Keeping Your Scientific Information Online

F. Nicholas Rahaghi
COO, e-nnovate Technologies Inc.

Summary of Presentation

- Evolution of scientific information management
- Translating old capabilities
- Enhancing new features
- Practical Considerations
- Future Directions
- Q&A and Discussion.

LIMS and ELNs Defined

- LIMS: Laboratory Information Management Systems
  - Automated tracking of specimens, experiments and data generated from those experiments.
  - The goal is to manage large quantities of similar information
- ELN: Electronic Lab Notebooks
  - Acts as a repository of ideas, experiments, data and discussion
  - More flexible and geared towards intellectual property generation

Things To Keep In Mind

- How repetitive are your experiments? Do they involve a serial set of similar tests?
- How many people are involved and at what level?
- How much creativity and knowledge generation is involved?
- Level of training and adaptation resistance

Focus: ELNs

- ELNs geared towards the evolution of information
- Act as your idea Journal
- Act as your observation journal
- Acts as your data storage
- Acts as your discussion forum w/ collaborators

Current Paradigm

- Write ideas in a text file in your ideas folder
- Write observations in a paper notebook
- Store data in your harddrive
- Have discussions over e-mail or by the water cooler.

Translating Previous Capabilities

Durability

- Paper is considered durable but some hazards can destroy it
- Data without management has limited life-span
- Two Factors:
  - Material Limitations (Some Cheap CDs have lifespan of <10 yrs and harddrives go bad)
  - Incompatibility: Data becomes incompatible to reading devices and software

Material Limits

- Completely solved by re-recording static data periodically and backing up dynamic data often.
- This also solves the hardware incompatibility issues
- One of the great advantages having off-site data management is that your data is backed up and transformed to new upgraded media without requiring your time.
- Your data can last as long as digital age continues!

Software Incompatibility

- Must use nonproprietary formats with history of backward compatibility
  - Examples: Store Excel files as Comma Separated Values (.CSV) files
  - Store images as .jpg
  - Store documents as .html or text (Ascii codes have remained the same!)

Scientific Merit

- Notebooks offer a level of professional scientific merit to your work
- To be compatible, your ELN must offer signature function (Another Words a time-stamp beyond which you cannot alter an entry). This corresponds to you “entering” your information and signing it as you would in a lab-notebaook
- Witnessing function also lends credibility to the entry.
- Editing of “signed” entries must not be permitted

21 CFR 11

- The acceptance of electronic documents with electronic signatures as valid in regulatory fulfillment
- Very important if work is to be ultimately submitted to organizations such as FDA
- Most ELN have features that make them “more” 21 CFR 11 compliant
- You must evaluate the features and their compliance level in the context of your organizational needs. Seek legal counsel.

21 CFR 11 ‘Some’ Features

- Traceable, auditable access logs
- Identity verification using passwords
- Documented electronic signatures (with identity verification)
- Server security features
- See federal agency or rule documents for more specifics

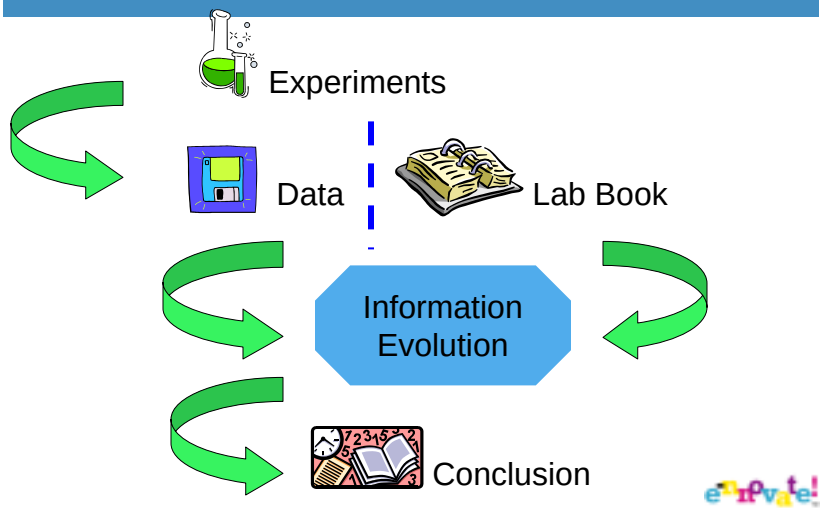
Intellectual Property Protection

- Notebooks are often used for intellectual property protection (‘We did it first!’)
- Entry date-time documentation, electronic signature at the end of each entry and witnessing abilities are very necessary
- Ultimately courts decide validity based on a myriad of supporting information
- E-nnovate offers a set of services to our customers to enhance their intellectual property documentation.
- Ultimately everything is only as good as your lawyer!

New Abilities

www.e-nnovate.com

Experiment Information Flow



www.e-nnovate.com

Streamlined Recording

- Need to record ideas,observations and data
- Currently bottleneck is entry point is not the same for these three types of information
- Integration of idea/observation text with data files into one entry system
- Recording can occur at any computer and small web-appliances

Improved Organization

- You can plan out a project by structuring topics, experiments and entries
- Different individuals can fill in the different pieces of the larger design
- Project managers can see holistic progress without intruding in the daily work flow
- New paradigms can borrow entries and experiments from older projects
- Different people can work on the same piece of a project without having to pass around a physical object

Increased Access

- Current deployment is accessible anywhere in the world where the web is available
- Can use any machine that has a web-browser
- Don’t need to carry around your notebook.
- Can work from home on entries and particularly in reviewing the contents and thinking process

Fast Sharing

- Instead of having to “give” someone the notebook (or copy few pages) can give direct access to entries
- Can regulate who can see what entries. Thus you can collaborate without exposing IP sensitive parts of your notebook
- Can make entries public (to the entire internet) to spread your findings
- Can invite collaborators who can view and comment on your entries.

Easy Searching

- Can search old notebooks or other people's notebooks for information
- Indirectly assists in sharing because others can find information that follows your specific organization scheme
- Allows you to quickly find current information
- Very powerful search functions are built in. As a field we are very good as search functions.

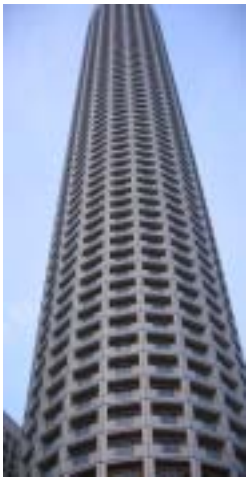
Increase Knowledge Production

Having the following all in one place

- The plan and larger picture
- The information
- Reorganization
- Discussion

- Leads to increased speed and quality of the generation of the final product:
  - A manuscript
  - A design
  - A concensus/conclusion

Secure



- All your information is only accessible to authorized individuals
- Firewalls, encrypted communication
- Frequent back-ups protect against loss
- Ultimately, nothing is a 100% safe on a network. BUT it is also not a 100% safe sitting on your bench-top!

Practical Considerations

Equipment Needed

- Computers and Networks!
  - Many ELNs are platform dependent and require software installation. E-nnovate's is not and so any web enabled computer can access it.
- Data entry modules near the workbench
  - A variety of options exist here, from PDAs, to covered laptops and off course desktops.

Cost

- Core Enterprise deployment of ELNs usually very similar to the cost of other software (Office, etc…) and works a license where users can be added
- Costs are incurred if you want modifications and additional support (consulting)
- Global access is a flat per user fee
- In our case costs are less or comparable to a cost of a real notebook per month with invited collaborators (who can view and comment) joining for free.

Enterprise Versus Internet

- In many cases you have a choice of the scale of deployment.
- Though the term “enterprise” is suggestive of a superior product, the scale of deployment is more a matter of priorities and existing infrastructure
- Enterprise deployment manages information on your network and servers whereas Internet deployment outsource this to professionally maintained servers and software

Global Deployment

Advantages

- No administrative overhead
- No need for existing server/network infrastructure beyond internet access
- Simpler Global Access and collaborative features
- Extremely simple to set up an account
- Automatically backed up

Disadvantages

- Less ability to directly manage features
- Cannot modify as much of the interface to fit your specific needs
- If moving very large amounts of data (> gig/day) may overwhelm internet bandwidth

Enterprise Deployment

Advantages

- Complete flexibility to alter interface and specification
- Direct (But not necessarily better!) control over access
- Very little bandwidth limitations
- More cost-effective for larger organizations

Disadvantages

- Requires existing network infrastructure beyond internet access
- Server administration required
- Back-ups may be automated but are still your responsibility
- Slightly more complex to get off-site users involved

The Future

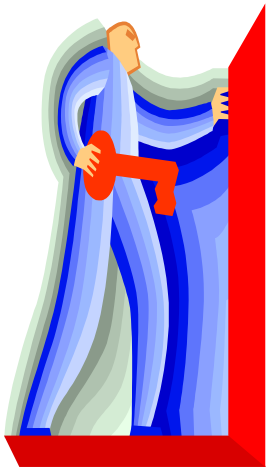
E-nnovate's Vision

- One system that takes ideas to final documents (Papers, Designs)
- Allows individuals with very complex thinking patterns and creativity to collaborate and use the same software to help the information evolution process.

Future Directions

- Compatibility with small web-appliances
- Integration with other applications

Join the Defining Moments



- The field is very young and you now have the chance help define future direction
- Try systems and give feedback!
- Please sign up or visit our website and let us know about your wish-list and comments.

For more information

- Let us know how we can help your design a collaborative environment for your needs!
- Info@e-nnovate.com