

Electronic Research Notebook Demonstration Workshop

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About this event

A theme which arose from our 'Support for Research Notebooks' (held in Glasgow and London in late 2018) was a desire from the research community to see examples of software which could be used as research notebooks.

This first electronic research notebook demonstration workshop (hosted by the University of Glasgow) was attended by approximately 20 personnel of various backgrounds including researchers, vendors, research support and teaching staff. The day took the form of 4 speakers, all presenting their experiences with electronic research notebooks followed by Q&A sessions following each demo. The day ended with a brief introduction to Jisc by Chris Brown, and a chance for attendees to raise any additional points/ queries.

David Robertson, University of Glasgow - LabArchives

The first presenter was David Robertson from the Physics department of the University of Glasgow, representing a small team of around 4-6 staff members. With a long personal history of using electronic research notebooks the Physics lab itself has several different projects/ subprojects, with different funders linked to sub-parts of larger projects – i.e. significant cross over. Electronic research notebooks are typically used for day to day work recording, individual graphs, pictures and spreadsheets. What they are not used for is large data stores (they use a NAS), photo collections, background material, documents (these are typically held in Subversion (SVN) or Github). SVN - version control software – has a whole file system stored on a central server and is used in parallel with the electronic research notebook. User can have a local copy on their own system, then the files get synchronised. Only a problem if multiple people working on the document at the same time. Github is another version control software that is similar to subversion which keeps common files across a set of PCs however can be more complicated.

The physical environment researchers work in comprises 3 different work sites - a clean room, a 'normal' lab, and a desk area. All 3 areas could potentially (and normally would be) linked to one project, therefore there is a need to link the data.

So, what is wrong with paper? Typically, it can only be in the one place at the one time. Importantly, it can't go into cleanroom. Furthermore, paper is difficult to search. There are situations where you have multiple people working on the same project – does this mean you can have one lab book per person or one lab book per project? Finally, with paper, backups are difficult unless users digitise their notebooks.

The first electronic research notebook David used was from US Department of Energy. It could only be accessed from within the university which may present a problem as users frequently work out with their typical working environment.

Other approaches take the form of a blog - i.e. Wordpress. Frequently, they have one blog per project. This approach can have time determined entries, with tags which works well if users assign appropriate tags.

David and colleagues now use **LabArchives** (Professional edition, although there is a classroom edition) which is a web-based system. They pay an annual subscription (around \$124/person/year). It is a structured system. It also comes with version control with roll back to previous versions is possible. Designed originally for the biochemistry field it has a whole host of features related to that, but many redundant features can just be left unused.

The system has a wealth of functionality with features like one log-in per person, numerous projects in a single notebook, standard file tree system, version control, electronic signatures (which locks the page at a particular stage) and the ability to reorder documents. Additional features include the ability to attach PDFs to each entry alongside text, a zoom feature and an annotation tool for images and uploaded documents. Data is automatically backed up by LabArchives, and you can download a PDF for your own permanent, local copy, if desired.

Questions

Q: *Is there any hyperlinking between Github/ NAS and the notebook?*

A: Not yet

Q: *Where is the data stored?*

A: Data stored in US which they have no issues with, but this may be an issue for others.

Q: *What happens is the subscription is cancelled?*

A: If you stop the subscription you would need to PDF your data.

Q: *As the software is web based have you experienced any server issues?*

A: No server issues. Initially there was, but not anymore. It also works on multiple devices.

Q: *If a DOI is created via the notebook, what happens if we stop subscribing?*

A: If a DOI is in a paper it only links to the LabArchives website and not the actual data. If LabArchives mints the DOI this provides a link to the landing page for the data only. If we stop paying for it, then we lose the link to the landing page.

Q: *Does LA work offline?*

A: No, it only works online - if offline you would have to make word document and upload it.

Q: *Can LabArchives link to any repository?*

A: Unknown. And they have not tried to link the content of the notebook with SVN documents.

Q: *How do they encourage students to use this electronic research notebook?*

A: They have a very small number of students and, as yet, haven't encountered any resistance. They try to encourage, but not enforce.

Katharina Hanika, Wageningen University - eLabjournal

Katharina is a molecular/ cloning/ plant scientist currently undertaking her PhD at Wageningen University in the Netherlands and has been using eLabjournal for 2.5yrs. The University had an eLabjournal pilot in 2016 and Katharina was studying at the University during this time. Katharina directly transitioned her eLabjournal use when doing PhD and became a key user. She is one of the universities data champions and they frequently contribute to a 'data blog': <https://weblog.wur.eu/openscience/category/wur-is-serious-about-data/>.

eLabjournal was founded by Bio-Itech in 2010.

There are two arms to this research notebook:

eLABInventory (ELI) which deals with sample data and **eLABjournal (ELJ)** which deals with experimental data and there is a direct link between each. Each arm can be purchased separately as a cost of 15 euros/ month/ user. They are working towards a classroom version.

ELJ has hybrid storage where only metadata is stored in the cloud and larger data files are stored in a server on campus. This hybrid solution is problematic when wanting to export data, but IT are currently working on this. ELJ can group by department and/ or research group. Alternatively, a group can be divided into different projects. Individuals can be in as many groups as they want, and it is possible to have various levels of permission within projects, with individuals being added to certain experiments. It has a structured layout (Project – Study – Experiment), not allowing deviations such as sub-experiments of sub-study.

Other features include lock and restore versions in which you can trace back to everything that has been done, a sign and lock feature in which supervisors need to countersign documents and the system has also been certified for patenting. It also links samples to used samples and/ or generated samples as there is obviously an important difference between the two. If you click on a particular sample, it shows all the data associated with it (including links to other samples, parental strains, experiments etc.) and produces a barcode and unique sample id for each sample. Each barcode can be printed off, attached to a sample (i.e. Eppendorf, container, freezer etc.) and ELJ has an app which allows you to scan these barcodes, on the move.

You can also add excel sheets (and work in excel/ word within the lab book, although there is not, as yet, complete functionality for this), annotate documents and link up with other software such as Chemdraw. You can attach any document – both files and images – and a customisable import button can import from excel with an exact copy of the information – allowing you to import hundreds of samples at one time. They are currently working on a drag and drop function to move sample information.

There is also an option to reserve equipment which is incredibly useful for booking equipment, however, needs everyone using it.

Protocols can all be held in the one place. It is possible to import, add and share protocols and lock it so that you are the only person that can view it. You can also track different versions of a protocol to identify changes if experiments haven't quite worked out as planned. You can input dynamic fields to your protocol (i.e. for routine, daily calculations such as cell counts). PDF versions of protocols and data can be printed off and used in the lab instead of tablets and phones.

And importantly, it checks numerous times if you choose to delete anything. Even so, if data is accidentally deleted, there is always a way to restore data.

Pros and Cons of ELJ

Initially there was a lot of resistance as many 'creatures of habit' were not open to change.

The advantages of an electronic research notebook such as ELJ are that data and information is readable, structured and searchable. They increase collaboration and data sharing (promoting FAIR data, data re-use and the sharing of data/ samples and protocols), providing a good platform for discussion and improve data management as a whole. They also help with version control and supervision of students. There is one place for everything, including results, analysis, data and files – worth the extra set-up time. If a member of staff leaves, there is not any issue with having to store their paper notes (of which there can be many). With ELI, sample management is improved.

One of the disadvantages is the transition period from paper to electronic research notebook – it took 6 months to completely transition and even now Katharina still uses paper in the lab and updates her notebook when she returns to the office. In addition, some tasks can take more time when using ELJ, partly due to a requirement for WiFi. Users initially found it to have a complex interface and navigation, with a fixed structure. There was also initial confusion over the ELJ and ELI interaction. Also, it is important to ensure departments have sufficient resources to use the software. For example, more junior members of staff might be more compliant if using a tablet.

ELJ is still under improvement. As a key user, they have a good relationship with the company, and frequently give feedback on user preferences to help further develop the product.

How do you implement it?

Ideally implementation should be department wide. Some departments used volunteers which didn't work very well. Other departments made it compulsory, which seemed to work better. They started with workshop and would contact potential users every 2 months. They also provided online demonstrations and hands-on exercises and an intranet group with key users in each group. Importantly, it needs someone to actively drive it forward.

Implementation of an electronic research notebook takes time, commitment and adaptability. It is probably easiest to start with a new project/ group of experiments, or a new staff member. It is also important not to try and input previous years of data – this would take up too much time and put people off.

Questions

Q: *How well does it integrate with existing workflows?*

A: Works well.

Q: *Can you assign barcodes to anything other than samples? i.e. experiments?*

A: Not currently. In addition, you can't read other companies barcodes (i.e. equipment, instruction manuals). Manufacturer kit instructions are not already in there but can put inserted and shared publicly. You can also bring in a public protocol and modify.

Q: *Are ELJ looking to make the structure any less flexible?*

A: Unclear if they are looking to make it more flexible.

Q: *Is this electronic research notebook primarily aimed at the biosciences?*

A: Yes.

Q: *Does it link to an institutional repository?*

A: Their library is currently looking into this.

Q: *What proportion of staff/ researchers are currently using it?*

A: Plant science are the biggest users, animal science users are just starting out.

Q: *What is the costing structure?*

A: As previously mentioned, with the possibility to negotiate.

Q: *What happens to the data when people leave?*

A: When someone leaves you need to transfer the data over and change the permission status of the data to grant someone else full access.

Aislynn Taggart, Centre for Virus Research (CVR), University of Glasgow - Microsoft One Note

Aislynn is a lab manager of a group of 30 staff at the CVR.

As a group they identified what they needed:

- An accurate record of all experimental work carried out in the laboratory
- Shared space for collaborative projects
- Sustainable option that would not disappear

- Long-term storage (and access) when group members leave
- Remotely accessible for access at conferences, home etc.
- Introduction of better laboratory practice
- Data stored in EU/ UK.

And wanted:

- An efficient documentation system where file names, excel sheets etc. were all uniform
- A solution for containment level 3 (CL3), clean room data recording (where nothing can leave)
- To avoid interpretation of difficult handwriting
- Protection from accidental damage
- A system which would act as an electronic research notebook, but also as a back-up system for their data
- To prevent cumbersome storage of numerous lab books.

They tried paid, free and guest licence options, and had a significant amount of support from University IT services. Ultimately, they chose OneNote as it was free to download, the data could be saved as a PDF and shared either between groups and/ or with the principal investigator (PI).

OneNote features:

- Automatic synchronisation with OneDrive which is valuable when working with large data files
- An app which works on various tools (phones, tablets), however the group all have their own Surface Pros allowing them other features such as write to text, recording talks etc.
- Good integration with other software (including MS Office suite)
- Different levels of access for various users
- Easy recovery is available – very easy for IT to recover data/ information
- 1Tb storage.

- Uploads are very quick, even large data files
- Ability to add pages (with title date and time stamped)
- Ability to copy and paste PDF files.
- Ability to select and email a particular page.

The group have moved over to Microsoft Teams in addition to OneNote. This allows for collaboration out-with the UoG via instant messaging and filesharing. Additional features also include: four-way video calling, calendars and meetings. As part of Microsoft it automatically syncs to both OneNote and OneDrive. The group feel it is more user friendly than OneNote, particularly in terms of communicating between teams.

Newbies, leavers and safety first

All new members of staff use electronic research notebooks – no one in the lab uses paper. One of the most common questions they get asked is: **'If/when a member of staff/ student leaves, what happens to their data?'** Answer is to download a PDF hardcopy. There are 90 days before your Office 365 account is retracted, giving you time to save everything as a PDF and importantly to change the level of access to someone else so that they can access everything in the notebook.

Another question they get asked is: **What if personnel don't want to use an electronic research notebook?** As a lab, all data capture and data management is online and there is no other way to do it.

From a safety-first point of view, it is important to share lab notebooks with at least one other person, to allow access if one person is not available.

Questions

Q: *How quick is it to upload audio and visual files?*

A: They are both very quick to upload.

Q: *Is this an electronic laboratory notebook?*

A: This isn't an electronic research notebook and is not specific for the life science field.

Q: *Are there limits to the file-tree system?*

A: 3 tier limits to file-tree system.

Q: *How can you limit the number of returns from a search query?*

A: Can self-limit searches.

Q: *What is OneNote's biggest attribute?*

A: It is great for storage. As a group they have lots of samples and extensive records are required, but they can store them all within OneNote and the information is found very easily.

Q: *How long does it take new lab members to get up to speed?*

A: Around 2 weeks.

Q: *What has taken up most of the time during the implementation process?*

A: The longest transition has been moving the group over. People were very wary initially as it was a significant transition.

Q: *How much time does it save?*

A: More than halved work in CI3.

Q: *What has been the outcome of using OneNote?*

A: Increased productivity and efficiency.

Q: *How did you start the implementation process?*

A: Sat down as a team and identified what they required and what they were going to do over a couple of days.

Q: *How much has changed since that initial decision?*

A: Not much tweaking since first decisions were made.

Q: *Do you have problems with being involved in different teams?*

A: No, not if you tag a person into a message that way you don't have to read everything.

Richard Adams - RSpace

Whilst research is not a linear process, note taking in the form of paper laboratory notebooks is linear, and the use of electronic research notebooks can combat this by linking to different samples, experiments etc. There are 3 phases: creating content, working with content and extracting your content.

RSpace is a small, independent company and its software has several versions ranging from free to the enterprise edition. The location of this edition is the customer's choice. If desired, it can be stored on local servers and managed by local IT services.

Features of RSpace:

- Searchable (search terms appear both in document and in gallery which lets you click on an item and see all the different areas it can be found i.e. all experiments, papers, reports etc.).
- Being able to link externally and embed office documents.
- Audit trails
- Versioning
- Data sharing and collaboration (automatic sharing with PI and user, although PI cannot edit, without permission)

- Signing/ witnessing.
- Automated metadata capture - at time of carrying out experiment - very helpful and saves trying to remember.
- Incoming messages and notifications
- Compatible with numerous formats: maths equations, code samples, sketches.
- Can upload CSV files
- Document templates (useful for junior/ new members and can help identify where something went wrong)
- Drag and drop
- Tagging and favourites: helps to organise data any way you like
- Software integration: can switch on and off various integrations
- MS Teams integration: can send messages via RSpace with a link to resource. Conversely, link within MS Teams to RSpace
- Can browse RSpace out with the software
- Document duplication and editing (for taking into lab for example)
- Available on multiple devices (although Tablet offering not as good as competitors)
- Mounts for lab bench for hands free working
- Data export in the form of HTML (complete offline record, varying levels of how much can be exported, including uploaded files) and XML (which is machine readable). XML can be transferred to another electronic research notebook from RSpace.
- API Key
- Connected to repository
- Owncloud integration and Evernote import expected in April 2019 release
- In-browser MS office editing.

Getting started

Ideally start with a new project or new staff member. Find what works for you or your lab. Include existing digital resources by linking to them, but don't try to work on an old project or try to input old data – this will be incredibly time consuming and put people off in the first instance.

Discuss with your group about how to organise your shared folder and perhaps consider a mailing list (i.e. Slack or MSTeams)

It is up to the individual laboratory how they want to organise their work, whether chronologically, by project or both – once a project folder is set up it is possible to order input chronologically.

It is perhaps worth considering using a forum for exchanging tips and ideas, and to streamline ways of working.

Organisation of content

Different approaches are possible. For example, by date or by project. It is also possible to mix and match these approaches.

Creating content

Content can be created by either direct entry, importing files from existing data, file uploads or linking to existing data. Everything is indexed, including content of imported text-based files (i.e. from a word document).

Questions

Q: *Does RSpace work when offline?*

A: No, RSpace doesn't work offline.

Q: *What are the weakest elements of RSpace?*

A: Mobile experience and discovering features - things can sometimes be difficult to find.

Q: *What are Rspace's strongest features?*

A: Exporting, generic electronic research notebook functionality (making it suitable for other fields such as social sciences). Linking and connecting to other sources. Group organisation and permission.

Chris Brown - Jisc

Jisc have launched the Open Research Hub to help integrate archival and active research data. Also, a way to promote the open science agenda through deposition and preservation of data.

Jisc also host the RDM toolkit which is can be used for best practice and guidance i.e. incorporating the findings from various workshops.

Future options for Jisc

Procurement framework to select a particular tool to test and potentially adopt. Consequently, Jisc need to assess current tools and the level of demand for those tools.

Exploratory work to identify interoperability between electronic research notebooks, repositories and CRIS using open standards. Testing and pushing/ establishing open standards.

However, it is important to identify whether institutions actually want this? Therefore, the use of case studies is very important.

Questions

Q: *Do vendors link up and work together?*

A: Currently, there is little appetite to allow individual vendors to link up and work together - but this is the ultimate goal.

Q: *What would be the preferred export from an electronic research notebook?*

A: The PDF is a closed proprietary system which is not ideal. We need another output to allow systems to interoperate.

Q; *Any thoughts on interdisciplinary collaboration?*

A: Interdisciplinary collaboration needs development. The interchange format is extremely important. Also need systems that maximise the efficiency of staff time and one that suits a variety of stakeholders including undergraduates, post graduates and post-doctoral scientists.

Our next electronic research notebook demonstration workshop will be held in Sheffield on 5th April 2019.

Notes: Kara McNair & Alison Spence 18/3/2019