

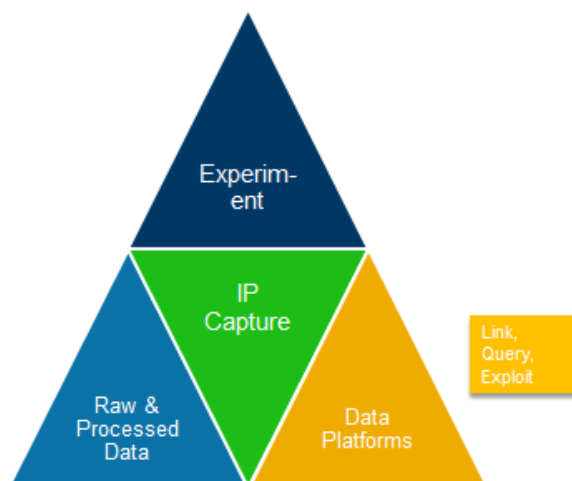
Experiment Capture & ELN Adoption Lifecycle

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Even if you know you need an ELN, it's worth thinking holistically about the data lifecycle for your experiment capture process that starts before an ELN gets involved and ends much further downstream in how that experiment data is used in longer-term knowledge aggregation, decision making and insight generation. As an intro, we use the term Experiment Capture to avoid using system names like ELN and LIMS too much since from our experience as soon as you start using those terms people are already thinking about the product itself. When there is more to it than that!

ELN adoption for Experiment Capture has become very prominent over the last 10-15 years with their ability to satisfy IP needs and support broad experiment data capture across chemistry, biology and beyond (vaccines, biologics and other modalities). The current installed base of ELNs covers the range of the industry now from large biopharma to SMEs, agro & food and Research orgs in between. Equally, ELN adoption is not universal in all organisations for reasons of cost, current business practices or using alternate tools as substitutes. The pressures and challenges of digital transformation and Lab of the Future strategies place their own requirements onto the experiment capture process and connected ecosystems.

Experiment Capture – define Experiment data



ELN Life cycle & current situation in 2020

Current ELN deployments:

- The original wave of ELNs from the mid-2000s are probably at a transition point, so that first wave of ELNs are at their 10 years point or beyond
 - That would have been the larger companies first
 - Then mid-size and others have adopted
 - Then the recent wave of SME going direct to SaaS ELNs (Dotmatics & a host of others etc)
- The early deployments of ELNs were often heavily customised which puts challenges on any future changes and upgrades. For some users & orgs, version upgrades have been postponed due to the costs of upgrade steps and redoing customised workflows with new versions.
- The move to the Cloud SaaS solutions from thick client means that customers can consider alternates now since there is a change process needed in moving to a Cloud/SaaS version anyway but that is not free of cost or disruption (e.g. IDBS, Biovia, Perkin Elmer, Dotmatics etc all have Cloud/SaaS solutions plus many others).
- Alternates out there now like Benchling & from a wide & hungry group of companies (e.g. Arxspan, CDD, SciNote, Sciligence and others) are all Cloud/SaaS from the start. The barrier to creating an ELN product is easier than it was previously and given the quality of web components but specialist components (Chemistry editing, complex data & biology object handling) need more thought and usability considerations.

- Science is evolving and a greater focus on especially the biology/Genomics workflows and not just chemistry synthesis mean that one ELN can rarely provide all the functionality across an organisation. It's possible that modules within a larger ELN could be tailored for specialist groups.
- User expectations have changed and certainly require better usability (UX) and support for the mobiles to fit into Lab of Future planning

A far bigger issue is that there is frustration that the promises of ELNs for improving experiment capture process and especially the quality of data & accessibility (e.g FAIR principles & reproducibility) has not been successful. The cost of ELNs has been high both in terms of lifetime costs and setup costs. Much of the data in an ELN currently are poorly structured and requires considerable wrangling & annotations to make it useful for analysis. The importance of data being 'born FAIR' to support analysis and AI/ML workflows are becoming critical and the experiment capture tools will need to step up in terms of these enrichment workflows.

Experimental Capture Tools Lifecycle

Our feeling is that a typical length of an ELN install since 2006, is nearer to 10 years than say 5 years for a few reasons

- Sheer change process for getting the first ELN means there is a lot of effort invested & tears!
- Original ELNs were heavily customised, even users were told this was configuration and was easy to repeat but it's not worked out like this
- Cost of change can be high for the integration with upstream/downstream systems and other issues
- In the future the change process could be quicker since the users' expectations for customisation are less based on the pain felt previously and so the change process will be less in the future. Equally, the ELN SaaS suppliers are keen to maintain a common code branch compared to the thick client model previously
- Cloud to Cloud integration will have change costs and those needed to be considered.

Equally, ELNs have been a victim of their own success and discussions of what should and should not be done in an ELN have grown. In terms of data management ELNs have often ended up being a 'dumping ground' for data and datafiles and this is now a serious issue with the breadth and variety of data coming from Experiment workflows. Also as mentioned above, the usability of the data captured in ELNs for downstream analysis has to be questioned.

How many Experimental Capture Tools should we have?

We are seeing a trend whereby more specialist ELNs are being deployed rather than seeking to force a wide variety of science workflows into a single tool. For instance, the needs of a chemist are very different to that of a molecular biologist or Omics work. That is partly why Benchling is doing well as they have focussed in molecular biology & NGS.

Using a 'Lord of the Rings' Analogy, there should not be one ELN client to rule them all but a spread of suitable ELN clients based on business domain.

Change processes

Many of the larger Pharma are looking at their ELNs as their first ELN lifecycle comes to an end. For some, they are sticking as the cost of change is too high or not considered a priority compared to other portfolio activities. Others have begun looking and running RFPs for selection. We have been involved in some of these. There are at least 4 large biopharma who have run or are running RFPs in the last 12 months. Some chose to select a new ELN compared to what they had before, others have looked and decided to stay with

the current vendor but move to the new SaaS offering that the vendor now has. We expect this process to continue.

Longer-term

We feel you cannot simply run an ELN selection process before one really has time to consider the wider experiment capture process and data lifecycle plus there are far more components and issues to consider these days. The need to have a range of Experiment capture tools is something we firmly believe in and one to consider as you plan your strategy.

Future Experiment Capture Environments

One approach to the future Experiment Capture environment is to consider the key workflows needed to record an experiment and preserve the data. A solution to this is to deconvolute the components of the ELN into the core services and components, as shown below in the diagram. The reasons this can be useful is that it can support some key principles:

- Diversity of science processes, and their expected growth, within Life Science R&D means that one Experiment capture client will not suit all user persona nor domains.
 - Being able to decouple the client from the core services will support this agility
- Ability to support FAIR principles for semantic enrichment of the experiment data in a flexible way and from data creation
- Importance of API access to data for downstream data pipelines and workflows to operational marts, graph DBs and data lakes.

Equally it does not mean that you need to create your own ELN but one must be clear what parts of the system you are going to use over using other services available to you. As mentioned the challenges of ELN have been the cost of ownership and updates over time that has made them slow to change and adapt to changing circumstances. These principles can be used to evaluate the suitability of the ELNs and to check their ability to satisfy these over the lifetime of the relationship.

For further information please get in touch



Experiment Capture Component Stack

