I generally try to do a page where I write my plan for the week and if I have anything to be added to that I'll just add some notes in that. Like oh do this or add idea. And write that down there. Generally for conferences I try to have a separate book also and then at the end of that I kind of have this conference and ideas from this conference or whatever. Lately I've just put it all into my notebook. But I keep all my notebooks so I've got loads of these pukka pad things from this year so

I've got all of the things there still.

Participant L: For the regular meetings, so we have a meeting on monday and wednesday, so for this I have a special book where I put the date and I write down the ideas of what I need to do and what we discuss. When i have a random discussion with someone about something often it's random papers but often I transfer it in the notebook, but sometimes I just have random papers everywhere.

Participant M: I have a separate notepad for meetings and journal clubs and stuff. And then any ideas I write wherever I find, I'm not that organised.

Participant N: It's a little bit a mix between having, I have a notepad for meetings and ideas and discussions and everything, but also it's the same like if I have a sudden idea I write it in the paper and then I try to transfer it but sometimes it just gets lost in the middle of all of the paperwork. I have notepads on the side for ideas and planning the experiments and trying to keep everything outside of the whole lab book. And then if I really find a fit then I'll just rewrite it in the lab book cleanly and everything.

Participant K: I have more unorganised stuff. I also quite often if I have sticky notes lying around I'll write my ideas on them and pin them everywhere. My computer was full of them at some point.

2.2.5 Question 2e - When you're performing calculations for your research?

Participant G: I think it's basically the same as a) and b) because performing calculations. Do you mean up to the main calculations and then calculation to analyse the calculations that I did as the main effect.

Focus Group Leader: Any calculations, so right from the beginning in the planning stage or calculations to support what you've done or analyse those. Or even preliminary ones to work out what you're going to do in the future or any equations.

Participant G: Yeah it's basically just the same as a) and b) then. it's basically just excel spreadsheets and XMGrace and sometimes PyPlots.

Participant H: In terms of calculations I do have a bit of a organisational structure. It's just a directory hierarchy. So i try to name the directories for the calculation and then maybe have a backup directory inside. Usually when we submit the calculations to the computer we have a timeframe in which we can run and then we have to continue afterwards. So we have to be sure to save the right data files to read in and restart the calculations. So in the input files I'll often have comments with notes about which parameters can be read in to restart the calculations and which can't because maybe it died right in the middle of writing some data files. It's just a hierarchy of comments in input files really.

Participant I: I laugh but I actually use very similar, because we are working with big files, you can't use the standard tools like git that they'd recommend for sustainable research because you can't git backup an entire large file every time you submit it. The best you can do is keep one local folder backup of whatever you're running and then continue from there. But for smaller calculations which are small files I have a python script which keeps a record of where the files are, what parameters

they're using, outputs a csv file, and plots the csv file using a python script, so you can get graphs out so you can hopefully trace back your graph to your data to your script back to whatever you ran.

Participant J: If I'm doing calculations on stuff mainly I use JMP and or R to run statistical calculations so most of the time for that I try to so, what data I was using, so it'll be reference to a dataset, for R in particular it will be what the actual code was that was run, so I'll try to have the code file and also the output from that. For JMP it's more often images and plots and stuff like that but they'll all be saved alone, and I try to have either a paper or blog post that has the method of what I did that's basically the same as the other ones but more code based as well.

Participant K: My calculations are probably a lot similar, it's like how much do I need to use of this, or how many mols of this so all of that I calculate generally and I have a little calculations book. If I'm doing anything else sort of statistical analysis wise then it's all very simple so I'll just do an excel so it's just like standard error and stuff, but that's pretty much all calculations we do.

Participant L: Yeah calculations really simple like concentration mol, so in the little book.

Participant M: Same, in my calculations book with the date and the experiment and I relate that back to the page in my lab book for the procedure, but it's pretty simple calculations, the same concentrations mols volumes.

Participant N: For me it depends on the experiment that I'm doing. If I'm doing a chemistry experiment then I usually do the calculations alongside the experiment so if I'm doing something on the lab book from chemistry I'll write it down there. If I'm doing something on my biological one I'll do it there or the rendering one. So basically I have three different steps of calculations and I don't have a separate notebook. I basically have it alongside with the experiment where I write it. If I'm doing any other thing like analysis I usually have it with the same type of files. So if I'm doing some statistics I have it on the statistical file, if I'm doing anything else I'll have it there.

2.2.6 Question 2f - When you're writing up your work?

Participant G: When I'm writing up my work?

Focus Group Leader: So either generally writing it up neatly, or writing up papers or reports.

Participant G: I usually use LaTeX to do it so if it's a report or something I usually use LaTeX but it's often quite a painful process and if it's not very long, say it's two pages or something, then it'll be a libraoffice writer or word or something.

Participant H: Yeah, I'm similar. So if it's a paper it usually comes down to downloading the LaTeX paper to begin with for the journal and then just modifying that, having a directory with a sensible name. LaTeX file, bibTeX file, references, and maybe a few comments in the LaTeX file. If it's a bigger document like a report with chapter headings and section headings then often I've got the sections or chapters in a separate directory with a separate LaTeX file and maybe a makefile to compile the whole document.

Focus Group Leader: Do you guys, you say you write up for papers/reports. If you've done an experiment and written things in your lab book or written things as you're going along do you ever

write that up? Do you ever have a neatly written or typed version of that or does it just stay in that form until you go into a paper or report.

Participant G: Yeah if I'm going to write it into LaTeX or whatever then there's got to be a reason, I'm not just going to write it up.

Participant H: Yeah same.

Participant I: I'm not sadistic enough to use LaTeX. I use LYX a graphical interface to LaTeX so you can output LaTeX code and it gives the prettiness of LaTeX code without writing LaTeX code. Generally they give us lots of, because we have the 9 month report, 18 month report, I always feel like I'm writing a report, so I've always got something I coud be writing it into if it's not a paper. So generally if I'm writing it in LYX it's either for one of those reports we're doing or for a paper.

Participant J: Usually I use LaTeX when trying to write reports. So I'd usually use it on dropbox because it does versioning, I tried github but I didn't get along with it very well. It's also good if you're doing work writing it up with someone else because it does changes and stuff relatively decently. So i'll have a folder for the actual piece I'm writing and then another folder for all the images that are going to be contained in it. And, other stuff like that will usually be commented in the actual file itself, but if I need to write lots of comments on it often I'll print out a version/draft/copy of the document, annotate it all on the actual paper version and then go make edits back to the file because I find it easier to write it out like that.

Participant K: Basically, lab work, writing up neatly not really, it stays in the lab book unless it goes into a paper and then i'll just download the template from the journal I'm submitting to. Generally I'll write in Word just because all the group basically does it and the boss doesn't really know how to use LaTeX. So yeah we just use Word and then just comments, the usual stuff you can do in word and thats basically it.

Participant L: Yeah, just like Word.

Participant M: Yeah. Word, the same.

Participant N: Yeah Word then some basically some random annotations by hand from time to time but it's mainly word.

2.3 Question 3 - When you're taking notes how do you organise them?

Focus Group Leader: So, sections, indexing them in your lab books perhaps, etc?

Participant G: Usually it's just the date and then the title, and then if it's with someone then I'll write down their name probably and then if it's notes on say a paper then I'll make a reference to that. And then for indexing and creating sections I'll write what its to do with, that particular section of that paper or whatever, and then it's just a deluge of bullet points and then no sections. So it's usually just bullet points that kind of thing in terms of indexing.

Focus Group Leader: Do you use the front bit of the lab book, or at least our log books, I don't know how similar how they are to your lab books, but they have a front page where you can say this page is this, and that page is that, and there are contents.

Participant G: No. not at all. It's just a mess. Yeah the indexing is literally the date and that's it. It'l be like oh I remember doing that. I'll sit on the computer and sit and date it and it'll be like July and I'll just go through July and see what it was, I think it's a pretty awful method but that's what I do.

Participant H: No.

Participant G: You don't organise or index it?

Focus Group Leader: It's generally how you organise it.

Participant H: If I write anything in the lab book it's got a date if I remember to put the date. I dunno, I think if you don't do these things then you remember it.

Participant G: Probably because you're forced to.

Participant H: Yeah I remember where it is, I can just feel it, it's just there in the lab book. I just know how far through the lab book. Most of my lab books are just filled with equations and stuff so it's not that much use at a later date anyway because I do quite a lot of working out in it anyway.

Focus Group Leader: Do you index your notes at all on the computer?

Participant H: On the computer yeah, I put the reports and things, they're in directory structures. I've got a directory with quarterly reports in for instance, and inside of there it's just 1, 2, 3, 4, 5. Of course they've got the date stamp on the directory so that's good enough as far as I'm concerned.

Participant I: Yeah, I use this KeepNote software which automatically indexes and I use sub sections within that. You can also do hyperlinks between the different sections.

Participant J: Most of mine, because I have a variety of different projects, most of my notes are organised by what area it's in. So I have different sections for the different projects. and within that different folders for the different areas and then i'll try to keep all of the notes in there. If it's things like actual notes on a blog or something they should be tagged by the same project areas. Handnotes on paper I usually colour coordinated by the project area it is, but not necessarily a lot of sub sections. But I try to write, when I date it, I'll write in the top corner what sort of area it is so that when I flick through I can find the different sections like that. But I don't really have any index, ideally, but then I'd probably spend so much time indexing my notes that I wouldn't have time to write them.
Participant K: I just put a date and sometimes a heading if it's just random notes that I';m taking.

Participant L: Yeah I use the first page of the lab book with the page, I put my title there because sometime I need to repeat the next time and I know directly which page.

Participant M: Yeah, I do the same, I just have the date and that's it.

Participant N: On my lab book I have, not only the heading and the date. but I have a little post-it

coming out of the lab book, so I always come back and just find the page directly. I have a little heading that I can relate to. So if it's a certain protocol that I'm looking for I'll just flick it, I can go straight to the page the thing is.

2.4 Question 4 - Do you use any technology to aid with your note recording?

Focus Group Leader: Obviously computers and stuff we've covered. but do you take pictures with your phone, do you ever use voice recorders or do you take pictures with cameras, some of you have mentioned pictures. Do you use tablets, do you send yourself emails, do you use any form of technology to help with taking your notes.

Participant G: I'm a fool for sending an email to myself, I'm always sending emails to myself. Which is really bad because then I lose them. But apart from that I'm sort of stuck in the stone age with making notes on paper, sort of in my lab book or on the paper like I was saying.

Participant H: Occasionally if there's a talk and there's an interesting slide I might take a photo of it. But I don't think I've ever looked at it again.

Participant I: I don't tend to take photos, textbooks if I want to scan a page I'll use my phone. I use Google Tasks to keep notes or just emailing myself.

Participant J: Sometimes I'll take photos with my phone, or sometimes with a camera but usually just my phone because it's so much easier. Other than that I don't really use, I use like the blog and stuff obviously that's on a machine, but I don't really email myself that much.

Participant K: I also take pictures on my phone of experiments in the lab or sometimes of presentations and then I generally store it all in the shared filestore in the folder.

Participant L: I take pictures of the experiment, I have a folder with all the pictures with subfolders and I email myself when I have no USB stick or no time.

Participant M: I take pictures with my phone of experiments and stuff. and I save them on my laptop.

Participant N: I usually also take pictures with my phone and sometimes a camera that I have in the lab. Basically with my phone i just email it straight away to myself, with the camera obviously I use a memory card reader or something similar.

2.5 Question 5 - If at all, how do you link any digital resources or notes to your paper based notes?

Participant G: It's pretty rare that I do, but if it's really useful then I'll write the URL down, but usually it's just bookmarked really, it's just bookmarks.

Participant H: I have a file, a ringbinder file, and papers. If I print them out eventually they work

their way into there, or they don't. But if they're important they go in there and often they've got notes on the back of them. So more often than not if I've read something already and I think it's important it's in the file, I'll look in the file and I can see what I've written on the back of it and then if it, if I need to look at some ancillary information then I can just go on the DOI and see the rest of the data or whatever they've done. I think that's the only way I do it.

Participant I: I don't.

Participant J: Probably badly, so more often than not if I'm writing paper notes then I might link to something digital then I'll link to the URL of the blog post or a DOI or the file path to where something is stored. I don't really link when I'm writing electronically, I don't really link to anything paper based. But I will link on the paper to something digital.

Participant K: Generally if I take a picture of something, I'll write in my notebook that I've taken a picture of it. I'll save it in the filestore with the date and what it shows so generally I can find it that way. But that's about it. If I have a paper or something that is linked to it I generally just write down who's it by or a title or whatever and that about it.

Participant L: I only do that, the only time I do this when I take UV spectrum and I just put that I did a spectrum and after I will just go to the computer where the spectrum is and make a file with the name and date and link to my lab book.

Participant M: Yeah I don't do that either really, if I take a spectrum either UV or otherwise I'll say in my lab book that I've taken the spectrum and all my spectra are saved by date so I know which ones corresponds to which experiment.

Participant N: In my case it's just, I usually relate the heading that I give to the digital data file, so if it's a picture or any other type of tile I usually have a heading that relates to the type of experiment that I did and I have the date and this way I can relate to the lab book and my written notes. usually I just think about back when I did it and what I did and then basically relate that.

2.6 Question 6 - Where is your data or research output stored?

Focus Group Leader: The data outputs from your experiments, your general research etc

Participant G: Well it's on my computer, do you want what other places yeah? My supervisor wants all my papers that we're collaborating on his computer as well for him to never read. They're also on the supercomputer, they're on Erodis because that's where the calculations are run. Some are on my computer at home. That's it really.

Participant H: They're on my computer. I've got another hard disk which is not backed up. But that works as a backup. My supervisor has got various discs on his computers that he wants stuff putting on that includes data files as Participant G said. He also has a disc on the University SSH server which we often put stuff on. Then on Archer the supercomputer there's the EPSO file system which is tape backed up, and for wave function data big files, we put stuff on there. But it can take hours to get stuff back off it. So often it's things that we think we might need in a year or so. Not

stuff that we're going to need soon. And it's the same on Erodis I think with various discs and the data is distributed everywhere and to be honest it's just sort of on memory.

Participant G: You know where it is but you don't know if it's on Erodis 3 or Erodis 4 and then you might have to search on the group server.

Participant I: I've got the same problem where I've got files split between Erodis 3 and Erodis 4, and on Erodis 3 and Erodis 4 you have the backed up home directory, and the non backed up scrap directory, and I'm also using the EPSO which is backed up on Archer repository. But generally if something is important I try and put it somewhere that is backed up if I've completed some work. If I'm working on some work then it's probably not backed up, but on a scrap drive on my machine or the supercomputer.

Participant J: My stuff is on dropbox, I use that so it's on my computer but also backed up on dropbox if I'm doing stuff like papers and stuff that have a lot of changes. We also have a group folder on the filestore system so that will be backed up as well. But a lot of the stuff that I'm saving like images and screenshots and stuff is on my computer which I always faff around with because of the stupid iSolutions filestore thing that keeps telling you you're over your limit. Most of it goes to the group filestore or to dropbox.

Participant K: I have pretty much everything on the group filestore. I save all my stuff there and obviously my supervisor can access it if he needs to and it's backed up. If I need to for any reason have it anywhere else like my thesis, I also saved on dropbox and external hard drive and other places. Generally it's all on the filestore.

Participant L: I have everything on my desktop at work and also in the share folder. And also in my laptop and also in my hard drive so kind of everywhere. I don't really update it often, every 5 months I update it and I put it everywhere.

Participant M: Everything that I do is saved on the group filestore. Also I have my own folder on my computer which is also saved on my laptop. I also have stuff saved in dropbox.

Participant N: My stuff is also all saved on the filestore from the group. I have an external hard drive that I also update from time to time and I have some of the most important stuff on dropbox as well.

2.7 Question 7 - Are you guys concerned about Intellectual Property?

Focus Group Leader: Do any of your records or notes need to be kept secure. Are there limits on who you're allowed to share your data with? Do you have to keep your data for a specific period of time? Are there any 3rd parties that need to sign off your data if you want to use it in a presentation or show it to anyone?

Participant G: I don't think I have any concerns about IP but I have to, if I do a presentation I have to get it signed off. It's making me wonder if maybe I should be concerned but I don't think so. By my sponsors, this pharmaceutical company. I have to send them the PDF that I'm going to

present for the label team to sign off. But there's no limits that I've been told of.

Focus Group Leader: And you don't have to keep the data for a period of time.

Participant G: I've not been told that I have to, the only thing I've been told is that if I do a presentation I have to get it signed off and that's the only thing. I don't know about you guys?

Participant H: My industrial sponsor is quite strict about it. They want 4 weeks, they want the presentation or the poster 4 weeks before I present it which is a nightmare, because half the time we haven't finished the calculation we want to present. That's the main thing. They're also concerned about the data. In terms of programming, code we write, they don't seem to care. But the data we're not really allowed to share unless we speak to our line manager and say is it ok. They usually say yes. But we're supposed to ask.

Participant I: I don't really have any concerns. On the rare occasion that I have an interesting idea I'll try and put it into my physical lab notebook with a data.

Focus Group Leader: So you don't have any concerns?

Participant I: I don't have any concerns as I'm not working with industry.

Focus Group Leader: So you don't need to keep it secure or anything?

Participant I: No. Only for the point of view that if I want to have a paper I should try and keep some of my results, to the point that until it's published they'll be private, but not really.

Participant J: Not really, most of my stuff is based upon data, the underlying data has already been published. A lot of the stuff that I'm working with is from other people and the data is already out there. And most of our stuff is meant to be open access anyway so our data is. I mean not all of it is currently up there, but it's going up on e-prints and stuff and it's not embargoed or anything as all of the journals are going open access ,so everything is open access. Obviously the analysis we don't publish it all. Although my blog is out there it's not publicly accessible, but obviously anything like our data that's all pretty much freely accessible and I don't really have any sign off. Obviously my supervisor looks over my stuff but I don't have any industry sponsors or anything. the other people who the data is based on we also go and ask them but all of it's pretty much been published anyway.

Participant K: Not too many concerns either, I'm not funded by industry. Obviously I'm not publishing, well I'm not making any data or anything available before I've published it. But apart from that, if there's a colleague or whatever who's like have you tried this, I'll say yeah and I found these results. I won't necessarily give them my protocol before I publish it or anything but there's no-one who really needs to sign off. The boss will look over our presentations but nothing apart from that.

Participant L: I'm funded by DSTL and they want to see everything. The poster, presentation, anything that goes out from the lab basically. It's not super secure they just want to look at the science more than. It's not really secret but they'll always check before.

Participant M: My answer's no, not really. It's basically the same as Participant K, I won't really

share anything but I don't have any concerns.

Participant N: Mine is also, I don't have any concerns It's just until the point of actually publishing we try and keep the sharing to ourselves and the group and everything but once it's published then we have no problem of having discussions and sharing.

Focus Group Leader: Do you guys work together?

*** Participant L, Participant M, Participant N and Participant K are in the same group ***

*** Participant I, Participant H and Participant G are in the same group ***

Participant J: I work with some people, but not for the uni.

2.8 Question 8 - Who do you collaborate with for your work and who do you share your work with?

Focus Group Leader: Do you share your work for feedback and do you find that useful and are there people you specifically need to be able to share your work with, so if you work together with each other?

Participant G: I've got three collaborations. There's one with the School of Medicine. There's one with some company in Oxford and there's another collaboration with my sponsors in Germany. Sharing would be useful, but sharing pretty much comes down to me writing up and reformatting it and showing them and stuff, and it's useful, sometimes. Do I share my work for feedback? Sometimes. I think it's mainly just because they want to know what I'm doing.

Focus Group Leader: So you actively write your notes up before you share them with your collaborators?

Participant G: Yeah, because otherwise i'd just be sending them an excel spreadsheet. Sometimes I do do that but it'll be really cleaned up because otherwise it's just a horrific mess of numbers with a few labels.

Participant H: We've got a collaboration with our industrial sponsors in Reading and Oxford Materials. I think actually that's the reason why we might not appear to be so organised with the notes side because every month we have to make powerpoint presentations so we kind of do put it together and put everything in order because we have to present it to the sponsors and to the collaboration on such a regular and frequent basis and so from the point of view of organisation and having things in a useful order it's useful. Apart from those people outside of the University, outside of this University. It's just people in the group that I do share notes with.

Participant I: Informally within the group we just verbally talk about things every now and again if I want some ideas or help or something. I have a collaboration with some people in Japan, again it's mainly a verbal communication of the work I'm doing, or a powerpoint. And I have regular weekly supervisor meetings. Mostly as Participant G said it's just to find out what you're doing more than

feedback but every now and then you get a useful piece of feedback.

Focus Group Leader: Do you write up your notes and change the format of them for sharing?

Participant I: Not for sharing, I don't write it up, other than powerpoints and verbally I don't share work in any written form, because other than papers and reports there's nothing.

Participant J: So we have a collaboration, basically because we're using data that's from other people we have collaborations with the people that the data comes from so it was over email back and forth, and each time there was a different version of a file which was pretty awful. Writing on a recent paper we've done a dropbox shared folder which was worked much better because you can make little incremental changes and it works much better. In terms of for feedback, it's mainly with my supervisor unless it's for a specific piece of work. And it depends really, we don't at the moment have organised meetings but we would write up what we'd done, like a summary as a blog post. But if it's just wanting feedback on a specific thing, I won't write it up i'll just be showing him output from my code, or a file or some images and it's usually just the raw work. It can be usually quite useful but something it's a bit of a faff. Especially if they're just sending loads and loads of files with slightly different names and you can get a bit lost if they don't have the same file structure that you're working with. Having a shared dropbox for when we're collaborating is actually really useful.

Participant K: I have a lot of people I collaborate with. Generally we try to have meetings, where I just prepare a powerpoint presentation with stuff I've done or results or ideas or whatever, so we'll just do that. Either in person or over skype. I send a lot of samples away for people to do stuff with. If i do that I generally create a word file with all the characterisation method and what they're supposed to be doing with it. For feedback we have group meeting every week, we all present every week what we've done and then we discuss within the group, so there's a lot of feedback within the group itself from ourselves and our boss.

Participant L: Feedback from the group meeting, so taking note of what people are saying to you, what you should do next, what you should try. Collaboration, I have a french boss as well, I have to communicate with him, by email often or skype sometimes. I try and prepare a presentation and then send it to him a bit in advance and then he can give me feedback and I take notes. When I send my poster or presentation stuff to DSTL they just send me an email back with like: Slide 1 - changes, etc.

Participant M: We have group meetings every week and we present what we've done. I get a lot of feedback from that. We collaborate with some people from the hospital as well which helps with quite a few of our experiments, so if I have a problem I can always go and talk to them and they have good ideas. Generally for experiments day to day we always share information within the group and I can get a lot of feedback from these people here (points to group mates).

Focus Group Leader: Do you write things up to share them with people?

Participant M: Especially during the group meeting I'll have a notebook and I'll write down any ideas that other people suggest, of what I should try etc.

Participant K: We always have the powerpoint presentations so they'll always be written up weekly, or twice a fortnight.

Participant N: Basically, most of it is the same as the girls said. We share ideas and the work that we've done during those couple of weeks. We have feedback from inside the group. I have another supervisor in the hospital so usually I also share my data with im and see from his point of view, and get some feedback from his side as well. Sometimes I also share my data with people who are more used to techniques that I use so I can have some feedback from them as well. So if I'm tiptoeing my way to something I'm not sure about I'll try to get some feedback from someone more experienced. Most of it is just inside the group.

2.9 Question 9 - Do you use reference management software and if so what?

Participant G: For literature?

Focus Group Leader: Yes, so like Mendeley or EndNote etc.

Participant G: It's literally just bibTeX, it's just a file with all my references in bibTeX form, and thats it.

Participant I: Do you manually write it in?

Participant G: Yes I do, I don't even have the software to do it for me. It must be something like 5000 lines long. I just go on export citation and copy paste the text. Sometimes you'll find a paper from 1970 and it won't exist so you'll have to manually write it in.

Participant I: I was worried you did it all by hand.

Participant G: I did start that way.

Participant H: I'm exactly the same.

Focus Group Leader: Just a big bibTex file?

Participant H: Yup with everything exported from Google Scholar.

Participant I: I use Zotero and then export to BibTex.

Participant J: Mendeley and then export to BibTex.

Participant K: EndNote.

Participant L: EndNote.

Participant M: EndNote.

Participant N: EndNote.

2.10 Question 10 - Imagine that you are trying to locate a piece of work or some notes from 6 months ago, how would you locate these notes and the associated data?

Participant G: Well as I say, most of it's date stamped, as in the data is date stamped. If I knew it was from 15th July, I'd just try and find 15th July in my notebook. In terms of finding data, how it would work is probably, if I'd lost some work I'd probably go find and then type it into grep so it's all on unix. And then I'd try and find that name, and it would be as backwards as that. So I'd just do a massive search of everything, try and find a filename with roughly what I'm looking for, and once I've found that data, find when it was made, roughly and then look through my lab books and find the entry in my lab books for that date. It would work roughly like that and it's pretty awful but that's what I do.

Participant H: On my notes it's roughly a by section search, in terms of data the find command. It depends, if I knew roughly what it related to and what calculation it was, what system it was, then it's likely that it's in a reasonably sensible directory and hierarchy and then I can just traverse that and find what I'm looking for. If I really can't remember, if I can just think of something that might have been in the file name or something that might have been in the file then I can try and find that or a date stamp or something.

Participant I: If I know the topic then hopefully I'll have a folder hierarchy and then I can remember where that topic is. If not then I would have to resort to grepping around to try and find what it is. For notes it's indexed so I can search by the date.

Participant J: In terms of notes it would basically be, say if it was on the blog it would be date stamped in terms of when it was published and stuff like that. Or in my paper notebook it would involve flicking through until I found the right area. Usually everything's saved by the sort of topic it is, so I would work out what the topic was that I was working on and then the files would be in that hierarchy. Alternatively I could search. Obviously if I knew what project area it was in then I could just search within that project area for the files that had been created within a certain month / days.

Participant K: Anything that I've written down by hand will be dated so I'll pretty much know where is is by flicking through. Anything that is digital, I guess we have a lot of stuff as we have these fortnightly presentations, so If I need to find anything it's mostly in there so I can just flick through them but if it's specific file or something then I generally also date them so I can just look back when I did it.

Participant L: I date lab books or I just go through with the date. If I, I often go through the presentation we have because they date, so I know that all the [topics] from this week will be there so I go from there. For the files I have tem images or UV Vis spectrum, everything I have the date on the file, on the name of the file.

Participant M: My lab book is dated and my calculation book is dated and then all the files that I have on my laptop on the computer are also dated and I have sub folders with what it is so I can easily find it.

Participant N: Since my lab book is in a chronological order I would just go back to the post-it

part and flick my lab book into the notes that I had on there. Since it's dated I can go back to my computer and see the date and look for the date and just relate the data that I have there.

2.11 Question 11 - Imagine that there is a fire in your lab and all of your paper notebooks are destroyed. How much of your work would be lost and how could you go about recovering this work?

Participant G: I think that's quite difficult to quantify, how much I would lose. But I don't think it would be that bad because as I say most of my notebooks are just theory, and equations and things so if the lab burnt I think I would just lose a load of me working stuff out. Most of it's just in here (points to head) anyway. Apart from I dunno, It's difficult to quantify. In terms of recovery, I'd probably just print out all of the papers and try and spew it back onto the papers. But, I'd be really annoyed.

** Discussions about the fire in the Computer Science / Physics Building at UoS 10 years ago ***

Participant G: Yeah I don't think it would be that bad. It's all on the computer anyway, I've got the presentations and stuff. So if it's just the paper notebooks it wouldn't be too bad I think.

Participant H: I can't decide whether I'd be completely f*****d. Because, I think that my lab books are only really useful locally in time. So, the last 10 pages are great, but a year ago, I built this unit. I've already written it into a presentation or report. Maybe I couldn't write every word that's in my lab book again in another lab book, I couldn't. But I could write the rough thing. I just write a load of garbage.

Participant I: I have almost all of my notes electronically so it wouldn't be a big loss from a research point of view. My supervisor says that if you have a great idea you should put it in your lab notebook, your physical notebook for IP reasons so you can say I was the first person to come up with this great idea, so I guess if that was set fire to that would be bad. But I don't have any great ideas.

Participant J: Obviously all my actual data and stuff like that, in terms of stuff like that it's all electronic, and all on file systems and most of the stuff that's on paper is kind of my thoughts and stuff alongside of it. Obviously it would be a pain if it was lost but most of the stuff that I did a while ago has already been written up. I think new, if I needed to re-do anything then all the data is there and most of the stuff images and outputs from it are all electronic anyway. Although it depends what I want to write up, there might be when I come to write up that I have to go and re-do a bit of something, but other than that I wouldn't lose too much actual work.

Participant K: I think it would be annoying because especially if I make notes in my lab book about things that I want to do like ideas or whatever. Regarding my actual work because we have these meetings all the time, literally everything is already there and all my data have graphs or whatever are already stored in the file store anyway. I don't think it would be disastrous just annoying.

Participant L: It would be annoying because your lab book is your old protocol with the exact amount you need to put in each reaction, and sometimes you want to follow a protocol that's in the literature but you observed that you didn't do it properly so something changed in the protocol but

it worked in the end so you want to keep that. If your lab book disappeared it would be annoying I guess. But in terms of that everything is saved and it's in presentation so it should be fine, it would be more for the protocol part that would be annoying.

Participant M: All my data is saved on my computer, my laptop, so that wouldn't be a problem. Most of my results because we have these meetings all the time so most of my results are in powerpoint so that's fine, it would just be annoying for protocols. I actually do most of it so often that I kind of do it off by heart anyway, so it wouldn't be that annoying.

Participant N: Basically since most of the paper part is protocols I would say it would be really annoying, but it will be more about trying to again remember how we optimised the protocol and everything but since all the rest is already in the digital form it would just be, just a setback. Not really the end of the world.

2.12 Question 12 - If you fell under a bus tomorrow, you don't die, you're just indisposed for a while. How would your supervisor access your work?

Focus Group Leader: Consider not only how would your supervisor access your work, but how would other members of your group or other people you work with access your work as well.

Participant G: If I'm honest I don't think he would, I think he'd just accept it. If he wanted to access my work, I have to put loads of my work on his computer anyway if I'm doing a collaboration. So hypothetically he'd go through that and develop whatever we're doing, hypothetically.

Participant H: When Steve went skydiving he was concerned he was going to die, Chris our supervisor got him to back up everything. I think he'd struggle to be honest, I hadn't thought about it before.

Focus Group Leader: Is there anyone else he could ask that he'd be able to ask? As in my last focus group they all said that my supervisor wouldn't be able to touch my work, and I said well a bunch of you work together if you can access each other's work is there anyone your supervisor could ask in your lab to access your work.

Participant H: He'd have access to it all because he's quite careful about getting us to put everything that we've done on his file system. The calculations I think he wouldn't have a problem with because he already forces an organisation structure on us.

Participant G: Can he access ssh.soton?

Participant H: Yeah.

Participant G: In that case he'd have no problem.

Participant G: What I'm thinking is the code that we've written that we haven't finished yet.

Participant H: He'd have no chance. It's the software we've written that is really the problem. The comments in it at the moment are for our benefit and they're not really, I don't think they're that

useful to anyone else. Once we commit it and it goes into the version control system it'll have proper comments and useful statements but as it stands it would be a nightmare for anyone to dismantle.

Participant I: It's not something I've ever really talked about with my supervisors. They'd probably, I mean everything I've got is passworded but if they could get through the passwords then they could sort of try and infer where things are by the logic of my file system. But really they'd struggle to find anything I've done but it's not organised for them to find, it's organised for me to find and I haven't told them how to find things.

Participant J: In terms of anything that was up, I think my dropbox might already be shared with my supervisor. But anything on the group folder they'd be able to find and usually it would be mostly searchable. I think potentially they'd be able to get into anything on my laptop because I think there's a clause about your supervisor being able to have access if you're basically indisposed. Most of the file structures would be logical and obviously anything thats been written up has been written up. In terms of moving forwards they'd probably be able to carry on as most of it's based on raw data and so most of it's there. I mean obviously I'm not sure they would because it's not more of his research. But if he wanted to I think he'd be able to find at least most of the stuff in there.

Participant K: We're quite pedantic with stuff that we have to put in the shared folder, so literally everything needs to be there in the created folders for everything. If you wanted to you could find everything and because we're quite a close group and some of us work on some other projects, so that would be fine. We'd all kind of be able to access it and get it. I don't think he could do much with it, but it would all be there.

Participant L: He can have access to everything if I update it correctly...every 6 months. Even for the lab books they are just in our desks and the other notes that would be fine he can access those.

Participant M: Same, I have everything in our file store and everything is in subsections so yeah.

Participant N: Basically it's the same. Since we, as Participant K said we're a close group, even if something isn't uploaded we can always ask someone else to do it for us, it should be straightforward.

Focus Group Leader: On a similar vein, some of you mentioned that you have industry sponsors, so if in the same scenario how would your industry sponsors be able to access your work, would they? Is that protocol set up?

Participant G: There's no protocol whatsoever, it would be whatever my supervisor can get they can get I guess. I think hopefully that won't happen, but if it did I think it would be pretty much my supervisor and my sponsors would just get the same information pretty much. There's no protocol set up I don't think. There is no known access or shared drive with my sponsors or anything in place.

Participant H: All my sponsors have at the moment is all the presentations I've sent in, all the posters they asked to have checked / signed off, and one shared Google Doc. That's absolutely everything, so if they wanted anything else they'd have to ask the supervisor whether they could have it. I think they could get access to it, and they certainly wouldn't want access to the code as I don't think they would care about that or be affected by the issue.

Participant I: I don't have an industrial sponsor.

Participant J: Neither do I.

Participant K: No.

Participant L: They will access through my supervisor, but I'm not even sure they would ask. They just want to see the big lines and the big questions.

Participant M: No.

Participant N: No.

2.13 Question 13 - Where are all of your notes backed up, electronic and paper?

Participant G: Paper notes aren't backed up at all, and if there was a fire there's no backup. I don't think there's any backup. Electronic, it's all pretty much backed up on ssh.soton and also my home drive's I think they automatically back those up, and on Erodis if you can count that as a backup I guess. And also a computer in my supervisor's room for him to look at. That's 4 backups, so should be okay.

Participant H: Papers not backed up. I think all my notes, anything that's typed up like a report or something is all in my home directory and I think that's backed up, it is right?

Participant G: Yes.

Participant H: Pretty sure it is. Calculations are pretty much backed up.

Participant I: I don't backup paper things. I keep my notes in this KeepNote thing which is backed up on dropbox and in my home drive.

Participant J: My paper notes aren't really backed up unless it's something that I've written down on paper and then expanded typing it up later. And then, electronic stuff, either dropbox is backed up and then the group folder will be backed up by iSolutions. There are a few files that are probably on my actual hard drive which wouldn't be backed up. Most of the time that's something when I've needed to save it in a specific location because the program will only save it in a specific place and then I'll move it afterwards. So most of them are probably backed up somewhere except for some of the papers then.

Focus Group Leader: Do you guys (**Participant I**, **Participant G**, **Participant H**) version control your code?

Participant I, **Participant G** and **Participant H:** Yes.

Focus Group Leader: Using?

Participant I, **Participant G** and **Participant H:** Git.

Focus Group Leader: Do you have private or public repositories, do you pay for a private repository?

Participant G: It's local right?

Focus Group Leader: So there's an interface to git?

Participant G: There's a guy called Participant G's Colleague who's the commit master, so we just sort of give it the code and he'll commit it to the central repository. There's an external thing.

Focus Group Leader: is that private too then?

Participant G: It's private to the office, but there's another one on top of that, there's like layers.

Participant H: In the central repository they use SVN.

Participant G: They've got a different thing. **Participant H:** That's why Participant G's Colleague is the commit master as he has to do the mangling to get it to commit properly.

Participant K: Paper notes, probably not really backed up unless I put it in one of our weekly presentations as I had this idea or this was my plan or whatever. Everything else is on the shared filestore which is backed up or dropbox which is backed up .

Participant L: Paper no backup, all the stuff like I said is on my laptop, my desktop, the shared folder, ny hard drive.

Participant M: All my paper notes aren't backed up. Everything else is on my laptop, the shared folder and dropbox.

Participant N: The paper notes aren't backed up. The electronic are both on my computer and on the file store drives and on dropbox and also hard drive.

2.14 Question 14 - Have you guys used an Electronic Lab Notebook before?

Focus Group Leader: If so what did you like and didn't like, and if you did use one and you stopped using one why did you stop.

Participant G: I've never used one.

Participant H: We got a new guy in our group who takes more notes than anyone in the world and he uses one. So at that moment I felt a bit embarrassed and thought I should try. I tried it once.

Focus Group Leader: Which one did you try?

Participant H: Wiki, LocalWiki?

Participant G: i've seen him using it, it looks pretty good actually.

Participant H: It's a wiki page, but it's a little program and you run it locally, it's something wiki,

and it takes forever. You have to use the keyboard. It just takes ages.

Participant G: I thought he used it just as much to sort of condense his work.

Participant H: He writes everything in it.

Focus Group Leader: There is a thing called LocalWiki, collaborative project that aims to collect and open the words knowledge, could that be it?

Participant H: Could be.

Participant I: When I did a year in industry in a pharmaceutical company, they had a mandatory ELN and it was a horrifying experience.

Focus Group Leader: What was it called?

Participant I: It was a homebrew version of an old ELN package. I've forgotten the name but it probably isn't commercially available. The main problem with is was they had this policy where you had to have everything in paper form at the same time as everyone having to use the ELN. So you had to write everything, print it out, and then if you wanted to change anything then on an electronic one normally you'd log it as redacting it, but with this you had to print it out and write in capital letters all over everything you'd printed out and sign it in triplicate and be supervised that you wanted to change one word on one page and you had to glue it in with all the lines through it. It was a real nightmare, but the problem was simply that you had to print it out, if you didn't have to print it out it would have been fine.

Participant J: I have used a few ELN style systems before. On my placement I worked with a system called BioBook from IDBS. Since then I have used blog based notebooks, such as the LabTrove system developed at Southampton and Blog3 developed also at Southampton. On my placement the ELN (BioBook) was good as it was a highly regulated environment and all of the work was template and the ELN was useful for completing the work more easily (once you had learnt the template). However in a less structured experiment this isn't really suitable. I like the fact that it is typing and so it can be quicker to carry out, you can copy and paste things to form reports/summaries and presentations more easily. What I often find though is that the 'ELN' systems I have used do not have enough useful functionality to do the things I need it to. One thing I often found an issue was putting images in my notes. It required the image to be a file on my computer which was then uploaded, and then linked into the note. Such a time consuming process wasn't particularly good. I switched from Labtrove to Blog3 as the tagging and classification for the posts was better with Blog3 giving me a bit more flexibility. However I have found that Blog3 is good for certain things, such as exporting text from various sources, but anything related to do with images/file uploads gives issues and doesn't always work. I have actually recently reverted back to using paper to record things as at least then I know that is saved properly. I would like to find another software to use but currently I don't know what I would use.

Participant K: No.

Participant M: I've never used one before.

Participant L: No.

Participant N: No.

2.15 Question 15 - What would you expect that an ELN would be able to do for you?

Participant G: I think it would help me organise myself because it's a bit of a mess right now. I think it would be, it would be useful to be able to say where things are. To have a central place where I know where things are on my computer because that's quite a big problem not knowing where things are, and on what computer as well. Because currently it's just basically from memory. I think that's the main thing really. Knowing what I did on certain days as well.

Participant H: I think it would be good, not to have to re-write things. I think if you had everything in that system and then you wanted to just polish it and publish it it might be quite good for that. I think, I don't really know.

Participant G: I don't know, it's difficult to say really.

Participant I: It would be indexable, it would allow you to link between different articles and be backed up automatically. Be easy to use, ideally using an interface that everyone is familiar with like Microsoft Word.

Participant J: The main thing I would expect an ELN to do is record notes and data without too much extra legwork being required. Ideally it would allow you to insert links to files/images (or store the file within the system) without significant effort, and also store metadata with the files/ image. It would allow you to classify notes with tagging and sections to allow you to search through data/posts easily. Ideally it would also work with a reference manager to allow to insert citations/references in a manner that doesn't require you to re find the reference when you want to use it elsewhere. It should also allow you to link to other posts/data within the ELN. It would also be able to take code/output from code and store that with associated metadata. An ELN which could also have 'recipes' written for known protocols/procedures would also be very useful as they could be used for a template and reduce down the amount of typing etc that needed to be done each time the 'experiment' was run.

Participant K: I'm not sure really. It may be a safer way of keeping notes if it is backed-up regularly.

Participant L: Maybe to be able to find, have like a search bar or something like that. You type it and it puts you directly to the thing. I quite like writing things.

2.16 Question 16 - How could an ELN make recording your work better?

Participant G: I guess it's hard to foresee in that I'd know where things are. It would structure things better I think. I don't know, can you attach things to it? If you've got files..

Focus Group Leader: You can with some, there are so many different ones.

Participant G: If you could do that it would be quite useful. But at the same time it could make things a bit more complicated so I don't really know, it's difficult to say.

Participant H: It would make me slower right?

Participant G: Yeah that's the thing.

Participant H: But then that may be an advantage. because you could view slower as more methodical.

Participant G: Yeah, I spend quite a lot of time trying to find things, so that time would be spent trying to organise.

Participant H: You'd have to do that wouldn't you.

Participant G: Yeah I guess you would, you'd know what you'd written about then wouldn't you.

Participant I: My feeling on it is that, a very formal ELN doesn't let you change things in the past, because it would be dodgy to change something in the past. But in real life if you've made a spelling mistake in something or you realise that there's something you've done originally it's nice to be able to change things without having to go through a formal process. It if was an easy to use ELN where you can modify things in the past then it would be very useful and a nice way of organising it. But with that I think it's so much hassle that it's not worth the effort.

Participant J: If everything was recorded on an ELN that actually worked well for me then I would not have to spend lots of extra time forcing myself to record data, instead it would work with me to give better note taking and this should reflect in making it easier to see results, or ideas that I wanted to work on. As well it would also make producing publications easier by giving easier access to data for collation and publication.

Participant K: I'm not sure it would necessarily make recording my work better...I mean... okay, I guess in the end it could save time. Let's say you have a protocol and all, already typed up whilst in the lab.Then writing a paper or just sending the protocol to a collaborator etc. will be a lot easier.

Participant L: Maybe it would be better if you have sections. That you need to absolutely type this, like reagent, quantity and everything to make sure that you don't forget everything.

Participant M: I think i'd probably be a bit more organised if I tried to use this. But I don't think I could be bothered, typing everything out, so much effort.

Participant N: I think it would be, as it was said before, if there was an attachment or something. If we could have pictures or some data already attached to it it would be everything in one place. Also it would facilitate backup of some of the written notes. At the same time I do agree, we can already do. I can already easily find my stuff on the written notes so I don't know if I would be bothered to actually write it in.

2.17 Question 17 - What equipment are you guys allowed to take into your lab?

Focus Group Leader: So, computer, tablets, phones, notebooks, pens, papers, obviously the physicists had clean room restrictions, I don't know if you guys have restrictions and what you are and aren't allowed to take into the lab.

Participant G: We've got no restrictions, we can take pretty much anything in. Our labs a computer place. We can take food in and anything, I don't think they're bothered. No One really checks. I don't know if it's like we're not allowed and we're just not checked. Equipment, no restrictions really.

Participant H: Has to be pat tested.

Participant G: That's true. We had someone come round and said we can't use the copy machine or anything.

Participant I: Computer lab, no restriction.

Participant J: My 'lab' is computer based in an office, as such I am allowed most electronic equipment in there.

Participant K: I'm not sure really? Cameras, phones... I guess laptops would also be okay, but to be honest, I'd rather not take a personal laptop into the lab.

Participant L: No restriction really. Make sure when you take your phone or everything you don't put reagent on it, you don't touch it with your gloves. But not really restriction.

Participant M: We never really have any restrictions, but we can't take food in or water or anything like that. But we can take everything else in.

Participant N: It depends on the lab, the chemistry one doesn't have but some of the biological ones we have to be careful about bringing anything in that is from the outside to avoid any contamination sources. Even if we bring something outside we need to make sure that we decontaminate and put some ethanol on it and kill any bacteria. Apart from that, the restrictions with experience would be more the biological side, and as long as I go through the process of verifying that nothing is hazardous or anything then the equipment should just be normally ethanol cleaned.

2.18 Question 18 - Does anyone have any other comments on ELN's or note taking in the lab or anything?

Participant J: ELNs haven't really taken off in most research areas (to my knowledge) because they don't really integrate into the scientist's workflow in a way that makes them feel like it is making their life easier, so people then revert back to the methods they are used to. Unless the ELNs are either enforced (as they are in some industry environments) or intuitive to learn/use then I think people won't readily adopt them as they are more burdensome than the

Participant K: I think ELNs may be a good idea, but only if there is a dedicated laptop, which

never leaves the lab, for everyone and if everything on it is backed-up very regularly. Personally I don't think I'd want to move away from hand-written notes though.

Participant L: Sometimes with my notes I realise that I am 2 months late and I take half a day to do it, so it takes quite a lot of time to make it properly.

Participant I: I think as PhD students we should have the liberty to choose how we take our notes, which is quite different to industrial positions where they're very worried about certain Intellectual Property things.

Participant H: It should just listen to what you say and make the notes seamlessly.

Focus Group Leader: Almost like dictating?

Participant H: Yeah, that would be great. Say I want this, I'm going to do this. Have a conversation and end up with a whole load of notes.

3 Biology Focus Group

This focus group was conduced on 8/12/2015 and comprised of 4 chemists (Participants O-R). The following colour key is used for the Participants and **Focus Group Leader:**

Focus Group Leader	
Participant O	
Participant P	
Participant Q	
Participant R	
Group	

3.1 Question 1 - What methods do you use to record your notes?

Participant O: Lab book.

Participant P: Lab book.

Participant Q: Lab book.

Participant R: Lab book.

3.2 Question 2 - For each of these different types of work, what pieces of information do you currently record and how do you record it?

3.2.1 Question 2a - Doing an Experiment in the Lab?

Participant O: Notes, tables, and then for writing up I tend to use pictures photos and graphs.

Participant P: For me everything goes in my lab book straight away because I do very computational stuff so I need to write down anything I do while I do it.

Participant Q: I put all of my notes in my lab book, once I've analysed all of my data all the graphs and pictures go in there so I know what's what.

Participant R: Mine's very much the same. Lab book, and then graphs go in afterwards and I also take photos on my phone of certain experiments so I remember what they look like.

3.2.2 Question 2b - Doing an Experiment outside the Lab?

Participant P: For me outside the lab I do behaviour at the hospital, I record everything and then I bring it back and analyse the results up until the graphs and stuff and put it in my lab book after. But I don't make any notes.

Focus Group Leader: When you say record, is that audio recording or machine based?

Participant P: It's, I've got a maze and stuff and I have a camera which I just record everything, so

I take no notes. I know what I'm going to put in because I plan it beforehand, like this mouse goes in on this day, do it and I take the mouse results back to the building.

Participant O: I don't do anything outside the lab.

Participant Q: I don't either.

Participant R: No.

3.2.3 Question 2c - When you're looking at your literature?

Participant O: Just use Word Documents, so if I'm looking at literature if I want to make anything I just write it down in the word document, it's usually focused on the subject.

Participant P: I would prefer writing it by hand, so I've got a notebook so I'd make notes and I have different sections for different things and I'll put stuff in there. Print lots of papers, and make notes.

Participant Q: Most of my notes are all on EndNote and if there's a paper I can't read on a computer screen, I'll print it out, make notes on it and type it up in Word.

Participant R: I don't like reading off the screen, so I tend to print it out straight away and use a highlighter and make notes around the paper and then I'll type it up neatly.

3.2.4 Question 2d - When you're thinking about your work?

Participant O: I don't think so....

Participant Q: I have to write everything down otherwise I'll forget it and then I remember my half great idea a few weeks later and can't remember what the idea was so I have to write everything down.

Participant R: Mine's always in a notebook. Different to my lab book, or it can be on the back of a paper which makes it very hard to find afterwards.

3.2.5 Question 2e - When you're performing calculations for your research?

Participant O: I will usually do them in something like excel and once I've worked out what I'm doing put that into my lab book by hand.

Participant P: That doesn't really apply to me.

Participant Q: The only calculations I really do would be concentrations and things and then stats afterwards. That's in my lab book and then Graph Pad.

Participant P: Yeah, the stats would be Graph Pad.

Participant R: So, the engineering side of things, that's always done in Excel because if you did it on a calculator you'd be absolutely s*****d. The histamine calculations and dred concentrations, are either done within Excel using the data and then into my lab book. Or it's done by hand for the concentrations on the assay sheets on the day.

3.2.6 Question 2f - When you're writing up your work?

Focus Group Leader: So papers, reports, neat notes etc.

Participant P: What do you mean write up? In terms of your experiment?

Focus Group Leader: Any form of write up. If you do any form of transformations on what you've initially wrote I guess. If you have lab notes in your lab notebook do you ever take what you've written in the lab and write it up neatly. What about when you're writing up your reports or your paper or maybe you're writing things into a different form for a supervisor meeting or presentation or something.

Participant P: Sometimes we have to present what we did, so whilst it's usually results that would go into a presentation. Or I make thicker notes now because I'm trying to write for a manuscript, I sort of put them together as a thicker form as a start of writing up the results section.

Participant O: I've written stuff up in results for reports, but I tend to just take stuff from the lab book and just neatify it and move it around a bit.

Participant Q: I pretty much do the same, any neat results will go into a word document. I also make figures and presentations to present at lab meetings and then they get tidied up and used later on in reports.

Participant R: All my image and any graphs I make in Excel with the raw data, that usually goes straight into a powerpoint so I've got the date and collection of everything together rather than scanning through all the notes. And then i can use them immediately for figure headings and figures and things in my reports.

3.3 Question 3 - When you're taking notes how do you organise them?

Focus Group Leader: Do you section them, do you create indexes, do you organise them at all?

Participant O: Notes on experiments usually if you're doing an experiment it's quite structure in itself what you're doing. If I'm taking notes on say literature it'll start as an absolute mess and then slowly be organised. But the initial, word's quite good. If it's that should be there and that's over here you can move things around. That is my indexing system.

Participant P: Mine's a little easier. Because it's computational I have everything per day on an excel sheet of what mouse I did on what day. In my lab book I can, because it's dated I can find it easily. If I do a different experiment this is what I mostly do, If I do a different experiment then I tend to put a sticky note, some kind of post it note so I know that this section is something else so it's easy for me to find when I flick through it all. And I also have an index at the front which says this page is this.

Participant Q: I don't really have an organisation system yet. All of my experiments are organised by date and their results files and images are all linked by date to pages in my lab book. But apart

from that I need some more structure in my life that I don't have.

Participant R: I've got a contents section in the front of my lab book which is a lot more helpful because no one else in my office does that so it's easier to look back. Equally all experiments data wise are saved with the date and I have separate folders for which experiments done. So there's a whole folder associated with each block, and that will be all the presentations, all the excel, all the data from those experiments with the dated headings. That's as far as it goes. I've just realised I've got 2 folders with lit review on. Because I'm redoing my lit review, so there's the old one and the 2016 version in the hope that I'll finish it next year.

3.4 Question 4 - Do you use any technology to aid with your note recording?

Focus Group Leader: So that doesn't just have to be the standard laptop, it could be taking notes with your phone or tablet or taking pictures with your phone or a camera, or audio equipment, recording equipment. anything technology wise.

Participant R: Pictures with my phone is really vital, it's really helpful actually. Other than that the good old EndNote is my hero.

Participant Q: I don't so much take images on my phone because I'd lose them. I put everything on my computer that I have, I have to do lists on paper and the same to do lists on the computer. File organisations and things are all on there. I guess that's kind of the extend of it. I record meetings on my phone which isn't really data taking but it's helpful because I don't forget what's been said. That's about it.

Participant P: Some experiments I do record with the camera, but sometimes if I don't have my lab book on me to make notes I write on blue roll and take a picture of it.

Participant O: I don't think I use anything outside the ordinary computer at my desk.

3.5 Question 5 - If at all, how do you link any digital resources or notes to your paper based notes?

Participant Q: Everything's dated. The same date on paper and in folders on the computer.

Participant P: Similar.

Participant R: I also reference presentations to all the data so if there's a picture associated with an experiment it'll go back into that folder.

Participant O: Dates.

3.6 Question 6 - Where is your data or research output stored?

Participant P: For me it's on the laptop that was given to me by the University, so everythings in there. We have a dropbox folder which we share with the whole lab group. I've got separate ones which means that my supervisors shares and then the rest are lab shares. So we have everything in dropbox just so that means I have backp. Which means I can work from home and things like that.

Participant Q: Mines on my computer and on a separate hard drive and on the BIU server. The Biological Imaging Unit at the hospital has a massive server and they've said we can put whatever we want on it so I've put everything on it and that's backed up elsewhere as well.

Participant R: I've got a terabyte hard drive which the University have nicely brought me, and a laptop and dropbox as well, because everything disappears way too easily on laptops.

Participant O: The J drive we have that's backed up, we can access from anywhere in the University.

Participant P: It's hard to access it with a MacBook. That was the issue for me.

Participant R: Some of it's could be associated with the VPN and you can link it because I'm part of the Immuno Parmacology group, otherwise you can't open it full stop It's a bit of an odd one, if you're not in the VPN you can't access it.

3.7 Question 7 - Are you guys concerned about Intellectual Property?

Focus Group Leader: There are 4 sub points so if you can consider them in your answer. Are any of you concerned about Intellectual Property?

Participant R: Not as much as I should be, the reason why I say that is because I have a first year student, and by first year student i mean first year PhD student who I kind of look after and a lot of the things he does usually it's going to involve me. So i will have to leave my lab book in the office because he will be looking over my notes and he will equally be having access to all of my data in order to help his research and vice versa. In one way it's a collaboration so IP doesn't really come into it. But for the engineering side of things I can only say so much because the device that I'm making, if someone makes it before me then that's my PhD s*****d.

Focus Group Leader: So there are bits of your data and notes that you want to keep secure then?

Participant R: Yeah, there are some bits, but that bit I'm not working on at the moment so it doesn't exist.

Focus Group Leader: And presumably you won't share that outside the supervisor.

Participant R: No, It's one of those things you don't do it outside, you won't even do poster presentations on.

Focus Group Leader: And in general terms does your data need to be kept for any specific period of time or require any 3rd party sign off,

Participant R: No I'm not funded by industry I'm just part of the University so very basic funding.

Participant O: I thought you had to keep your PhD lab books for a certain amount of time.

Participant P: It's 10 years apparently.

Focus Group Leader: Same questions for everyone else.

Participant P: Because I work with animals and I record videos I've got it secure. but we're not allowed to obviously let anyone else see it so, even with the camera and stuff we had to let the animal unit know that we're just keeping it for research purposes and not distributing it anywhere, so I should really keep it locked away when I'm not using it. I back it all up on a hard drive and I should keep that hard drive locked away so that no one else can access it.

Participant R: My supervisor has every one of his previous PhD students lab books in his office for reference at all times, same with thesis's, I've taken one home and I've got lab books to go back, as some of the experiments we've been doing haven't been working or been done for the past 15 years in that lab. Yay optimisation.

Participant O: I've got what I think is a pretty clever system called the messy lab book. Most of the notes were kind of from people who were trying to learn how to do something ridiculous. So I chat to them or the people in the benches around me about what I'm doing the rest of the time. There's some stuff I probably wouldn't tell them openly about and I guess I definitely wouldn't speak to people outside that group of the University. I'm definitely not particularly careful with my lab book and I've been told off by my supervisors before for leaving it on my desk.

Focus Group Leader: Do you need to keep any of your data for a particular period of time or require any 3rd party sign off?

Participant P: Well that's entirely up to my supervisors. Because my supervisor makes me backup my lab book by photocopying all the pages so that she has a record of that just in case I lose my lab book. She's very paranoid. Just in case I lose my lab book there's a copy somewhere.

Participant Q: I don't know how careful I should be with my research. I do animal work as well, so that side of stuff, that side of things is very much kept quiet. Outside of uni. But in terms of my data or databases, my entire research group knows what I'm doing, my supervisor knows everything I'm doing. I probably wouldn't talk to anybody outside of that about details because I think Diego would get a bit funny about it which is fair enough. But, I don't really know the extent I should be super careful with my stuff at this moment in time. Maybe in the next few years it'll be...

Participant P: Another thing is my supervisor doesn't like us presenting our data, prematurely. She wants it, as long as you've got a story and you're nearly ready to publish then you can present it to people outside. She's a bit paranoid about people stealing.

Participant Q: I've presented posters on my previous work in the group before and the first thing they said was be careful who'll be asking you questions, don't let anyone take pictures of this.

Participant P: I went to the NDPD conference in Niece, and it sucked because I had to stand next

to my poster stopping people from taking pictures the whole time, even during talks that I wanted to go to. I couldn't go because there were people who would sneak out and start taking pictures of everyone's poster.

3.8 Question 8 - Who do you guys collaborate with and share your work with?

Participant Q: My lab group at the moment, we collaborate with another lab in Hamburg, which I will be going out to at some point this year. So at that point in time I'll probably be sharing some of what I do with them. But now it's just within the group. No one else is really interested.

Participant R: I'm part of 4 different....I've got 4 different supervisors. There were 5 but one got removed. There's 4 different groups that I've got to collaborate with, and what makes them worse is we've got bioengineering, medicine, bio-hybrid devices, and the clinical pharmacology. When I presented at the Engineering conference, the postgrad conference, everyone had to present your current work. So that was then presenting to the whole of Engineering within Engineering at Southampton. We then had two different heads of different departments within Engineering and now there's another collaboration going on with me and now them and their PhD students, so that's even a bigger base to present to and collaborate with. So it's kind of that list of supervisors probably will increase again.

Participant P: I'm doing some things outside of my supervisors expertise. She's managed to get people who are good at it. Participant Q's supervisor helps me with immunising and then there's another person for BioChemistry. I've got collaborations in that sense. Also I've got an unofficial supervisor in another University who helps me with all the behaviour side of my project. Do I share my work with these guys? I vaguely did in my author list when I did publish.

Participant O: Basically just people who just as Participant P was saying, if you had something that you wanted to do and my supervisor isn't that sure how to do it or there's something that you want to use we end up speaking to someone else who maybe knows how to do NMR or who has unlimited money who can buy the things that we need to buy. We'll collaborate with people on that note basis, if we need someone else. It's more like mutual benefit.

Participant R: I don't know about collaboration but we also found because there were so many elements with my project, we've ended up writing to people who are very well known names on the papers that I read. There's a guy called Evo who's literally heard of everything to do with facts from basophils, so we ended up writing for this lab and then in exchange for my protocol then they'll analyse it and send me back their protocol in exchange to try and help me out, which actually works quite well. There's another group in Italy that I do the same with that was part of a mentoring scheme.

Focus Group Leader: Do any of you guys write up your notes or change the format of your notes before you share them with people?

Participant P: Yes.

Participant Q: Yes, because I feel like my format is illogical to everyone but me, so everything has to get written up in a legible way and I guess presenting data obviously you present your data in it's

final format to other people, as you'd want to show them the final graph elsewhere. I have to because people don't understand.

Participant O: Yeah.

Participant R: There's also a generic way that you're meant to write your lab notes, when you're writing up writing up, you'll say you used a substance at a certain concentration but you'd never say the specifics. So when sharing you tend to do that and if their really really interested they can ask you.

Participant O: Anything I've sent to other people to collaborate I've basically written up in a mini report, the methods and all that jazz.

Participant P: Similar for me, it's mostly figures and things that I put together and send it over, and if they have any queries in particular they'll email back and I'll do all the analysis that they want, but I wouldn't sent it just like that, I wouldn't send the raw data. I would analyse and get things.

Focus Group Leader: Do you guys find sharing your data useful.

Participant Q: Yes at the moment because I'm still not entirely sure what I'm doing, so it's great for me to able to say this is what I've found, how does this relate to my wider project. It's useful to discuss things with other people in the lab, particularly now we've got 3 postdocs who have all started in the lab who have different ideas, so it's nice to to get different people's point of view. More often than not they suggest things I hadn't even considered thinking of. So it's useful.

Participant R: Yeah. Definitely agree, talking to people about it always does help. But I'm finding going outside of the lab is sometimes a lot easier than staying inside, because at the hospital for basophils literally it's just me and the technicians nobody else, maybe my supervisor but it tends to be a lot of umming and arring and have you looked at the papers. Talking to people helps, and equally looking at thesis.

Focus Group Leader: You said Basophils...can you clarify?

Participant R: Basophils: 0.2% of your white blood cells ,the ones that contain your histamines. They're responsible for your allergic reactions. No one really specialises in them that much in research because there's two different types of cells that have histamine, your mast cells and your basophils. Mast cells are in your skin and they're the ones that everyone specialises in. in conferences there's maybe 2 talks on basophils and the whole rest of the conference is mast cells.

3.9 Question 9 - Do you use reference management software and if so what?

Participant O: EndNote.

Participant P: I use papers only because my supervisor recommended it but then she decided to move to something else, I bought it so I have to use it, it's easy to use so that's fine.

Participant Q: I use EndNote and I used to use Mendeley, they're both about the same.

Participant R: Yeah the same, I've got Mendeley from when I first started my PhD but now I use EndNote.

Participant O: Friends use a reference manager attached to word.

Group: General disgust.

Participant O: Most people I know use EndNote, they gave us some training on it at the beginning.

Participant P: Yeah.

Participant Q: And the University will give it to you for free.

Participant P: Although I don't find that that much use, I went to it but it was very simple.

Participant R: Yeah it doesn't work on mac's either the way they showed us.

Participant P: Yeah.

Participant R: So I wrote to the library and they gave me a one to one tutorial and that was really useful.

Participant P: I used to do EndNote for my masters but then my supervisor was like use papers it's so much nicer. The good thing about papers is you can actually download the paper onto there so you have your paper which you can easily access.

Participant O: You can do that on Mendeley.

Participant P: Yeah but it's much prettier. Its sort of set out really nicely, now Im used to papers but she moved to Mendele so its really annoying now.

Participant R: There's NVIVO as well, sounds really strange but it is a software. I don't recommend it, it's really not user friendly. And as soon as you download it from the University site it immediately makes you do an upgrade and tries to charge you 300 dollars.

3.10 Question 10 - Imagine that you are trying to locate a piece of work or some notes from 6 months ago, how would you locate these notes and the associated data?

Focus Group Leader: Or this can be less if you've started your PhD more recently than that. How would you go about doing that?

Participant O: Start in my lab book.

Participant P / **Participant R:** Yeah.

Participant O: And use the date to find the results files. And then my lab book would hopefully tell me exactly what I did as well so I can repeat it if required, tell someone else how to do it. If i'd filled in the contents page of my lab book it would be even easier as I could just start there and find where it is. At the moment it is kind of flicking through until I've found it.

Participant P: I normally base it on dates, or if it's an entirely different experiment I have a contents page that tells me when I did what. If it's the protocol I'll have it on a separate page which has been indexed.

Participant Q: Mine would be my dates, well it is by dates in my 2 months of PhDness. I mean even when I was doing my masters everything was in my lab book so I'd go back to the date, flick through it until I've found what I was looking for. Which probably isn't a good system, but 3 years of PhD...I'll work on that.

Participant R: Contents page.

Participant Q: I don't have enough for a contents page.

Participant P: I sort of know when I did it, but that's more for if someone else wants to find it.

Participant R: Mines Faculty of Medicine, when you get your lab book from them. Because we all get given the blue standard lab book, but Faculty of Medicine have the red ones with a contents page, which is the whole reason I did a contents, otherwise I wouldn't have done them.

Focus Group Leader: Ours had contents pages (log books), as I indexed all of my notes in my first year.

Participant P: Ours didn't. I just used the first page and put contents.

Focus Group Leader: We got log books as maybe that's slightly different for ECS, and my first year one has a contents page.

Participant P: That would have been more organised. Each time I get a new one I write page numbers on each page, and it's really annoying.

Participant R: Ours also has squares for the boxes that you put into, so if you want to you can be really articulate, one letter per box.

Focus Group Leader: That would be beautiful.

Participant R: I think depending on the lab book you're given probably, implies or implicates how organised you're going to be. MY engineering one is scruffy as hell because that's the standard blue one and it was the same for my dissertation but the medical one is really pristine and I will sometimes write up lab notes in a book and then write them up neat into the lab book because it has to be perfect because it's all signed off anyway.

Participant O: It used to be neater in my lab book when I was checked, whereas now....

Participant R: You say that, mine hasn't actually been checked yet.

Participant P: They will before your transfer.

Participant R: No one checked it at 9 months.

Participant P: They get it out, flick through, good enough. I think they probably go, is it legible? Yes.

3.11 Question 11 - Imagine that there is a fire in your lab and all of your paper notebooks are destroyed. How much of your work would be lost and how could you go about recovering this work?

Participant P: Definitely yes. Everything has been photocopied.

Focus Group Leader: What if the photocopies were burnt?

Participant P: They've been scanned into dropbox. They've been scanned so that she has a copy and she makes me put it into dropbox.

Participant R: You're making me want to go near a photocopier.

Participant P: It takes ages....the thing is tho she comes round every 3 months saying have you done it. For me, I don't really need my lab books, everything is done electronically. My lab books just sort of an at the time list of things. It's just so that at the time I'm doing my experiment I'll write ok, this this this. As soon as I've finished, at the end of the day I go and put it all into the computer and I have an electronic copy. So i never really use my lab book again unless it's to record the next day's stuff.

Participant Q: All of my experimental detail would be lost and that would be very sad. Well for 2 months it wouldn't be that sad I could probably recover. Everyting is also saved on my computer, all the data is on my computer and I mean would lose my lab book but all the important stuff is electronic. If my computer and my hard drive also burnt in the fire that would be unfortunate too but if it was just my lab book that disappeared i'd probably be ok at this point in time.

Participant R: If my lab book disappeared it wouldn't be the worst thing in the universe, but having said that I now feel the need for the printer and the photocopier. But that was because I did a lot of optimisation at the beginning so the protocols I've now got typed up neatly that work, they didn't originally so I'd lose all of the ones that didn't work, which isn't a bad thing but then I can't really prove that I improved it apart from the pictures.

Focus Group Leader: Story about how the in another focus group someone was only backing up on a hard drive.

Participant R: I take my hard drive everywhere with me.

Participant Q: I worry that if I take my hard drive somewhere I'll put it somewhere and never find it.

Participant R: That happens to.

Participant P: I keep it on my table, I plug it into my thing and it backs up everything.

Participant R: Because I don't have a lockable desk or draw anymore. I'm at the hospital, I have to take everything with me. That and I've got a masters student sitting at my desk in Engineering so I have nowhere to sit, so basically the laptop comes with me everywhere as well so the only thing that's going to burn is the lab book.

Participant O: I think most of my lab book is just a list of things I've done that have failed. I do protein work, so are my DNA samples lost in this fire? I think I could amalgamate most of them.

Participant Q: So we're losing all of our samples as well? As well as our lab books? Or just our lab books?

Focus Group Leader: Well it's basically if there's a fire in your lab...

Participant R: It's not like you could save your samples is it.

Focus Group Leader: If your lab burns down I sincerely doubt it's just going to burn just your paper lab books.

Participant Q: Then we're s*****d.

Participant P: It's taken me 2 years to get these mice...if they burnt I'd be in a lot of trouble.

Participant O: I don't even know how much time after the fire having my lab book would actually save me, because I know what not to do now, what's horrible, how most things that work were eventually made to work. So I think I could probably get back to where I was in a year....

Focus Group Leader: How long have you got left?

Participant O: A year.

3.12 Question 12 - If you fell under a bus tomorrow, you don't die, you're just indisposed for a while. How would your supervisor access your work?

Participant P: For me it's really easy, my lab book is neat and I always do it neat dated, everything. Everything is on dropbox. I don't think she needs me. We all have a separate file for protocols if we add any protocols we put it in this share dropbox file. Everything is there within her reach. Because we're her first students she's planned ahead already. So it's all there and she doesn't need us.

Participant Q: My supervisor is like...Where is this? So you know you did that? How do I find it?

Participant P: The annoying thing is our dropbox is so big so I've had to pay for more.

Participant R: I actually have a file associated with my name. Everything I send my supervisor he prints off and puts into this file, which is kind of scary when I found out. If I were to be indisposed

the PhD student could attempt to do it wrongly from my lab book. Theoretically my PhD student could give my lab book to Laurie who would make it work.

Focus Group Leader: Who's that?

Participant R: The technician.

Participant O: Everything that's worked has been written up neatly to some extent. Everything in my lab book is just a lot of stuff that people shouldn't try. So I guess if they were going to try and optimise stuff I've done than they wouldn't have a list of the stuff that definitely didn't work, but other than that I don't know how useful my lab book would be anyway. It's been written up so it does kind of have the methods and what I've done in each one so they should be able to repeat stuff.

3.13 Question 13 - Where are all of your notes backed up, electronic and paper?

Participant O: J Drive.

Participant P: Time machine, on my laptop. Which is always at work and is plugged in so is constantly backed up. I also have it in dropbox. I have everything in my documents and then any important things I then move it onto dropbox so it's there.

Participant Q: I've got it backed up onto an external hard drive, and onto this other server, the imaging unit server.

Participant R: Hard drive, computer, dropbox. paper copies I have nothing of anything.

Participant Q: Yeah me too.

Participant R: I want to scan stuff now.

Participant P: I've never had to look back through it, once it was useful in the hospital when I needed to check a mouse, it took ages trying to find out which scan. it did have a page number but you had to look through every single scan to see where it was. It's more of a pain. It's there as a backup.

Participant R: I change tiny little things and it'l be a whole protocol and one step you double the concentration of something or you change it from 20 microliters to 40, and it shouldn't make that much of a difference but one's worked really well and the other hasn't worked full stop. I wouldn;t have written that up neatly because you know which one didn't work.

Participant Q: My problem is I save something onto dropbox but then I forget if I've saved the updated version or not and then I have a file on my computer and a file on dropbox and I dont know which the updated one is.

Participant R: You end up with the 2016 thing.

Participant Q: It's more out of sheer laziness that I don't back it up ontop dropbox, because if I

edit things on my computer it's a faff to work out which ones new.

3.14 Question 14 - Have you guys used an Electronic Lab Notebook before?

Group: No.

Participant Q: I've never heard of an Electronic Lab Notebook.

Participant O: Sebastian Shephard has one, and he showed me it, and it looked kind of awful.

Focus Group Leader: Ironically having investigated Electronic Lab Notebooks on the market, the highest represented science I found individually was biology.

Group: general confusion.

Participant Q: Do you have to pay for them? Where do you find these mystical things?

Focus Group Leader: Some are paid for, some are open source.

Participant O: My supervisor has talked about it before.

Focus Group Leader: These next 2 questions may not work that well....An Electronic Lab Notebook is basically a way for you guys to record your stuff on a computer. There are a variety of different ELN systems. I'll bring up an example of a Biology one and show you.

Participant P: Would this mean carrying your laptop everywhere?

Participant Q: Or an iPad.

Participant O: It has special paper and when you write on it it transfers it to the computer.

Participant Q: So it's like an actual notebook?

Participant O: It's like a normal lab book but it's like a graph pad thing with a pen.

Participant Q: I thought it would be a thing you typed on.

Participant P: Thats what I thought.

Participant O: It's just like a normal notebook right?

Focus Group Leader: No, there's lots of different forms. It;s a piece of software, you know you've got the concept of Electronic Notebooks, so you've got things like Evernote, Google Docs, Word and all that kind of stuff. It's just a standard text document, almost like a replacement for paper. This is a step forward so it's a replacement for your lab notebook, or ideally it would. It has domain specific knowledge. So biology ones would have specific things catered for biologists. Here is a document about an ELN in biology.

shows example

Participant Q: So it kind of looks like a combination of Word and Excel.

Focus Group Leader: Kind of yeah, it's basically a piece of software that in an ideal world would replace your need for the paper lab notebook.

Participant O: So you'd type instead of write?

Participant P: Sort of confused then, when you're doing your experiments in the lab, is it that you have to have a computer next to you.

Focus Group Leader: People use them for a variety of different things, so some people could use them, instead of writing down in your paper notebook you could write straight into here. Or you could transfer from paper to here. It's an either or thing. It's similar to doing your normal notes. If you guys are writing a paper you'll write a bit by hand then you might transfer it to a computer or you might write straight into Google Docs or a Word document.

Participant R: I can't get it in my head, the idea of almost having an iPad and writing with the pen and then it just kind of transfers across.

Focus Group Leader: To an extent. there are some that try and simulate the handwriting.

Participant P: For me, this just seems, because I write everything into my notebook so I have to take it into the lab so I need something that I can use whilst I do my experiments. Because I don't tend to write on bits of paper, it's very rare that I would write on a bit of paper and then take it back out.

Participant R: I take photos in the lab.

3.15 Question 15 - What would you expect that an ELN would be able to do for you?

Participant Q: I think it would be useful in terms of being able to access your lab notes if you needed to and didn't have your lab book around. At the moment I don't take my lab book home and they just stay at my desk. So if I found myself desperately needing to look at my lab book while I was at home which is unlikely, I guess I'd be able to. Is it a cloud thing? Can I access it from home?

Focus Group Leader: It can be. If you have a bit of software on your computer, it's going to be on your computer. Some things are web based and cloud based, and therefore you can have them anywhere because of the nature of it. Equally if you had it on your laptop or an iPad it would be just the same as having anything else on there, just like you've got Word on your laptop you've got this. It can either be web based like a website that you can use on everything via a web browser or it's a particular standalone piece of software that you take and you download and you have installed just like word or powerpoint.

Participant Q: I guess easy access at home would be good, and it would save me printing out all of my graphs to stick into my lab book, so I could just copy them.

Participant P: When I did my behaviour sheets that I write down, and make notes on. So it would be quite good that when I have my final results if I could attach those in without having to have paper copies here and there. And then you have videos as well, so if you could link these are the videos for this.

Participant R: it would be good having everything in one place as you'd be able to search keywords which would help a lot.

Group: General agreement.

Participant R: You can remember using a reagent but you can't remember how much you used or what for or what you've done in the past, so you could probably get it up on your phone if you were helping them out randomly in conversation.

Participant O: So I tend to do very basic calculations as I go and it's nice having free flowing notes just on the side in my lab book. I think if I had a word document I wouldn't necessarily be able to do that as easily, or it would be more annoying. I can just kind of write out the basic equation, rearrange it on the page and then just put the numbers I need into it and it's quite easy on paper, I guess Excel would kind of work in a similar way but I don't know if it would be as easy as by hand.

Participant R: It would be good to visualize your results tho, if you wrote down that you'd be able to see them immediately.

Participant P: I personalise my notes. I tend to write things like damn it didn't work.

Participant O: What I meant to do .... what i actually do.

Participant Q: Leave yourself little notes. I've written stuff like that.

Participant P: Like DO NOT do this. **Participant Q:** Or things that often go wrong, I like to add notes like this will probably go wrong for you because you're unfortunate. I've found that more than once and I don't think I'd put that on the computer.

Participant P: Yeah.

Participant R: When you read it it makes you smile. It's a good thing to have things that make you happy.

Participant Q: I like to colour code, my lab book is very much colour coded.

Participant P: Are you allowed to use colours?

Participant R: I do.

Participant P: I thought it had to be black and blue and you aren't even allowed to use pencil.

Participant O: I use pencil.

Participant R: I have metallic sharpies in mine at the moment.

Participant P: I just presumed it was no pencil, as someone shouldn't be allowed to rub it out.

Participant Q: It's not pencil it's coloured pen. And I couldn't use sticky notes if I did it electronically.

Participant R: You can tell everything I've done around Christmas as all of my samples are written in gold, silver or bronze.

3.16 Question 16 - How could an ELN make recording your work better?

Participant O: I guess a lot of, some of the stuff I do for data, my note taking and then my actual writing stuff up to get results is quite disjointed. I'll do stuff in the lab and take notes then I'll get something that I have to take and put onto the computer in a useful form to make the results actually fit into my lab book. An ELN would be more continuous which would stop me forgetting what I was doing.

Participant Q: I'd agree with Participant O.

Participant P: My notes just are used on the day and then I put it into Excel and everything and my analysis is done in MatLab. It would just be I guess, my handwriting is ledgible so I don't know how it would help. I guess it's what I said before it's good to have everything in one place, like with my behaviour, it's good to have the videos and everything right there so I don't have to try and find them. Apart from that I don't think the normal experiments I do wouldn't be that different.

Participant R: I think it would be helpful to visualise the data there and then but other than that at the moment it's a bit all over the shop because I have the engineering side and the biology side and I tend to use one book at a time rather than a mismash. If it was a mishmash then I'd probably be more stressed.

3.17 Question 17 - What equipment are you guys allowed to take into your lab?

Participant P: Allowed or we take in anyway?

Focus Group Leader: The specification.

Participant Q: I don't know what I'm not allowed to take into the lab so my phone comes in and I take my ipad in. If I use the laptop occasionally I might take that in. I haven't been told specifically you can't have this. In the animal house you're not allowed anything.

Participant P: I take it in.

Participant Q: I'm still good.

Participant O: The only equipment I take in is generally stuff for my own entertainment. My phone or an iPod.

Group: General agreement.

Participant O: I have a camera that I sometimes take in.

Participant R: My phone always comes in although it's not supposed to. The other lab has music and ours is in silence so someone has to play music. Basically usually it's just a lab book and a pen and whatever colour sharpie I've bought that weekend.

3.18 Question 18 - Does anyone have any other comments on ELN's or note taking in the lab or anything?

Participant R: After doing this I feel very unorganised and I'm writing up at the moment and now I've realised how disorganised I am.

Participant Q: This is great for me, people are organised, maybe I should do that too. I'm intrigued by an ELN, whether it would be useful, like actually really useful or I would just use it to procrastinate and just write things up in a different format is another story.

Group: General agreement.

Participant Q: As I like to write things up to avoid doing work.

Participant P: Which is what I meant, if you could take it in and use it it would be good but if it's just to make notes and then rewrite it later it seems like a waste of time.

Focus Group Leader: Depending on the discipline, this is one of the reason for the restriction question, it's very different. The physicists have the cleanroom and they're not allowed to take anything in because it would contaminate the lab but the flip side with the chemists is that they could take in what they want but they don't want to contaminate their equipment with what's in the lab.

Participant P: I think it depends on what you work with. In the biology lab there are containment places where you can't take anything. For us I can use anything.

Focus Group Leader: There's definitely a hardware restriction depending on your environment.

Participant R: In our lab, we've got the PC's that are in there are so slow that it would be nice to have a quick piece of equipment that you could do stuff on. I dunno if it's the same for everyone, but if you could write down into the virtual lab book that would be great as I work by writing so if I type up something I won't remember it, if I write it I would. My protocols were remembered in my head because I've written it up so many times.

Participant O: The surface ones cool, that's just a magic pen and a grid and it transfers, if it was something I had to type then hell no.

Focus Group Leader: There are some that have tried to simulate the writing part.

Participant R: Interviewing fields projects students might be useful. This sort of thing might be

useful for them when they're out and a bit.

Participant O: I know some that use them.

Focus Group Leader: Any other comments?

Group: No.

4 Chemistry Focus Group 2

This focus group was conduced on 15/12/2015 and comprised of 6 chemists (Participants S-X). The following colour key is used for the Participants and **Focus Group Leader:**

Focus Group Leader
Participant S
Participant T
Participant U
Participant V
Participant W
Participant X

4.1 Question 1 - What methods do you use to record your notes?

Participant S: I just use a copy book which is the standard one provided by the department, so it's just a carbon copy book for me to keep and I keep the book in the lab so I've got a backup in case the building burns down. I also record quite a lot of data as .CSV files when I'm using a data logger and I use the notebook as an index to that but I don't like to copy it down like some guys in my group will write it all down in their book. But that's almost, pretty much all I use is that one book.

Participant T: Pretty much just my lab book, handwritten lab book and all the data files, thats pretty much it.

Participant U: Lab book is the most typical way, sometimes I write on file on Word just to get it clear. Basically the lab book.

Participant V: Yeah, it's the same for me, lab book mainly, sometimes just a notebook but when I'm working it's pretty much the lab book.

Participant W: I use a physical sample book to note things, but then they'll be an ID that links to information on the computer.

Participant X: Lab book, I sometimes have a notepad and use a computer, and I'll copy up the notebook in case something happens to it.

4.2 Question 2 - For each of these different types of work, what pieces of information do you currently record and how do you record it?

4.2.1 Question 2a - Doing an Experiment in the Lab?

Participant S: If I'm doing, it depends on exactly what I'm doing, so I tend to do 2 different kinds of experiments. I'll do either a synthesis or I'll do a, one of our transport run experiments or NMR titrations or something like that. If I'm doing a synthesis I'll tend to write the schema out in my book and get everything written out beforehand, my quantities, the solvents locations, molecular weights all written down already, so I'll do that at my desk when I look at the paper that I'm copying or

whatever. And then I use that information to then, as I'm doing the experiment in the lab I'll have all that ready to look up, all the risk assessments while I was already done in there, and then as I add the compounds together and start mixing stuff up I'll then write I added this to this underneath so I've got all of the prep done at the start with the reaction scheme, quantities, amounts risks and then will just be a listed recipe basically of what I did afterwards. When I do transport runs it works slightly differently so, I have sort of the front page, the first few experiments I did when I started my PhD I've got the full method written out and then when I write a transport method for example, I'll say I'm creating lipid viscourse as per this experiment, these are the masses I use, this is my final concentration, I'm screening this compound which I synthesised in this other experiment number to link that to that, and then we'll have a full record of every run that I've done on our electrode setup. So when I do a screen I'll just, I'll basically make up a table where I write out, this is compound 1 at this concentration and it's found under this filename, so I've got that record as all I'll have then on the computer is a list of numbered .CSV files that I can go back through and say oh that one was these 3, but for this one these are the ones I want to add to my spreadsheet to check later on. My lab book pages are my reference for all of that so I don't end up with all the data in my lab book. That's almost all that I use my book for, so it's those 2 things that I do in the lab, that's pretty much it.

Participant T: Lab book. We don't really take anything else into the lab.

Participant U: and **Participant V:** Agreement.

Participant X: No. Sometimes make notes with a sharpie on the table. Probably shouldn't do that.

Participant T: I've done that.

Participant W: In a physical lab book.

Focus Group Leader: What pieces of information do you record.

Participant T: What you did in your experiment. All the weights and everything.

Participant V: Yeah all the weights.

Participant T: Calculations.

Participant U: My results are colour changes, visual things.

Participant T: I also record the file names for things like for NMR and MassSpec and various other techniques that you use and then you can find them on their data source.

Participant X: I tend to just be using lots of machines so I have to write down all of the settings and stuff.

Focus Group Leader: How do you record it, is it literally just notes or do you guys have graphs, pictures, diagrams, tables, mind maps?

Participant V: Tables.

Participant T: Tables.

Participant X: I was always told to do a diagram of your setup first time you do it, because I do electrochemistry you have to do the cell and you have to draw all of that.

Participant V: We don't do that.

Participant T: I occasionally do diagrams of my vesicles, what I've got inside and what I've got outside, but it depends what colour.

4.2.2 Question 2b - Doing an Experiment outside the Lab?

Participant S: No I pretty much don't do anything outside of the lab. If Im looking up something to do in the lab Ill take the book outside the lab and then like I said Ill do all my prelim work and make sure Ive written my scheme and everything like that so Ive got everything ready to go. Theres not a lot I do outside the lab that I will write up in my lab notebook, my lab notebook stays for a record of what Ive done in the lab. I keep a separate notebook for my ramblings of ideas and things Ive found in the literature. Occasionally if I run a model on the computer Ill keep all the files in a folder, if I run something on spartan or something like that, but thats very rarely something thats worth writing up as an experiment in the book.

Participant T: NMR Titrations, so we do that in the NMR Room.

Focus Group Leader: Same question applies, what pieces of information do you record?

Participant T: Pretty much all on a computer. I type the numbers that I get into my laptop, I don't write anything down.

Participant V: For my titrations I bring my laptop with me, I don't write it down in my lab book.

Participant T: Me neither.

4.2.3 Question 2c - When you're looking at your literature?

Participant V: Laptop.

Participant X: I don't write anything in my lab book, I've seen other people do it, but I tend to sit and write notes on the computer, and write what I've thought about the paper.

Participant W: I used to keep a physical notebook for literature stuff so I'd link things together and make a map.

Participant X: Because otherwise you just forget.

Participant U: I download citations in EndNote just to keep track of things.

Participant V: I do that in Mendeley. Sometimes I like to just print it and write on it, I find that easier. It really depends.

4.2.4 Question 2d - When you're thinking about your work?

Participant T: Use a notebook, or scrap paper.

Participant X: If Im somewhere and I think oh I need to do that Ill text myself.

4.2.5 Question 2e - When you're performing calculations for your research?

Participant S: I don't do anything that's going to be published, if I've thought of a compound and I'm worried that there might be some steric issues or it's not going to be the right shape to bind the molecule that I want to use I'll tend to build it and run it on spartan but it's because it's not. I tend to only do it for a quick look, like oh yeah I think that will work, and then Ill make it. Doing the calculations is not something that Im going to write up, I use it as a tool to inform what I'm going to do as opposed to actually it being the work that I'm generating.

Participant U: Pieces of paper.

Participant X: Scrap paper or on the desk.

Participant T: If it's a calculation that I do regularly I generally have an excel spreadsheet that does it for me so I don't have to do it.

Participant X: If it's a complicated one then I have to use Excel.

Focus Group Leader: Do you guys have in your calculations, are they complex calculations, do you have lots of symbols and are they more mathematical or are they general formula.

Participant T: Mine are normally just lots of concentration calculations.

Participant V: Yes.

Focus Group Leader: So the sort of thing you can do in Excel easily?

Participant V: Yes.

Participant T: Easily done in Excel.

Focus Group Leader: When I spoke to the physicists some of them were saying that even if they're trying to represent their calculations as they have quite a lot. But it's not like that for you guys?

Participant T: No.

Participant V: No.

4.2.6 Question 2f - When you're writing up your work?

Focus Group Leader: Either just writing it up neatly or into papers or into reports, for your supervisor.

Participant S: It depends on how I write things up. What I tend to do, the stage I'm at at the moment is to try different things until I work out what works, so I keep everything like I say. I've got my ideas notebook on the go with this doesn't work and maybe I'll try this next. When it comes to then writing up something for a publication as I make the compounds I tend to get a few word documents on the go, so I will, I have one word document on my computer, for the last thing I

published I had one word document where I had all my Mass Spec assignments so every time I got a spectrum back I did all the write ups with all of my assignment and I just left it in headed paragraphs so when I went to put it in paper form it was just a copy and paste job to put in there, and then what I'll do then is I'll sort of, if I've got a load of synthesis to write up I'll just have this word document on the go where I'll summarise my procedure from my lab book in the same form I'm going to use in my supporting information of the paper and again just have that all ready to then cut and paste into a document later on. Just so I've got that clean written up thing that leads to publication. I've got a few things like that on my computer, I've just got this folder of word documents and it's like this project's mass spec and that projects NMRs. Everything tends to be separate so for example all my NMRs I've got a folder where i've saved every single file by the experiment number which links back to the book, to the synthesis. And then I'll refer to my compounds by the lab book page number. and if I look at the NMR folder and I'll find the NMR there and if I look in my word document my mass spec assignments Ive got it there and like you say it's just a copy and paste job when it comes to writing up an ESI. I'll take the procedure from there, Mass Spec from there, copy and paste a picture of the NMR and it's done. So I tend to try and write those little bits up as I go and then bring it all together to make a document of what I've done. Thats the theory anyway. I don't always do it. WHen I'm at the stage like I am now I'm basically just smashing out experiments every week to try and find the method that works and once I find the method that works and I start making up the stuff I'm going to publish and thats when I start being a bit more careful about making sure I have everything prepared as I go to write up later on.

Participant U: We have weekly reports so that helps, it's also quite time consuming, you need to do it every week but it helps a lot in thinking what have you done and the problems and everything. They are all online.

Participant V: Using your laptop, if I have a longer one like my transfer report what I had to do, is first I write everything like a plan on a sheet of paper and then just everything on my laptop.

Participant X: Are your weekly reports mandatory do you have to do them?

Participant T: Yes, they do.

Participant V: Yes.

Participant T: Friday they're all there.

Participant X: My supervisor ignores me most of the time.

Participant U: Really?!? Participant U & Vs Supervisor...If one is missing he will absolutely get furious. Whereas yours....

Participant T: My supervisor didn't read my transfer report, Participant U & Vs Supervisor did. He likes reading, a lot.

4.3 Question 3 - When you're taking notes how do you organise them?

Focus Group Leader: So creating sections, indexing, both on paper and on the computer.

Participant T: I like to think it's organised but if I have data relating to stuff that I've done in my lab book then it generally has the same code, so I have the lab book code, the page number and then what it is and I have that on the computer as well in folders. I try and organise it like that, sometimes it's not like that.

Participant W: I try and have the, because I work sample by sample, I tend to have the unique code for each experiment and then a unique code for each sample, because sometimes we might do more than one experiment for each sample so we'll have both of those at the top of each page so we know what's going on. Sometimes when running other peoples samples I'll end up having an excel spreadsheet to correlate our different coding methods, to double check.

Participant X: I don't keep track of anything, when I'm writing it I'm like where's my...what's this experiment?

Focus Group Leader: What about you two? (Participant V and Participant U).

Participant U: Pretty much the same, I tend to, I'm probably more organised in the weekly reports, I like more to type at the computer rather than having my lab book, so sometimes my weekly report are more precise than my book.

Participant V: I'm exactly the same, we have a code top left, top right we have the date and then an equation that shows the reaction you're doing, a table recording everything you're using and then a prep. That's usually how we'll do it. I use the same code for every other experiment that you're gonna do to characterise the reaction. That's usually how we'd do it.

4.4 Question 4 - Do you use any technology to aid with your note recording?

Focus Group Leader: There is the obvious laptop, but I'm not just talking about laptops, there's phones, tablets, cameras, taking photos on your phone, recording equipment?

Participant S: I tend not to for note taking. A key limitation to that is I don't actually have any bits of tech that I'm willing to get out in the lab if you see what I mean. I wouldn't put my laptop near things. I've spilt far too many things. Actually to be honest if I had an old one and I had a good system to use I probably would use it, but the reason, it just tends to be the system I've worked out is I've got my book which is kind of everything that's done in the lab and then that links back to things that i Have on my computer or I've got all the stuff that I can't store in the book like my NMR spectrum, my Mass Specs and things like that. I don't have a lot of things that I'd need to for example take a photo of or something like that. I tend to just note stuff down as I see it. If I've made white crystals I've made white crystals then I don't need to see a photo of them to see what they look like. Because that's the only detail I need is while I'm writing up. When I do generate data I tend to write an index for it. when I generate a load of .CSV files and transport runs I'll just write an index

to them all like that.

Participant T: Occasionally I take pictures of the compounds to show how pretty they are.

Participant V: Yeah.

Participant U: I took some pictures too.

Participant T: I occasionally use my tablet, not in the lab but we have a separate room that we do less dirty work in, analytical stuff. I use my laptop and my tablet for that. But I wouldn't normally take them into the lab.

Participant W: We have the camera attached to the microscope so I can take a picture of the crystal I've just put in, and then check. It's slightly easier to remember which ones which by sight rather than by the code.

Participant X: We have quite a lot of random technology that we use, microscopes, cameras, to make sure that the electrodes are perfect, so nothing really comes to mind but I don't use my phone or my laptop or anything in the lab.

Participant T: I do email myself all the time, all the time. If I'm using different computers, instead of putting it on a data stick I'll just email it to myself because I know it's stored somewhere there.

Participant U: Yeah I do the same.

Participant T: I generally get it and then save it somewhere, but I will, if I'm in the lab, or on a laptop in the lab I'll email it to myself and then I can have it at my desk.

Participant X: I suppose dropbox.

Participant V: Yeah dropbox.

Participant X: That's pretty neat.

Focus Group Leader: Out of interest do you guys organise your emails relating to your work at all?

Participant T: I have some sorted into folders because we get Mass Spec stuff sent to us over email so they're all in one folder and things like that.

Participant U: Yeah, conferences and mail from your boss, log sheets, weekly reports, tend to break them into these kind of categories.

Participant V: Yeah same, I have one for work, the group, the university, I have some for my flat as well like the agency, I have a lot of different folders.

Participant W: Mine's sort of as is.

Participant X: I do but I don't check it half the time. My supervisor found my other email and started emailing me on it without telling me, he was like did you get that paper and I was like what

paper?

4.5 Question 5 - If at all, how do you link any digital resources or notes to your paper based notes?

Participant S: If I've created a digital resource I'll make sure I've got a link back to it in the book, again if I've run an NMR experiment then I'll write the filename that the NMR machine has created. If I ever lose the copy on my computer and I want to go find it later on or it's not one that I've worked off, like the final one but it turns out I need it later on, I can always go back to the NMR server and pull that out. I tend to just use the paper book as a link to the stuff. There's not a lot I actually generate and would need to keep. Saying that if it was all in one place that would be different, that's one of the problems. I did trial using an ELN last year, it was one heavily geared towards organic synthesis.

Focus Group Leader: Is that the type of Chemistry you do?

Participant S: It's a bit of both, I do the synthesis side, design molecule, build it, and make it in the lab. But then I also do testing of it and do a bit of physical chemistry on it, so that's where I'm developing lots of .CSV files of time courses over some of the transport experiments that we do. What I found is that I just couldn't, there wasn't a way where if you weren't doing this + this goes to this then there wasn't a way of writing down today I'm doing a transport run, this is the concentration I'm starting with and here are the links to all the files. So I couldn't just write down that index of run this compound with concentration and here's the file. If it had that ability to do it I'd be more tempted to use it all the time because I could keep everything in one place and it would just be a case of if it links to the file you could just double click and open it, brilliant. The one I used couldn't deal with the breadth of stuff that I did as I'm not a straight organic chemist. I've stuck with just for everything lab based having the record in the book because that's the way I've got used to it basically.

Participant T: Pretty much just with the codes.

Participant V: Yeah.

Participant U: Yeah, linking with the codes.

Focus Group Leader: Does that code, is that code an experiment code?

Participant T: It's normally just my lab book and initials and I always do mine as lab book number, page number and then my initials with whichever experiment it is. But then people can find it in the lab book really easily if they need to look for it.

Participant V: I use the same information, initials, and date, number.

Participant T: As long as you've got it all in the right place.

Participant V: And page number.

Participant X: I tend to go initials, date and then if I do more than one experiment I kind of hit a problem....so if I only do one experiment a day I'm fine.

Participant W: Mine is the year and what sample that's being run for, it's usually NCS and just numbers increasing throughout that year towards the new year, it just keeps going up. I'm into the 700's now.

4.6 Question 6 - Where is your data or research output stored?

Participant S: What tends to happen is when I generate data with some, for example the open access NMR kit or the mass spec kit, it's all stored on the remote server where the files are created and then I will pull those from, and then for example the NMR spectra I will assign it, and make the spectra look pretty so I can get a picture for a paper, and then I'll save my own copy with my annotations on it, so what I have is a large data folder that's broken down into NMR transport fluorescents UV vis, so all the machines I've used and all the stuff that I've worked out from the raw data sits on my computer and then the raw data still exists on the server that it was created on, and it's the same with my transport data, the two computers in the instrument, all of the raw stuff stays on there, but I pull it off that computer and put it on mine where I do the work and produce the plots from it. So I tend to have 2 copies everywhere, my computer holds all of the stuff that I've worked on but the raw data stays on the server forever just in case, you never want to lose that stuff. Because I can access all of that from my desk computer, I don't really have a need to have it in the cloud as of yet. I may change my mind about this when I go to write up and go oh I left that on the desk computer. But I do tend to keep a copy of it every couple of months on my hard drive.

Focus Group Leader: But then you could go on holiday and have it with you.

Participant S: I could do....the problem is often it's just 5 minute jobs I have to do, so if I've got all my my files i just have to import them into excel and then plot them and that takes a 5 minute job and when I've got it done. So I tend to do it in between doing things in the lab when and where I can.

Participant T: I've got some, most of it's stored on the uni computer and then it's all backed up on a hard drive. thats pretty much it.

Participant U: I tend to back up quite often, maybe once a week.

Participant V: The uni computer, hard drive, on my dropbox I have a copy. We have a copy of the lab book as well.

Participant T: Do you?

Participant V: You know that you remove the pages?

Participant T: Yeah. They're duplicate pages you can rip the right ones out.

Participant X: I only realised to do that, one of the masters students was like you know you can do

that.

Focus Group Leader: What about your paper notebooks, are they all stored in the lab or at home?

Participant T: You're suppose to take the whitepages home with you.

Participant V: Are you?

Participant T: Because. the whole point is if the building burns down..

Participant V: Yeah.

Participant T: You've still got a record.

Participant X: Yeah.

Participant T: That's what you're supposed to do with the white pages.

Participant V: Thats good actually.

Participant X: Someone told me, one of the lab managers told me it was to get us used to industry, because in industry you're supposed to have 2 so if the boss wants to look at yours...but apparently not.

Participant T: I got told it was in case the building burnt down.

Participant W: My sample book only exists in one place in the lab, but it is sort of more information for my benefit as all the information is on the computer as well, it's just easier to solve the structure when you've got all the stuff in front of your ather than try and pull it all up in one window. It's not vital information that would be lost.

4.7 Question 7 - Are you guys concerned about Intellectual Property?

Participant S: Depends on what I would be working on. Because what I'm working on is all looking to go into open publications, not necessarily open access but it's all going to be in the public domain, IP is not necessarily something that worries me too much. We do have people in our group who are working on compounds that we are looking to patent and so if I was involved in that project it's more of a thing of, more of a need to keep the stuff secure and not you know...it's the kind of thing that we don't talk to other people about because as soon as you do that you can't patent something. For my stuff its less important, the main worry of security is losing it which is why I keep backups of it everywhere as that would be a nightmare. It's not so much of a problem as long as it's not...I don't know how much of a problem that other groups looking at our stuff to scoop us would be. That would be the main concern is that someone would look at it and say that's a great idea and get the apper out before us, but in terms of IP and patenting things the stuff I'm working on is not especially relevant but thats just because of what the projects I'm working on is..if I'm working on other things it might be more of a concern.

Participant U: Yes.

Participant T: Yes. I suppose with research you don't want anything going missing or stuff as people can steal your ideas.

Participant U: You always need to be extra careful, for example in talking about your work at conferences, you can have cases which...you can risk information being stolen.

Participant T: Yeah.

Participant U: Participant U & Vs Supervisor is really only happy to send us when we have something ready, published, he's quite...sometimes even if we're close maybe he doesn't want to say anything.

Participant V: It was okay before, but since we have been scooped, it's been quite strict.

Participant T: It's quite strict.

Focus Group Leader: What year are you guys in? (**Participant T:** & **Participant V** 2nd Year, **Participant T** and **Participant W:** 1st Year).

Focus Group Leader: (To **Participant X** and **Participant W**) as 2 first years, are you concerned about IP?

Participant W: I haven't got anything to steal yet.

Participant X: They can have my data if they want, it's pretty rubbish. Not really, I don't think its ever been...because I've worked in the same lab for 2 years now, I don't think we've thought of that in electrochemistry, in fact we kind of share all of our ideas quite a lot.

Participant T: In our group we share.

Participant X: I mean even within the University we share a lot, it's never really been a talking point.

4.7.1 Question 7a - Have you got any notes or records that you have to keep secure?

Focus Group Leader: This will probably apply more to you 3 (**Participant T**, **Participant U** and **Participant V**).

Participant U: I don't think there is like this...

Participant T: I don't think there's any specific...

Participant U: Any specific yeah...

Participant T: The only reason why you'd need to other than the fact that you don't want someone else to have your ideas.

Focus Group Leader: Out of interest, if you guys are worried about that sort of thing, would that put you off using cloud software to backup your notes? Or backup your references or your work?

Participant T: Probably not, mainly because I don't think my research is exciting enough for someone to hack and try and steal it.

Participant V: Yeah.

Participant X: If it was that exciting probably wouldn't put it on the cloud.

Participant T: Yeah.

Participant X: We had one point where we were doing some work in industry and we weren't allowed to tell anyone, I think its fallen through now, it was some kind of experiments for this company that was making a machine that could clean hospitals.

Participant T: Yeah, I suppose if you're working with Industry...

Participant X: They didn't want anyone else to know, the company didn't want anyone else to know. They made sure they didn't tell anyone.

4.7.2 Question 7b - Are there limits on who you can share your data with?

Focus Group Leader: Some people put limits on use of dropbox, use of things like GoogleDrive because then you're making it public, well could be making it public. Do you guys have limits imposed on who you can share your data with? Or are these more self imposed because you don't want someone to steal your ideas?

Participant U: I wouldn't be concerned within the group...

Participant V: Within the group it's fine.

Participant T: Yeah.

Focus Group Leader: Am I right in thinking no one has industry sponsors here? You're all EPSRC or Uni funded? Ive had quite contrasting answers to these questions.

Participant T: Yeah.

Participant S: It depends on where your funding comes from. Everything that I do has to go on an online database anyway and everyone's going to see it eventually. So I can't be secretive about my stuff because it has to be in the public domain anyway. But at the same time it is...some of the postdocs are working on patentable compounds and maybe looking at turning them into drugs later on they are things we need to look at keeping schtum about as this could put the whole process in jeopardy.

4.7.3 Question 7c- Does your data need to be kept for a specific period of time?

Focus Group Leader: I've heard various rumours that it's 10 years.

Participant X: Indefinitely.

Participant T: Yeah, I don't know if there's a specific number, but Phill likes to keep the stuff

forever.

Participant V: Yeah.

Participant T: We have a hard drive that needs to be plugged in, this huge thing, with the whole of the groups work from years and years and years. so forever.

Focus Group Leader: What would happen if that hard drive burst into flames?

Participant T: God knows...hopefully everyone who's on that hard drive has their own stuff saved.

Participant S: I need to keep all of my data all of the time because whenever I have..as part of my research funding I have to publish everything on an open access server so the last paper I published, when the proofs finally went on eprints on the soton server I then had to upload all of my associated data that I've produced, going back to the raw files that I've produced my plots from. So it's fully there and in the open. Thats just what you have to do nowadays with the EPSRC funding.

Focus Group Leader: Im funded by EPSRC and I dont have to do these things, although I guess Im funded by the Web Science DTC and EPSRC sponsors them.

Participant S: I didn't have to do anything until I'd published. When I published that was when they said we need everything you've had to go with that, and everything needs to be available. Have you been asked to do research fish as well?

Focus Group Leader: Yeah.

Participant S: You have to have all those records of stuff youve produced and to go with all that you then have to have a record of all of the data youve used. It does have to be kept in a raw form so that I can then have everything ready to upload. But again because Im quite good at numbering and keeping everything in its sub folders its normally quite easy just to take it all together and zip it up and then upload it.

4.7.4 Question 7d- Does your data require any 3rd party sign off?

Focus Group Leader: This could not be applicable because you're not with industry sponsors.

Participant S: I don't need to run it by people before I publish anything. Because it's 100% EPSRC it's not a problem.

Participant U: No.

Participant V: No.

Participant T: No.

Participant W: No.

Participant X: No.

4.8 Question 8 - Who do you guys collaborate with and share your work with?

Focus Group Leader: If at all?

Participant T: Other people in your group obviously, and we do have specific collaborators that we work with in other universities.

Participant V: Yeah.

Participant T: That we share quite a lot of our data with and I imagine it's the same for you guys.

Participant V: We have some.

Participant T: I'd say that the stuff I work in the airline transport is huge and there's loads of groups doing it, and we do have a lot, sometimes Phill's like don't mention this when they come to visit.

Participant V: Yeah.

Participant T: And others he's like mention that, and then tend to...but you do kind of have to be careful about it. You decide whether you want them on your team or against you.

Participant W: It's a bit weird as we tend to get, at the moment I'm not doing my own research, it hasn't really started, I'm sort of receiving samples from other people, and solving them for them. There's a bit of weirdness about how much information we give back. There's a hub and cif file or stuff, so they can't pass it off as their own then have to use the way that you did it.

Participant X: I think it's fairly free who we share our work with, if I've got a problem with my data my supervisor will be like oh I'll just ring up that professor, and he rings him up and he comes down and has a little talk with us and says what he reckons, so no we can share with most...probably if it was randomly sharing with other universities probably not, but for collaborating.

Participant S: Yeah, I have the odd project with other groups who we will either send compounds to for them to do testing on for us, or they will take...so we've have collaborations with some computational groups before, we've done q-sarm for example on other groups compounds. It's not something I've been that involved with yet, I have provided a load of compounds for some people in life sciences to do some NMRs on for us. Whether or not much comes of that we'll see. But often it tends to be because we're bringing in different groups from different specialties, they don't necessarily want to see a lot of the raw data they just want to see the output so they're not bothered about looking at every single plot i've produced. In the transport experiment they just want to know which are the good ones and which are the bad ones so that we can do the comparison. When it comes to writing up papers we will write up the transport section, they will write up the NMR bit and the computational bit and we'll kind of mesh them together and make sure it makes sense because everyone is a relative expert in their own field. It is useful to be able to send them your outcomes so everyone knows exactly whats going on. So it's useful to share it then.

Focus Group Leader: So it's useful to share it then?

Participant S: It's normally, having to share the produced things. So the guys I'm working with in life sciences they're not going to know what to do with all of the CSV files I've produced but they'll want to see the final plots that I've produced from origin or excel so being able to share those outcomes is more important, and preferably with some kind of notes explaining them. As that's what we tend to do, is either produce a powerpoint or a PDF with all the pictures, but then we'll have annotations of this means this.

4.8.1 Question 8a - Do you share your work for feedback?

Q8a) **Focus Group Leader:** Do you share your work to get feedback on it. **Participant U:** I would say yes.

Participant V: Yes.

Participant T: The meetings are good, I do a presentation of my work and then get automatic feedback straight away and everyone in your group can comment on it and that's pretty good.

Participant W: Similar sort of idea, with the presentation...we're meant to have a weekly one but that never happens.

Participant T: [To Participant U] You have 2 presentations a week don't you?

Participant U: Yeah.

Focus Group Leader: You have 2 presentations a week and a weekly report?!?

Participant T: It's amazing they get any work done isn't it.

Focus Group Leader: Do you have the time to do the work to present anything?

Participant U: We need to...

Participant T: These guys are in really early and really late, they're very hardworking.

Participant X: Yeah, share work for feedback, we don't do presentations that often, maybe once every....there used to be times where we did presentations every fortnight, but our groups got quite small recently, quite a lot of people have left so we don't do it as often.

4.8.2 Question 8b - Is sharing your work useful?

Participant T: Yeah.

Participant X: Yeah.

Participant T: It's nice to have a fresh perspective on it.

4.8.3 Question 8c - Are there people you need to be able to share your work with

Participant T: Supervisor.

Participant U: Supervisor.

Participant T: Noone you have to..

Participant U: No.

Participant W: Supervisor.

Participant U: Apart from those transfers that the University requires, to see if you are proceeding in your research or just...

4.8.4 Question 8d - Before you share your work, do you write up your notes or change the format first?

Focus Group Leader: Or does it depend?

Participant S: Yeah, even with my supervisor, because he's head of school and he's often away so sometimes I'll just have to pick out a few key plots that I've produced and stick them on a few slides with a couple of words to explain exactly what each one is so he has an easy access to what I'm doing. Because that's often when he's away for a few weeks at a time. The only way to get any feedback on what you're doing or at least to kind of keep him updated.

Participant T: Normally it's like plotting first and then make it into something that people would understand to look at it straight away and be like oh I know what's going on, rather than it just being off the computer or whatever.

Participant U: If it's just like just a chat or talk about something on the board or if it's a powerpoint presentation as we have it all the time of presentations so we have powerpoints.

Participant V: You will never present your lab book, you won't take it to your boss, we reformat it a bit.

Participant W: Yeah, format it into a story for powerpoint.

Participant V: Yeah.

Participant W: Make it make sense.

Participant X: Yeah, same. You have to format it into reports and powerpoints, but also my supervisor is really precise, he has the exact fonts and sizes that he likes. You have to have the scale perfect as well. If you don't have it it's er

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4.9 Question 9 - Do you use reference management software and if so what?

Participant T: Mendeley.

Participant V: Mendeley.

Participant U: EndNote. But it's creating a lot of problems, or I can't use it also is possible.

Participant W: EndNote as well, at the moment it's just folders and folders on the computer and I do need to sort that out.

Participant S: EndNote. Because that tends to be, it's what I first started using when I was an undergrad and because I've worked in a similar area I've just kept the library going. It's good. I don't keep it as up to date as I should as I'm not the best at reading. I keep everything in there and try and, I quite like EndNote because you can get it up to date with the full papers and you don't have to link back to the website. I tend to read something, library it and then sometimes I'll tag it. I've got a few groups of different projects. and if I'm making a series of compounds and this paper is to do with that synthesis to do with that series then that goes in that folder but I'm not the best at keeping track of it all. I've got into the habit of writing a reference in my lab book every time, if I copy a synthesis or adapt a procedure I'll say I adapted from and write a shorthand reference so I can find it later on in my library when I need to reference it. I do need to be much better at doing that. It's actually quite important to have that link between something you've done because you may have a folder of 20/30 different synthesis that you've used for one project and going through and finding the actual one that had the reaction that you used is very annoying, so you have to have that link back from the experiment you've done to find where you've got the idea or why you're repeated the synthesis from, because you have to reference that back every single time you use it in the paper.

Focus Group Leader: Focus Group Leader: I learnt the hard way that leaving your references...I mean I never left it to the last minute in a horrifically disorganised fashion but I definitely didn't keep them as up to date as I should have done for my masters.

Participant S: When I was doing my last paper, 3 of the compounds that were in it had been made previously and I found the papers and put them on my library and thought it's fine I'll just reference them later, but I hadn't actually written down which ones they were in. So it came to hunting through the thing and trying to find the ones where they'd actually synthesises each one. So it wasn't like I lost them, but when it came to writing them up it was very annoying because I'd write the sentence, these 2 had been previously synthesised here and spend half an hour to an hour trying to actually find the ones to add in. What I like with EndNote is that you can be very lazy. You can insert your citation via search. And it does all the style for you. It already has all of the templates and all of the.

Focus Group Leader: Do you LaTeX?

Participant S: No it's all Word.

Focus Group Leader: *Shocked Look*

Participant S: Yeah I know it's always a shock to Comp Sci people. We still do the old school. Again when you're writing your paper you just download the word template off them and just work in their template.

Focus Group Leader: In my last Chemistry Focus Group we had 4 computational chemists and 4 'wet' chemists, they all said word and they said they all had their paper lab notebooks and their precise notes like you. All the computational chemists all used LaTeX and Git etc.

Participant S: If you're looking to publish LaTeX is useless, the publishers don't use it.

Focus Group Leader: I know I'm trying to write a paper for a Chemistry paper and I have to use Word and it's horrible...I need to start writing computer science papers just so I can use LaTeX again.

Participant S: Because Word integrates so well with EndNote and EndNote already knows what all the journals want your references to look like, it saves time.

Focus Group Leader: I have to use ACM....the American Chemical one?

Participant S: ACS.

Focus Group Leader: Ah yes thats the one.

Participant S: Thats the best thing, being able to use the dropdown menu and changing from ACS to RSC.

4.10 Question 10 - Imagine that you are trying to locate a piece of work or some notes from 6 months ago, how would you locate these notes and the associated data?

Focus Group Leader: [To **Participant X:** and **Participant W**] did you guys start 6 months ago?

Participant X: No.

Focus Group Leader: When did you start?

Participant X and **Participant W:** October.

Focus Group Leader: Ok, well think October for [**Participant X** and **Participant W**] and 6 months ago for [**Participant T**, **Participant V** **Participant U** and **Participant S**]. How would you locate those notes or those pieces of data from 6 months ago?

Participant S: It would simply be a case of flicking back through my book. I'm very bad at dating things, in fact I don't think I've written a date in my new lab book which has been going since January.

Focus Group Leader: It's December....

Participant S: It's less relevant..some people I know will just write, go through their lab book chronologically so they'll just use the pages and flick over the page and just keep going. I don't do that, every new page gets it's own individual number and that is an experiment. And that experiment number links to everything. I have a system where I just use my initials, lab book number, page number. One synthesis will link back to that one lab book page, so it's not like I'd be flipping through looking for this note going oh god where did I write down the NMR file for this, I'd go to 7567/3, ah that's the schema I did for that reaction and that means that's the NMR filename, or if I go to the Mass Spec, once I know that experiment number I'll go to the Mass Spec and search my experiment number and it will be there on the server. The thing I do slightly different is when I'm doing transport runs

because they're less easy to find. I have a spreadsheet on the go that I update reasonably regularly so I just have a list of all the experiment numbers, the type of lipid that I've used. The compound I tested and then a sort of note of what kind of experiment it was. Some things will just be screening out one concentration, other ones will be something like a hill plot where I do 6 or 7 different concentrations. So I've got that note there, so it might say PHC Hill Plots, PH4, Compound 1, Hill Plot, Experiment Number. Again I can just search the excel sheet and find the right one and then it goes back to the experiment number again where I can just find the page in the book with all of the raw notes on. The page number on my lab book is the key that unlocks where everything else is if you see what I mean. So if I know what I'm looking for I can normally find it.

Participant T: It's normally got a date within the code somewhere so just search the date.

Participant V: Look in the lab book, the date. Then you got the code on your laptop hopefully. Should be easy..

Participant T: Yeah.

Participant W: I'd just flip to the start of the lab book.

Participant X: Pretty much. All my data has the year and then the month and then the date so it all lines up.

Participant T: In order, yeah.

Participant W: Mine's by year. It might take me a bit longer next year to find stuff.

4.11 Question 11 - Imagine that there is a fire in your lab and all of your paper notebooks are destroyed. How much of your work would be lost and how could you go about recovering this work?

Focus Group Leader: Those white pages that are in the lab are also destroyed.

Participant S: I'd be ruined. It would just be a nightmare. Because I use a duplicate book I can take out, I have a set of pages where I've taken out all the spare pages, and I'm supposed to take them home but I don't do it very often. So there's currently a pile of the last 3 months white pages on my intray which I need to go and put in a folder...

Focus Group Leader: So if the lab blew up you would genuinely be stuffed.

Participant S: Yeah, because I don't take stuff home. In theory when you take all your whitepages home and they're all stored at home so you've got a backup of everything you've ever written and that's the best thing.

Participant T: I'd just stop my PhD. It's not worth it really now.

Focus Group Leader: So that lab blows up, everything in that lab blows up, whatever hard drives or laptops that are in there, everything in that lab, that's gone. How much work would you lose and

how would you go about recovering this work?

Participant T: I'd have pretty much all my data still, because I keep my hard drive at home.

Participant V: I would lose all of my compounds.

Participant T: You'd lose all of your compounds which would be more of an issue than the data.

Participant V: That's really annoying. There's nothing we can do about it anyway, compounds you have to keep in the lab.

Participant T: I think keeping a backup at home is the best bet, for all the data and stuff.

Focus Group Leader: So you'd be able to recover.

Participant V: The data yes.

Focus Group Leader: And what about all the stuff that will have gone up in your paper notebook? Will that be recoverable? Is that also stuff that exists on a computer or stuff that you could replicate?

Participant T: Lots of my scribbles would have gone, which is a bit like oh...bit annoying, but it's not essential data.

Participant U: The weekly reports have most of my stuff.

Participant T: Yeah, thats another good thing about doing a weekly report. You've got everything written up.

Participant U: I think there's a copy.

Participant X: With the weekly reports thing, because they always write the feedback on my weekly report. All of that feedback, it's on my desk, all of the weekly reports stacked up. I don't read it but...it's still nice to have.

Focus Group Leader: Why don't you photograph it or scan it?

Participant T: Or take it home?

Participant X: I could take it home?

Focus Group Leader: What if his house burns down...

Participant X: If the two places I go burn down in one day I'm having a really bad day.

Participant S: If they both blew up I would be very upset. All of the digital data should all be on different servers. So all the raw stuff remains on where it was produced. The stuff I've written up sits on my hard drive which I then back up to my portable on occasion. So I do have multiple copies of everything. But like you say the lab book is not a perfect system because if you don't, if you haven't taken those books, those pages away somewhere else there's always the chance of losing the whole thing.

Focus Group Leader: Does that not worry you? In terms of the effect it would have on your PhD if it did. I know it's unlikely but..

Participant S: It doesn't worry me as much as it should, because I'm not careful about it. Now we've talked about it I'm probably going to go home and take that pile of papers home to go with the others. It's not too bad. I have only gone through 2 books which shocks the rest of the guys in the lab because I think I'm just a bit more concise and it's a lot more notes linking ot other bits where I can find things. So it kind of is all backed up in a folder away as long as it's somewhere else it's alright. If I didn't do that...if i lost both copies of the lab book I wouldn't really know where to start. I could probably go through and try and find out what I had because often in my excel sheets it will say for example what compound was tested but it would be very laborious. I could probably recover most of the transport data because there is a note of what compound is in the spreadsheet but it would mean opening every single one and checking that it's inside and I would lose the key to the random numbered CSVs that I've created. They would just, I'd been stuck with whatever ones I'd...so long as I'd imported and averaged the correct ones into my spreadsheet already I could get away with it but if I ever had to do that from scratch I couldn't because I wouldn't know which files were which compound and it would be a nightmare. So it is a bit scary that it's the key that unlocks everything.

Focus Group Leader: I'm sorry I feel like I've caused you serious amounts of panic about your notes.

Participant S: All afternoon I'm just going to be tearing out white pages and putting them in a folder. It does need to be done because it's the only thing that can..I do keep a record like a spreadsheet of all the transport runs to experiment numbers there's still a bit of...I could still find those again. But I'd lose for example what each of the files meant. It would be a big deal if someone came and torched it anyway. Id probably cry. Id be here for another 3 years.

Participant W: If my laptop was at home I'd be fine.

Participant X: Yeah, I keep everything, I take all the paper home, all the notebooks home. My USB stick I keep in my bag.

4.12 Question 12 - If you fell under a bus tomorrow, you don't die, you're just indisposed for a while. How would your supervisor access your work?

Focus Group Leader: also how would your industry sponsors (although I guess not applicable for you guys / colleagues / anyone who needed to be able to access your work, access your work.

Participant S: With great difficulty probably. Again, if someone had the lab book they could go through it and see what I've done. They may not necessarily have the spreadsheet to go and find the exact experiment for the first time, but if you flick open to an experiment page you'll see very clearly the reaction that I've done, or exactly what transport run I've done that day, as I do write all that detail down. And in theory you should be able to go back and get the raw data off the original servers if you needed to do that and provided you could get onto my portable hard drive you should be able to find a backup of everything. It should be possible for someone to look at my book, find the right

reaction and then be able to go through just with that experiment page number and find everything that's related to it. You should be able to find the NMR folder and the Mass Specs in my document and even the physical compound will be on a file, labeled with the compound is but also the book number for the experiment where it was made. So I think as long as you had the book you could go back between everything and that would be how you'd do it. It's all traceable via that page number.

Focus Group Leader: Is there anyone in...because some people. I've done in focus groups have worked in groups together and therefore even though their supervisor couldn't necessarily get to their stuff they could all get to each others stuff. Do you have anyone like that where you and another person or other people in your group or centralised stuff.

Participant S: We tend not to although we do collaborate on a lot of things. If we are all working on something when it comes to write up normally a dropbox folder will go up and everyone just puts everything in, and it will only be the worked up data and the transport plots that we need to publish, all of that, we'll get it all in one place and we can all find it. The other thing we do have is the group has a large portable hard drive that everyone tends to backup to every 6 months. When someone leaves the contents of their hard drive goes on this thing and then it's always there so you don't lose any of the raw stuff that they've done. It tends to be, it doesn't really, because everyone works slightly differently as well. Everyone has their own spreadsheet for working out their transport data but produces the same graph at the end of the day. Everyone kind of works on their own thing, although actually everyone in our group is working on the same project and will eventually collaborate on the same paper, it doesn't really come together until the end until it's a case of, right we're writing up, put all your plots on the dropbox and then I can find them and write the paper up. It's often not a lot of need to dip into the same pot, while you're collecting everything. It may change based on what project you're doing but currently it's not really necessary. Especially so for example I'm collaborating at the moment on a project with one of our postdocs and one of our project students but we're all doing different bits. A postdoc is doing a load of the x-ray crystallography and the synthesis, I'm working on some of the, I'm doing a load of NMR work on it and a load of selective electrode work on it, the project student is doing all the fluorescents work and we've all got our own stuff and we work it up in own way and it won't be til the end that we need to combine it. That's normally where we use the dropbox. But while we're working on it, my postdoc again is only interested in the EC50 number that I bring out, not necessarily my data, he doesn't want to go through all of that it's kind of my job to do it. But towards the end of the project tends to be where everyone needs to to be able to dip in share. We do keep some kind of group documents for stuff that's useful for people. We use a lab management website called Qartzy which is where we keep all the lab inventories so we can find all of the chemicals in the lab, but there's a few group documents on the go in there. Key 1 is failed transporters so if someone previously has made a compound that they thought was going to be great and it was rubbish you put a picture of the compound in the document with an explanation about why it didn't work just so people don't waste their time making the same things that someone maybe 5 years ago has made and hasn't worked already and we already know that. So there's a few bits like that, that we tend to keep up to date that everyone can see. And we use that as well for instrument booking and things like that which is very useful. We have a couple of spectrometers and all of our own selected electrodes set up so that people want to use them at different times, we have to use that to keep the lab organisation done and that tends to be more what we use the sort of collaborative things for.

Focus Group Leader: Do you use any LIMS? Laboratory Information Management Systems.

Participant S: I don't know. It depends what you call a Laboratory Information System. I guess that is kind of what we use, because that's where we keep the database of every chemical in the lab in there, is listed, where we bought it from, how old it is and importantly where it's stored. We've got 1800 entries in that database of chemicals in our lab and it's all just in cupboards away and so we recently actually redid the system on that where we individually numbered every single bit, it took ages, we individually numbered every single chemical in the lab. But now just by knowing the number that's listed on Qartzy you can just go to the right cupboard, the right shelf and pick up the right numbered one really quick. So we use that system, the booking system, and also it's got a group calendar that sends out reminder emails about who's on the store rota and when group meetings are and who's presenting so we use that kind of group organisational thing, so I guess, I don't know if that is a laboratory...I don't know. Not 100% sure of the definition. it's also got a group documents store as well so that's where we keep the failed transporter things like that, raw spreadsheets for new people things like that.

Participant T: They'd be able to access it off the hard drive and lab books. Just take those. The only thing they wouldn't be able to get is maybe stuff that I haven't backed up yet that's on your university login, but I imagine iSolutions can find that, and get stuff if they need to. So pretty much everything they'd be able to get.

Participant U: NMR as well, it's on a USB stick, I can run ten more samples every day, but then we have a group folder, so everyone can access that. Even if you are not there.

Participant T: I can access it.

Participant U: I know.

Participant T: Scary.

Participant X: We don't have any group folders so you'd probably have to search my memory stick and hope it wasn't in my pocket when I got run over. The lab book I always keep it in the lab. So you could read that. All of the data is saved on the instrumental computers, so you probably wouldn;t wanna do it, but you'd have to go and search it all up and load it up and click the PDFs. It would take you a while.

Participant W: My lab book stays in the lab. All of my structure solutions they could get straight off the filestore.

4.13 Question 13 - Where are all of your notes backed up, electronic and paper?

Focus Group Leader: [To Participant S]. You've covered your paper notebook backups or potential lack thereof, what about backing up your electronic stuff. Do you use version control, dropbox.

Participant S: No, I do it manually on my hard drive. I back it up physically on my hard drive and I do a backup every few months onto the group hard drive as well so there's a couple of different copies

of it. Most of my documents and things that I produce, papers, writeups is backed up by iSolutions, because I do have a iSolutions computer and some things in my documents folder but that's not big enough to keep all my data so my data is sat on my hard drive so it's part of that. I don't back it up online really. Maybe I should. Im going to go and set up dropbox now.

Participant T: They're backed up on a hard drive, the electronic stuff obviously. The paper stuff is only the duplicate stuff, I don't really have any backup stuff for just the notes.

Participant V: Same.

Focus Group Leader: Have you got your duplicates at home?

Participant T: Some of them, not all of them. My second more important lab book has not been ripped out yet. Maybe I'll do that before Christmas.

Participant V: I have to scan it in from the whitepages, It takes time.

Participant W: Just on the filestore. And my paper lab book isn't backed up at all.

Participant X: I've got everything backed up on my computer. I've only got the copies, carbon copies of my lab book.

4.14 Question 14 - Have you guys used an Electronic Lab Notebook before?

Participant T and Participant U and Participant V and **Participant X:** No.

Participant W: I have a little bit, it was hideous.

Focus Group Leader: What did you like and what didn't you like.

Participant W: We used LabTrove which was a bit of a headache to navigate. I did just forget to put things up as well, and sort of a week later I went oh what did I do? Oh quick...update that.

Participant T: I think, if you don't have your laptop in the lab, then it's one of those thing. You wanna write it down when you're doing it and then it's like an extra thing you have to do.

Participant X: Yeah.

Participant W: That's what I ended up doing.

Focus Group Leader: Is that the reason it was hideous, or was it difficult to put your data in, was it a difficult interface?

Participant W: It was, yeah. It wasn't super intuitive, the way we used it. But it made sense, because you can upload pictures of stuff taken on a microscope, which was quite nice, but then I think I would have preferred just to have it for that and then keep a normal lab book.

Participant X: Did you do it for the extra practicals.

Participant W: I did it for my 3rd year project, so not in the advanced practical.

Participant X: I think we did do it in the practicals as well.

Participant W: They taught us how to use it.

Participant X: I don't really remember it, I remember it was kinda useful that you didn;t need your lab book out, that you could do it on a computer. But it was a bit of a pain to use.

Participant T: One of the girls in our group used one when she was away in Singapore, and I was trying to re-do a reaction that she'd done, and the only copy she had, she didn't have a physical lab book, it was only on this electronic one, and I found it, but she'd put so little on it that I was really struggling to follow what she'd done, because I think it's just, obviously it's so easy just to write in the lab book, and like what has she put on there, she'd got what the experiment was and a few conditions but she hadn't written ... you know when you're in your lab book you write things like it went this colour or it did this or it took a bit more solvent, things like that it just didn't have it as it was all really formal, and it was just really hard to follow I thought.

Participant X: I think I would use it. Because all my experiments are really quick so I can sit there and then I've done 20 experiments, and it's really hard to puke up some writing so that's why I normally do it through the notepad and then write it up.

Participant W: You can also use a template if you're doing similar experiments.

Participant X: Yeah.

Participant S: I used a program called Enovalys.

Focus Group Leader: That's in my list.

Participant S: We, a few people in the department trialed it last year. And if I'm quite honest I hated it. Because firstly it was geared at only being able to use, it would only work if you were doing an organic reaction, so you had a schema of workup. If you're an organic chemist doing the same reaction over and over again and just changing slightly different quantities it would be fine but I found it quite hard to note down observations and I think the difficult thing was I didn't have a laptop to work on so I was basically writing everything into my lab notebook and then copying it into the thing on my computer which I don't thing really, I didn't really get the usefulness of. If I had say a separate laptop in the lab where I could just sit at my computer. take a reactive scheme that I've made, copy it somehow into my lab notebook and it would bring up quantities and everything for me and do the risk assessment, well not for me but bring up all the hazard information all done that would be amazingly useful if I could just walk into the lab, bring it up on my laptop and then add...what I needed was the equivalent of the written notes because when using Enovalys all it had was a picture of the schema and it was like workup steps, wash with this, wash with this. When I write it up in my lab book I'll kind of write it in the journal style so I've already got the kind of written procedure done and I quite like that because it makes it much easier for me to go back to when I'm writing up and just type it up because I don't have to think about what I did, I don't have to transcribe what the scheme said to what I actually did because it's ery easy to say, if I just had notes, I dissolved this in this and then

added this, stirred it, 24 hours, it's much easy to do it when it's already written out. And I'd say it was okay for, I could understand if you were an organic chemist doing the same reaction all the time, because then it had places where you can, they tried the right things as they had areas where you could upload your Mass Spectrum and upload your NMR spectrum but I don't really want to upload it to this cloud thing, I want it in ACD labs where I can work with it and thats a step thats annoying. If for example I could just type in the experiment name and the machine that I ran it on and have that note because then I would have to bring it off the remote server anyway thats more useful than having to upload the PDF of the Mass Spec every time because thats not how I work with that. I look at it on the remote system and then write out my assignment how it would appear in the journal to then sit in my document later on. It was just a bit inflexible with stuff like that. So it would be nice if you could, it would be more free to just make notes about what we did and have it linking back. The other thing was the flexibility of the kind of experiments. The first day I used it, I was getting used to it, did an organic reaction, wrote it up and went okay I can kind of see getting used to it. And then the next day I was doing a transport run and it was just totally useless, because when I write out my transport experiment I'm basically saying i did this experiment, I'm doing 6 cyanide 7/8 this time using this mass to start with, I lost this much solution and therefore my final concentration is this. Here is the calibration of my 2 electrode and here is a list of the files I've produced. There's nowhere to put those tables or those shorthand notes of what we've done. If it was something where I could link back, if I could sit and write out my procedure for this thing and make a copy of it every time, so I could say I've run this experiment, these are the conditions, this was the calibration and these are the files produced and again have it linking back to where the files are or have them stored on a dropbox or google drie type thing where you can then get hold of them. That would be more useful doing stuff like that than just having basically a prettified version of your reaction scheme. I think thats what..it's not actually as practically useful as even just writing things down so you know where stuff is.

4.15 Question 15 - What would you expect that an ELN would be able to do for you?

Participant T: It would be quite cool if it could do calculations.

Participant X: Yeah. It does.

Participant T: Does it? I've never had one.

Focus Group Leader: You can get some that do.

Participant V: We almost chose that Mestrey Lab book, Participant U & Vs Supervisor wanted us to start using it.

Participant T: Working out mols and stuff, it's simple to do, but quite nice if it did it for you.

Participant V: It does it for you, you can add NMRs and your formulas and stuff.

Participant T: Thats quite good.

Participant V: And you can have one folder for the lab book and you can just look at someone's lab books, and if I need a prep then I just need to click on it, find it.

Participant U: In the case of being organised and tidy. I think it's better. Sometimes you struggle to read the handwriting for example of another person's lab book.

Participant V: Yes!

Participant U: I think it's a nice idea, I would use it.

Participant V: I still would use my lab book for scrap work.

Participant T: Yes, it's like immediate, you can write things down straight away. When you're doing your experiment youve got your gloves on and stuff and you wouldn't want to be able to type, so you;d definitely have to go and write it up outside.

4.16 Question 16 - How could an ELN make recording your work better?

Participant T: Neaten up. You'd have a proper, obviously you;d generally follow the same thing every time you do a reaction, but if you had an electronic lab notebook then you'd have a template so all your experiments would be exactly the same format which would be quite useful I think.

Participant V: As well, when you want to publish, I'd have everything I want. Say I do a prep, I have a reaction and I have to go onto my laptop to tidy them up and I have to go somewhere else to find the Mass. Just on that one you have one page for your reaction, your prep, your units, your NMR, your Mass Spec.

Participant T: And you also could group things together by project, because you might be doing 1 or 2 projects at a time. Whereas in your lab book you could have one from one day and the next day you might be doing something completely different not relevant.

Participant V: I think that's what we kind of do, using dropbox. When we need to publish a paper we create a new folder on dropbox and we have everything inside, so for each component we have the relevant information, all the characterisation. So I can do it easily.

Participant X: You could put data in, that would be good.

4.17 Question 17 - What equipment are you guys allowed to take into your lab?

Focus Group Leader: For example some of you said you wouldnt take your laptop into the lab, but are there any actual restrictions on what you can take into the lab?

Participant T: I don't really know.

Participant V: We don't really ask.

Participant S: I don't have a laptop I wouldn't feel remorse for if I spill stuff on it, I would not take my personal laptop anywhere near the lab and the computer that I use in my office is a desktop, so obviously impractical but I like having a big machine to work on. If I wanted to take a laptop in it wouldn't be a problem, we do have a couple of group ones that sit in the lab and people use them to work on their transport data while theyre getting stuff off the fluorescent machine and there wouldn't be a restriction on having a laptop but I would be tempted to get one of the old iSolutions redeployed ones to take in. I wouldn't take my personal kit in there. I don't leave my phone out on the desk because there's always the chance that you'll spill something dirty on it. Theres just so much in our lab that, Ive got holes melting through my lab coat from accidently spilling acid on it the other day, and I need new ones. Its just putting stuff in harm's way. It is the most dirty place, but that's why we never take our coats, gloves, anything like that outside the lab because we keep...when you walk around the chemistry department you always look down at your feet to work out where you are, so if youve got carpet between you youre in the clean zone and theres nothing chemical, but once youre in something with a hard floor underneath its designed to be a dirty zone. You cant handle chemicals and solvents without getting them everywhere, as careful as you are its always possible just to knock something over. Ive broken a lot of glassware in a couple of years. If it was my personal laptop I wouldnt want it anywhere near the stuff in the labs, even just the atmosphere in there its not very nice. If you look at the stands and things, you take the foil bottoms off and just the rust...the stuff is falling apart. Things dont last very long in there. We had a desktop computer in there for looking up the database and it just died one day, for just no reason it wouldnt switch on anymore. I think sometimes just being in that dirty atmosphere with stuff floating in the air its not ideal. But, if I had a lab laptop that I didnt care about then it wouldnt be a problem. Id just have to be careful with typing if Ive got gloves on and things like that. It would be ok having a laptop on the central desk. Its an old one that no one wants anymore so weve kind of sacrifice it to the lab. You have to think about...if you have just been handling something. I suppose its no different to picking up your pen now you think about it, as if Ive just been handling something I wont pick up my pen because I dont want to touch that without my gloves.

Participant T: We have laptops in the lab, mainly just in our clean areas. Because we have clean and dirty areas, and you keep your laptop in the clean area. I don't normally take my laptop in, I'd use it whilst I was doing...I don't take my own laptop in it's like the group one.

Participant X: You're not meant to take it in. I think also there's a risk of contamination.

Participant T: Everyone does. I don't think you're supposed to.

Participant W: I'd probably, unless we're dealing with anything like nitrogen it's alright, you're not normally wearing a lab coat, anything in my lab isn't much contamination, its dealing with tiny amounts of chemical samples. I do tend to have my laptop in there.

Participant X: I don't really...the only time I've ever taken a thing in is I've taken my tablet in as I was going to watch something as it was really early and I was polishing electrodes and that's the most boring thing in the entire world.

Participant T: We take our laptops into the physical room as you're in a room with no windows all day.

Participant X: But the postdoc came in like you should be working.

Focus Group Leader: Could you put headphones in and listen to music?

Participant T: You're not supposed to listen to music.

Participant X: No, you're not supposed to listen to music.

Participant T: Everyone does, you're not allowed to wear headphones, that's worse.

Participant X: I think it's that you're meant to have full awareness, sometimes if it is really boring and I am doing polishing I'll have 1 in and then I can hear.

Participant V: You could have speakers.

Participant T: We have speakers.

Participant X: Yeah, I've seen quite a lot of people with radios in there. I think you can take them in.

Participant T: They've tried to ban them but we didn't have music in our lab whilst Jenny was there as we're supposed to be the good group that follows the rules because we're head of chemistry's group and then when she left we got speakers. Phill's never said anything so I don't really see the issue if he's not said anything. **Participant X:** It's more of a problem for safety. If the safety guy doesn't come round and watch people will just do whatever they want.

Participant T and **Participant U:** He's on our floor.

Participant X: He comes in our lab sometimes but always tells us a week in advance.

4.18 Question 18 - Does anyone have any other comments on ELN's or note taking in the lab or anything?

Participant T: Are there access to free ELNs.

Participant V: Mestrey is free.

Participant T: I think if they're free, it might be interesting to try and see.

Participant X: I want to try it.

Participant V: You may be able to ask for a trial, a guy came in from Syngenta, I have the contact if you want.

Participant T: Maybe I'll try it. It would be nice to try.

Focus Group Leader: [To Group] These ones are Open Source. (Group Notes down). Indigo ELN, Open Enventory. There's also Enovalys which has a free and commercial version.

Participant S: That would be the big thing, if it was linked in with the dropbox like system, so I could just say on my computer where I'm recording a transport data, if I had that just uploaded to a dropbox folder and then my notebook can find that dropbox folder and C1.csv and if I've noted down C1.CSV is this concentration and this compound and they can just kind of download it from there. Just linking all that stuff together is much more useful than saying being able to have just short handed versions of a reaction scheme because I think it's interconnecting things rather than the actual. That will be how digitising my lab book would help, not necessarily just taking it, it's got to be more than just taking it off paper. It's got to have that extra functionality to make it useful otherwise, because thats what I decided after using Enovalys all I'm doing is typing in exactly what I would write in my lab notebook and that was taking me more time, although it was off paper and was then more secure because it's online it was just taking more time.