Technological survey on LIMS and ELN in Life Sciences

*Project ShareBiotech – University of Nantes*
# TABLE OF CONTENT

Introduction ........................................................................................................................................4
  1 - The European project ShareBiotech .........................................................................................4
  2 - The technological needs in the Life Science market .............................................................4

Survey background ............................................................................................................................5
  1 - Background and objectives .......................................................................................................5
  2 - Methodology ............................................................................................................................5

Computer data management system market landscape .................................................................7
  1 - Data management solutions ......................................................................................................7
  2 - The data management market ..................................................................................................9
  3 - The ELN market .......................................................................................................................10
  4 - The LIMS market ....................................................................................................................11
  5 - ELN and LIMS suppliers .........................................................................................................11

Supplier interviews ..........................................................................................................................14

User typology for the survey ...........................................................................................................15

Phone interview survey ....................................................................................................................17
  1 - Academic laboratories and technological core facilities ......................................................17
  2 - SMEs: Biotechs and CRO .......................................................................................................18
  3 - Corporate groups .....................................................................................................................18

Online surveys ..................................................................................................................................20
  1 – Academic laboratories and technological core facilities (N=30) ..........................................20
    a) Positions and responsibilities of surveyed contacts ............................................................20
    b) Implemented quality standards ...........................................................................................21
    c) Computer data stored ...........................................................................................................21
    d) Awareness of data management solutions ...........................................................................22
    e) Implemented LIMS & ELN data management system .......................................................22
    f) Factors triggering the adoption of a data management system ...........................................23
    g) Factors limiting the adoption of a data management system .............................................24
    h) Benefits of implementing a data management system .......................................................24
  2 – SMEs: Biotech and CRO (N=17) ..............................................................................................25
    a) Positions and responsibilities of surveyed contacts ............................................................25
b) Implemented quality standards ................................................................. 26

c) Computer data stored .................................................................................. 26

d) Awareness of data management solutions .................................................. 27

e) Implemented LIMS & ELN data management system ................................. 27

f) Factors triggering the adoption of a data management system ................... 28

g) Factors limiting the adoption of a data management system ....................... 29

h) Benefits of implementing a data management system .................................. 30

Analysis ............................................................................................................. 30

1 - The market ................................................................................................. 30

2 - Quality system ........................................................................................... 31

3 - LIMS/ELN ..................................................................................................... 31

4 - Suppliers ........................................................................................................ 32

5 - Corporate groups ......................................................................................... 32

6 - Academic laboratories and SMEs ............................................................... 32

Recommendations ............................................................................................. 33

APPENDICES .................................................................................................... 34

Appendix 1: Online survey ................................................................................ 35

Appendix 2: Supplier company profiles ............................................................ 40

Appendix 3: Surveyed contact list ..................................................................... 49

Appendix 4: Peer recommendations .................................................................. 51

ABBREVIATIONS ............................................................................................... 52

For more information about this technological survey, please do not hesitate to contact us:

- ShareBiotech project manager: Charlotte LEPIERE-DOUARD
  charlotte.lepere-douard@univ-nantes.fr

- Novoptim marketing consultant: Dorothee ALLARD
  dorothee@novoptim.com
Introduction

1 - The European project ShareBiotech
The European project ShareBiotech gathers 4 countries: Ireland, France, Spain and Portugal. The objective of this project is to strengthen the biotechnology sector within the Atlantic Area and improve the service offer of the technological core facilities involved in the project. ShareBiotech notably aims at making technological core facilities more accessible to companies – and specifically small & medium enterprises (SMEs) – working in the field of human health, nutrition, agriculture/food-processing, cosmetics, marine biology and environment. Providing companies with technological service offers and carrying out collaborative research projects will also contribute to facilitate Research & Development (R&D) projects.

In 2010, ShareBiotech initiated a technological survey amongst their members (including academic laboratories and technological core facilities (1), Biotech companies (2) and CROs (3)) to identify the current technological needs. The survey revealed a strong demand in bioinformatics and more specifically the need for data analysis, management and storage.

2 - The technological needs in the Life Science market
The sudden increase in “high content” technologies has created the need to structure data management. Since the mid-90’s, correlated to the human genome sequencing achievement, “high content” technologies emerged, initially in genomics (sequencing, microarray, genotyping, SNP…) followed by proteomics (protein identification on 2D-LC-MSMS, protein microarray, biomarker identification…). By the year 2000, high content screening (screening of millions of molecules on a therapeutic target of interest) and metabolomics (metabolite identification using LS MS-MS) also required strong data management. In fact, these ultra powerful “high content” technologies generated massive amount of data useful in research to better understand disease causes and develop new therapies. The high content technologies have opened up new perspectives to researchers and have allowed significant scientific breakthrough.

These “high content” processes are usually led in partnership between academic laboratories and industries. Technologies are first developed by academics and the proof of concept is demonstrated by academics in pilot studies. When validated, the technologies are transferred to the industry for routine application. These technologies have initially been applied in human health and since they provided promising results, other Life Science sectors (animal health, agrofood, cosmetics, environment, biologic and medical chemistry) also adopted the tools.

Considering the amount of data generated, data accumulation and transfer, the data integration in the R&D process has become a bottleneck, specifically in the Pharma industry since a reliable traceability of data is required to comply with regulation.

---

(1) Technological core facilities are structures that provide a particular type of research material (such as data acquisition, data analysis, consultation, and/or other service) and give access to technologies and services that are generally beyond the technical or financial capability of individual investigators. Often the use of these facilities is shared across departments and disciplines.

(2) A Contract research organization (CRO) provides support to pharmaceutical and biotechnology industries as outsourced services based on a contract agreement.

(3) “Biotechs” stands for biotechnologies and have for main activities cellular and biomolecular techniques to develop products or services for human health care, animal health care, agricultural productivity, food processing, renewable resources, industrial manufacturing and environmental management.
Survey background

1 - Background and objectives
In 2010, ShareBiotech partners carried out a survey in France, Spain, Portugal and Ireland amongst their members: 183 research groups and 143 companies working in the field of Life Sciences were interviewed to understand R&D activities and identify technological needs and hurdles in their research activities. One of the conclusion of the study was a strong need for quality procedure, including data processing, data management and transfer. Many research groups and companies expressed the need to implement a clever data management system compatible with the current data management process in place in their institution/company. Considering the number of solutions available on the market (commercial software, open source, etc.), ShareBiotech decided to conduct a survey to better understand current solution implemented and users expectations, in terms of quality, data traceability, and compatibility. ShareBiotech appointed Novoptim to conduct a market survey, to advise and support its members (academic laboratories and Biotech/CRO companies) in data management. The main objective of the study is to understand the current status and practices in data management in the Life Science market (industry and academic) as well as to identify the main solutions available.

2 - Methodology
For the current project, Novoptim applied its proprietary and validated methodology. The geography of the study was focused on France. The target market was Life Science including Pharma, Biotech, Agrofood and Cosmetics.

The project was split in 2 phases (see Figure 1):
- Phase 1: market research
- Phase 2: field-based research

Phase 1 aimed at drawing the data management solution landscape, its trends and current challenges, as well as the specifics of the Life Science market. Data were extracted from journals and publications, interviews with Key Opinion Leaders, web searches, proprietary data, etc. The data collected was processed and thoroughly analyzed to draw the macro economical landscape.

Phase 2 aimed at assessing the current needs and providing answers related to the implementation of data management solutions, by probing the following market actors:
- LIMS/ELN suppliers
- Potential users in academic organizations (academic laboratories and technological core facilities) and Biotech/CROs
- Corporate groups

Corporate groups are well-established companies with more than 250 employees and a turnover of at least 50M€ (opposite to Small & Medium Enterprises (SMEs)).
Figure 1 – Survey methodology

For the LIMS/ELN suppliers, a questionnaire was designed to interview by phone a sample of 8 contacts and to collect feedback to understand the trends, the field of activity, the commonly used tools and assess market penetration. For the potential users, the feedback was generated in 2 steps:
- Phone interviews (8 academics and 3 Biotechs/CRO) were conducted to segment the market, generate a first level of feedback on the needs and specify the target population
- The online survey was designed based on the data generated by the phone interviews (see Appendix 1). A total of 30 academics and 17 Biotechs/CRO were surveyed to answer the following questions:
  - What types of quality procedures are currently in place?
  - How do you currently manage data?
  - What type of data do you manage?
  - Did you design your own solution in-house or did you buy it from a supplier (if so, which one)?
  - Are you familiar with ELN? LIMS?
  - What are the advantages and limitations?
  - What are the benefits (expected benefits) for implementing data management solutions?

Finally, corporate groups were surveyed to understand their expectations in terms of data management when working with academics and Biotechs / CRO. Phone interviews were conducted with 4 groups in the targeted segments: 2 Pharmas, 1 Cosmetics and 1 Agrofood.
Computer data management system market landscape

1 - Data management solutions
A R&D-driven company might rely on hundreds of different ways to acquire, store and analyze data, some of them requiring “homemade” solutions to match different scientific processes. These different data management processes often force scientists to handle different type of files and transfer data from one program into another, an error-prone process that leads to inefficiencies and productivity losses. Because the R&D process is focused on innovation, there is no single way that scientists, chemists, engineers look at, manipulate, and analyze their data. Thus, a flexible approach that empowers scientists to apply their research in a way that works best for them is required. This approach must accommodate the success of R&D initiatives, and at the same time, provide a framework for improved decision-making, enhanced results, shorter time to market and ideally decrease costs.

During the survey conducted by ShareBiotech in 2010, two different types of electronic data management systems were identified: the Electronic Laboratory Notebook (ELN) and the Laboratory Information Management System (LIMS).

ELN is the computer-based version of the paper laboratory notebook that keeps track of experimental data, procedures and document research performed in a laboratory. The ELN is designed for the same purpose as the paper laboratory notebook and allows connection between scientists, instruments and software in regulated and non-regulated environments (see Figure 2).

![Figure 2 – ELN applications](image-url)
The first ELN solution was developed in the 1990s. 2 types of ELN are currently on the market:
- Generic ELN: not dedicated to any discipline/application and adapted to full enterprise deployment
- Specific ELN: developed for a particular discipline or application, adapted to department-wide deployment

The main asset of ELN is its regulatory and legal compliance. ELN is expected to comply with FDA regulations related to software protection (electronic signature for example) and is often referred to patent prosecution and IP litigation.

LIMS is designed to store data (sample management, instrument and application integration, electronic data exchange and more) and is useful for operational entities in the laboratory to manage samples and sample flow management (see Figure 3).

**Figure 3 – LIMS applications**

The first LIMS solution appeared in the 1970s and the first commercial solution was launched in 1982. 2 types of LIMS are currently on the market:
- Commercial (license based solutions)
- OpenSource (free access solutions designed by web communities)

LIMS have multiple uses in quality control/quality assurance (QA/QC), manufacturing, R&D laboratories, workflow and data tracking support. Compared to ELN, LIMS is highly configurable and scalable (well adapted for research in genomic and genetic laboratories for example) with a flexible architecture and smart data exchange interfaces.
The implementation of data management solutions in the Life Science environment is complicated. The work plan/architecture and solution strategy will be different according to the type of activity: industry, academic or solution provider (such as CRO for pharmaceutical industry), therefore making it difficult to provide a common generic solution.

Before implementing a data management solution, the aims and objectives must be well specified to ensure that the solution will match the specific needs. The evaluation and routine use of LIMS and ELN cannot be implemented before settling the strategy.

As a matter of fact, designing the right product requires accessing, integrating, storing and analyzing a vast amount of data. Everything from complex scientific data for drugs, chemicals and materials is connected to the associated information needed to bring the product successfully to market. Without an efficient data management solution the innovation process can easily slow down, delaying its implementation and the associated benefits.

2 - The data management market

![Figure 4](image-url)

**Figure 4** – The Life Science instrumentation market with detailed Lab. Automation
and analytical science spending (Source: Strategic Direction Inc., Instrument Business Outlook- Jan 2011).

In 2010 the worldwide Life Science instrumentation market generated about $40 billions, including Lab. automation ($2,8 billions) and Analytical Science ($37,2 billions) (see Figure 4).

The Lab. automation market is split into 4 segments: liquid handling, microplate readers, robotics and IT management, accounting for approximately 7% of the analytical Life Science instrumentation market. The LIMS/ELN fits into the IT management segment.

In 2012, LIMS and ELN accounted for 5% ($440 millions) of the total Lab. automation spending.

3 - The ELN market
The ELN market (see Figure 5) is one of the fastest growing IT segment with a turnover of $80 millions in 2010. In the upcoming 3 years, the segment is expected to grow by 25-30%.

The market is driven by multiple factors such as compliance with external regulation, IP protection, instrument management, as well as workflow management and quality control.

![Figure 5](image.jpg)

**Figure 5** – World ELN revenues and projections (Source: Estimation from Atrium Research consulting (2010), «ELN: a global strategic business report » companies and markets.com (2011), « Laboratory informatics guide 2008" Europa Science LTD).

Five major players dominate the ELN market (representing 60% of the total market):
- CambridgeSoft (Perkin Elmer)
- Accelrys (Symyx ELN, Contur EN) (Thermo Fisher)
- Velquest
- Waters
- IDBS
While the vast majority of companies are keen to adopt ELN in areas such as formulation, bioanalytics or R&D, there remain a number of challenges preventing the 'paperless' laboratory environment. As a relatively new technology, the ELN introduces innovative ways of working and unfamiliar procedures. The biggest obstacle is the integration and interoperability between the new system and the existing laboratory infrastructure.

4 - The LIMS market
In 2010, the LIMS market was estimated around $380 - $450 millions (source: ChemWare, 2011) and is expected to grow by 3-4% in the upcoming years (see Figure 6). Pharmaceutical laboratories (with clinical trials, genomics and quality/R&D) as well as chemical and petrochemical products generate 90% of this turnover.

IT players and instrument manufacturers dominate the LIMS market:
Pure players
- LabLynx (Elab LIMS) (inc. 2000)
- LabWare (partner Waters)
- Labvantage (SQL LIMS & Sapphire LIMS)
- AT Lab
Equipment & solution providers
- Perkin (LABWORKS)
- Abbott (STARLIMS)
- Thermo (Watson LIMS)

Figure 6 - World LIMS revenues and projections (Sources: Estimation from ControlGlobal.com (2009), Chemware (2011), ControlGlobal.com based on ARC Advisory Group report (2009)).

5 - ELN and LIMS suppliers
Different types of LIMS and ELN are currently available on the market (see Figure 7). The suppliers’ segmentation is based on solution specificity (niche market) or broad range of applications. A non-exhaustive list of providers and their ELN/LIMS solutions is provided in Appendix 2 (with details on solution type, brand, price,

Broad range suppliers provide LIMS and ELN solutions, but also other products and services (such as equipment from Perkin Elmer). Moreover their LIMS/ELN solutions are more expensive and adapted to well-established/corporate groups, since they offer packaged solution with multiple modules. Small companies and academic laboratories do not have a need for such sophisticated solutions.

Niche suppliers offer more specific solutions with a reduced number of modules and focus on specific application. These solutions are more adapted to small companies and academic environment.
Figure 7 – LIMS and ELN solutions
The LIMS market is reaching a consolidation stage: there has been recently a strong merger and acquisition activity and niche suppliers were acquired by large and well-established companies such as Abbott, Perkin Elmer and Thermo Fischer (see Figure 8).

**Figure 8 - Fusion and acquisition of niche solutions by major actors**

### Supplier interviews

The field-based research phase (Phase 2) started with 8 phone interviews of LIMS/ELN suppliers:
- Thermo Fisher
- Perkin Elmer
- Agilebio (LabCollector)
- Loc@soft
- Stratocore (PPMS)
- SPC consulting (2 contacts)
- OVUM (consulting firm)

The objective of the interviews was to identify the solutions currently available and/or implemented in Life Sciences and understand if the solutions are different according to segment/customer type.

The interviews brought common conclusions
- The solutions implemented have a common platform, which is adapted through specific modules to the client's needs
- The client segmentation is done based on funding capacity and usage

The segmentation based on funding capacity is as follows:
- Big Pharma
- Small/medium Pharma
- Small/medium Biotechs
- Academics
- Clusters (combining Pharma, Biotechs, academics)
Usage of ELN and LIMS also depends on the needs: R&D or quality. LIMS is mostly implemented for QA/QC management purposes, as ELN is most suited for R&D.

Structure type, size, organization and amount of data generated are also considered in the segmentation but the data management platform is basically equivalent before customization to match specific needs (different modules). For example, web-based solutions, such as Contur (Thermo Fisher), Labcollector (Agilebio) and PPMS (Stratocore) are more adapted to academics and small Biotechs but all the mentioned solutions need to be customized to meet specific needs.

According to suppliers, ELN and LIMS are fast growing markets. Three major suppliers lead the market: Perkin Elmer, Thermo Fisher and Abbott, with Perkin Elmer owning 30% of the global LIMS market. The major suppliers are UK and US based companies and the adoption process is faster in UK and US.

French suppliers offer niche solutions such as Stratocore (positioned on the technological core facility segment) and AgileBio (flexible solution adapted to academics and small Biotechs). The ELN market is still emerging, growing faster in industry than academics/Biotechs since it is difficult to implement a solution without dedicated and qualified resources. The pharmaceutical industry has the biggest market share due to the high amount of data generated and the regulatory requirements (FDA regulations, such as 21CFR).

The key benefits expected from user are different between industry and academia:
- Increase productivity in industry (Perkin Elmer claims +20% by scientist)
- Intellectual property protection and data record in academia

However there are common benefits such as increased quality, traceability, efficiency, keep track of successful but also unsuccessful studies (avoid « Redo »), avoid loss of data (especially in academic laboratories where turnover is high), be able to prove data during a publication submission (ELN is ISO9001 compliant) and compliance with regulations (ISO9001, 21CFR, etc.).

**User typology for the survey**

Overall a total of 62 respondents were contacted during the study (see Figure 9):

![Segmentation of surveyed respondents](image)

**Figure 9 – Segmentation of surveyed respondents**
- 38 academics laboratories & technological core facilities (61%)
  - 13 academics with less than 10 persons
  - 7 academics with 10 to 50 persons
  - 9 academics with 50 to 500 persons
  - 1 academic with more than 500 persons
  - 8 undefined
- 20 Biotechs/CRO (32%)
  - 5 industries with less than 10 persons
  - 10 industries with 10 to 50 persons
  - 2 industries with 50 to 500 persons
  - 3 undefined
- 4 corporate groups (6%)
  - All groups with more than 1000 persons

Geographically, all surveyed contacts were based in France. An important concentration of academics and Biotechs/CRO are located in the Paris area explaining the high proportion of respondents in this region compared to other French regions (see Figure 10).

**Figure 10** – Geographical distribution of surveyed contacts

For the phone survey, **15 contacts** were interviewed:
- 8 academics (laboratories and technological core facilities)
- 3 industries (Biotechs and CROs)
- 4 Corporate groups
For the online survey, **47 responses** were obtained:
- 30 academics (laboratories and technological core facilities)
- 17 industries (Biotechs and CROs)
The complete list of companies and institutions surveyed is provided in Appendix 3.

Positions and responsibilities of surveyed respondents were the following:
- CEO/President
- Head of laboratory
- Head of R&D department
- Head of platform
- Head of resource center
- Team leader
- Project leader/manager
- Laboratory manager
- Quality manager
- Information technology (IT) manager

Since small structures (academics and SMEs) were surveyed, each contact was most likely in charge of more than one responsibility apart from their main function in the laboratory.

For the academic laboratories and technological core facilities, about 50% of the surveyed contacts were head of platform and 33% were quality manager. For SMEs, the responsibilities were more spread with about 33% of CEO and 25% of quality manager.

**Phone interview survey**

1 - Academic laboratories and technological core facilities

A total of 8 phone interviews were performed representing the following positions:

- 3 quality managers
- 1 research engineer
- 1 group leader
- 1 lab head
- 1 technical manager
- 1 IT manager

The respondents have implemented a data management system for the following applications:

- Biobank record (strain lines and related experiment results)
- Sequencing data
- Administrative documents and protocols
- Management of stocks
- Equipment booking schedule

Overall, these data are managed using in-house data management system (server back up, classified folders, etc.) and only two out of eight (2/8) laboratories have implemented a commercial LIMS (Labcollector from the French company Agilebio).

As a matter of fact, respondents will only consider adopting a commercial solution if their current in-house solution does not fit the needs.

The limitations to implement a commercial solution are high cost, complexity to implement and the lack of dedicated resources in the laboratories. A LIMS is indeed considered very useful in reinforcing the internal organization, avoid wasting biological reagents, and ensure data traceability, normalization and security. However it is not a requirement for quality, hence not mandatory for the laboratory development.

Concerning quality, 5/5 academic laboratories and 2/3 technological core facilities have implemented a quality system (for at most 2 years), even though not many of
them have certifications (1/8 are ISO9001 and 2/8 in progress to adopt ISO9001 and 1/8 to adopt NFS96900). Most importantly, there is no internal resource dedicated to quality in academic laboratories. As a result, the person in charge is not dedicated and manages quality on top of his primary function in the laboratory.

As for the ELN, the awareness level is very low, taking into consideration that the academic sector is still in the process of implementing paper laboratory notebook. For the respondents, ELN is believed to be more adapted to corporate groups.

2 – SMEs: Biotechs and CRO
Three contacts were interviewed: 2 CROs and 1 Biotech representing the following positions:
- 1 CEO
- 1 quality manager
- 1 research engineer in charge of data management

The interviewed contacts have the same type of data to manage as academics:
- Biobank record
- Sequencing data
- Administrative documents and protocols
- Management of stocks
- Equipment booking schedule

The three interviewed contacts are aware of ELN and LIMS and two of them use an in-house solution to manage data. Only one has implemented a commercial LIMS (Labcollector from Agilebio).

Similarly to the surveyed academics, the interviewed contacts follow the same motivation to implement solutions: strengthen internal organization, avoid waste of biological reagents, traceability, normalization of data, data security. The SMEs interviewed pointed out acquiring certification faster as an additional benefit.

The respondents will adopt a commercial solution if their internal solution does not work. However the adoption of a solution is limited by the cost, lack of budget (no dedicated IT budget) and complexity to implement. Since they do not have the dedicated and qualified resources, the return on investment is not worth it.

It is important to note that data management solution is not a prerequisite for working with their clients (not a “must have” but a “nice to have”).

ELN is not commonly used (0/3) because of its complexity and the respondents are satisfied with the current paper laboratory notebook.
Concerning quality, 2/3 have implemented a quality system for which 0/3 are ISO9001 and 1/3 is in the process of adopting ISO9001.

3 – Corporate groups
Four corporate groups were surveyed to understand their expectations in terms of data management when working with academics and SMEs.
Phone interviews were conducted with the targeted segments: 2 Pharma (Sanofi and GSK), 1 Cosmetics (confidential) and 1 Agrofood (Danone).

The main reasons for outsourcing are:
- Expertise unavailable in-house, lack of resources
- Need for innovation
- Design of new models
- New or complementary products
- Widen the offer portfolio and budget re-allocation

The corporate groups were interviewed on the type of partners for outsourcing (see Figure 11). The ranking was the following:
- SMEs (4/4)
- Corporate groups (3/4) and academic laboratories (3/4)

![Figure 11 – Typology of collaborators (NB: the respondents could give more than one answer)](image)

The criteria to select their partners are listed below:
- Keep the deadline of the work plan
- Confidentiality management
- High quality standards for results and deliverables (no need for certification)
- Social ethics compliant with the client’s expectations
- Animal facilities compliant

Regarding the data management system and quality status, no specific requirements are expected. However, the partner, ideally ISO9001, GLP and/or GMP, has to offer:
- High level of confidentiality
- Data traceability
- Structured data management (no preference over commercial or in-house, as long as it is reliable)
- Flexibility
- Reactivity to meet client’s need

The interviewed contacts are well aware that LIMS/ELN are very complex to implement and use. It should only be used if it does not lead to loss of efficiency. The paper laboratory notebook is a reliable data management solution as long as it follows the requested quality standards. However it is important to keep in mind that standards and regulatory requirements are evolving. Hence large companies will raise their expectations.
Online surveys

1 – Academic laboratories and technological core facilities (N=30)

a) Positions and responsibilities of surveyed contacts
(NB: the respondents could give more than one answer)

![Contact positions](image)

![Contact responsibilities](image)

**Figure 12** – Surveyed contact positions (others: quality manager, professor) and responsibilities (Others: Technical manager, head of bio-informatics, animal facility engineer).

As shown on Figure 12, the main respondents were project managers (13/30) and engineers (12/30) with responsibilities as head of technological core facilities (13/30) and quality manager (8/30).
b) Implemented quality standards

70% (21/30) of the surveyed contacts currently have a quality system in place (see Figure 13): 20/27 core facilities and 1/3 academic laboratories. In terms of quality standards, ISO9001 is the most common with 56% (17/30) of implementation within technological core facilities (16/27) and academic laboratories (1/3) (see Figure 14).

c) Computer data stored

Academics store different type of data and more specifically protocols and standardized procedures (27/30) followed by equipment management information (26/30) (see Figure 15).

---

**Figure 13** - Quality system currently in use

**Figure 14** - Implemented quality standards

**Figure 15** – Computer data stored (Other: Scientific and experimental data)
d) Awareness of data management solutions

As observed during the phone interviews, the online survey confirms that academics are neither familiar with the terms ELN and LIMS, nor their application (see Figure 16).
The ELN and LIMS awareness level amongst survey respondents is low: 66% (20/30) are not familiar with LIMS/ELN.

e) Implemented LIMS & ELN data management system

(NB: the respondents could give more than one answer)

The respondents that have implemented a LIMS or ELN were surveyed on the type of solution in place.

Figure 17 – Implemented LIMS

Academics design their own in-house LIMS solution rather than implementing a commercial solution (see Figure 17).
Indeed, for LIMS, 12/30 (40%) have implemented an in-house solution and 3/30 (10%) a commercial solution. The commercial solutions currently in place are: RedMine (open source), GLPI (open source) and BASE (commercial).
The remaining contacts, 15/30 (50%) confirmed not having implemented a LIMS.
The ELN adoption is much lower than the LIMS, indicating that very few laboratories use ELN. Only 6/30 have implemented ELN (4 in house and 2 open source) and 25/30 do not have a solution in place (see Figure 18). As pointed out in the phone interviews, academics are not currently using ELN yet since most of them are still in adoption or routinely use a paper laboratory notebook.

**f) Factors triggering the adoption of a data management system**

As indicated by the suppliers, the reasons to implement a data management system will differ according to the segment. For the academic segment, the adoption of data
management solutions is driven by the need for better internal organization (19/30) as well as the laboratory strategy (18/30) (see Figure 19). Client need and collaborator request are not adoption drivers.

**Figure 20 - Data management solution adoption limitations**

The main limiting factors in adopting a data management system are ranked as:
1. Cost/lack of dedicated budget (12/30)
2. Lack of available resources (11/30)
3. Complexity to implement (11/30) (see Figure 20)

**Figure 21 – Benefits of data management solution adoption**
The perceived benefits of implementing a data management solution are ranked as follow:

1. Better organization of the lab (19/30)
2. Increase efficiency (18/30) and avoid loss of data (18/30)
3. Allow better data sharing (16/30)

Moreover, a data management solution is perceived to a lower extent as useful to improve client satisfaction (13/30).

2 – SMEs: Biotech and CRO (N=17)

a) Positions and responsibilities of surveyed contacts

(NB: the respondents could give more than one answer)

Figure 22 – Surveyed contact positions and responsibilities (Others: Technical manager, head of bio-informatics, animal facility engineer)
Respondents were mainly R&D managers (10/17) with responsibilities as CEOs (5/17) and Quality Managers (4/17) (see Figure 22).

b) Implemented quality standards

![Figure 23 - Quality system currently in use](image)

![Figure 24 - Implemented quality standards](image)

A significant portion of the surveyed contacts, 70% (12/17) currently have a quality system in place (see Figure 23). However, 5/17 acknowledged not having any quality system in place.

In terms of quality standards, ISO9001 (4/17) and GLP (4/17) are the most common (see Figure 24).

c) Computer data stored

![Figure 25 – Type of computer data stored](image)
Surveyed respondents manage all types of data and more specifically protocols and standardized procedures (14/30), experimental data (12/30), quality documents (11/30) and data related to labware, consumables and reagents (11/30) (see Figure 25).

**d) Awareness of data management solutions**

![Graph showing awareness of data management solutions](image)

**Figure 26** – Awareness of ELN and/or LIMS definitions

As observed in the phone interviews, SME’s are not fully aware of ELN and LIMS solutions. Half of the surveyed Biotechs (8/17) are not aware of the LIMS nor the ELN solution. (see Figure 26).

**e) Implemented LIMS & ELN data management system**

(NB: the respondents could give more than one answer)

The respondents that have implemented a LIMS or ELN were surveyed on the type of solution in place (see Figure 27 & 28).

![Graph showing implemented LIMS](image)

**Figure 27** – Implemented LIMS
For LIMS, 6/17 (35%) have implemented an in-house solution, 1/17 (6%) a commercial solution and 1/17 (6%) an open source solution (the name of the solutions were undisclosed by the respondents). As for the remaining contacts, 8/17 (47%) contacts have confirmed not having a LIMS in their facility.

**Figure 28 – Implemented ELN**

The ELN adoption is lower than the LIMS. Only 2/17 have implemented an in house solution.

**f) Factors triggering the adoption of a data management system**

**Figure 29 - Data management solution adoption drivers**
As indicated by the suppliers, the reasons to implement a data management system will differ according to the segment. For the SME segment (see Figure 29), the adoption of data management solutions is driven by the need for internal organization (9/17) as well as securing data (9/17). ‘Client need’ scored high (8/17) compared to academics. This shows that the market and the client needs influence SME’s strategy much more than academics.

g) Factors limiting the adoption of a data management system

Figure 30 - Data management solution adoption limitations

For SMEs the main limiting factors in adopting a data management system are:
1- Cost/lack of dedicated budget (14/17)
2- Lack of adapted solution (8/17) and the complexity to implement (8/17)
h) Benefits of implementing a data management system

Figure 31 – Benefits of data management solution adoption

There are multiple benefits of implementing a data management solution. Overall, the perceived benefits for SMEs are:

1- Data management allows increased efficacy (10/17)
2- Better internal organization (8/17)
3- Keeping track and storing all data generated

Analysis

1 - The market
The IT tool solutions (LIMS and ELN) market is expanding. As a matter of fact, the ELN market is set to grow strongly as knowledge management becomes a priority. Although the LIMS market is mature, new cases are emerging to face specific R&D needs. LIMS and ELN can be overlapping, however they have different aims and will most likely stay separate: traditional LIMS handles samples and laboratory automation, while the ELN’s core function is to replace traditional lab notebooks and plays a key role in IP and knowledge management. The R&D LIMS and ELN space is crowded and fragmented but a few vendors (big players) stand out with wide solutions often linked to equipment set-ups. Small players are positioned on niche markets and are going under M&A (merger & acquisition) activities from the big players.
2 - Quality system
The survey shows that for the Life Science research based organizations (Biotech SMEs, technological core facilities and academic laboratories), the awareness level for LIMS/ELN is rather low. The majority already has in place or will implement shortly a quality strategy, despite the fact that the segment surveyed has different understanding of quality and is not at the same level. Academic laboratories and technological core facilities have implemented a quality system (60%), but only 30% have certifications. SMEs are more advanced with a high ISO compliant proportion (70%).

The motivation to implement a quality strategy is clearly different between the segments. While academic laboratories and technological core facilities follow a strategy focused on internal needs, SMEs are implementing tools in response to external constraints.

3 - LIMS/ELN
LIMS/ELN are in the same situation as software publishers 20 years ago, when introducing the Enterprise Resource Planning (ERP) solutions such as SAP, Oracle, Business Object, etc. ERP was initially developed for the manufacturing industry and then evolved into bringing the decision making information from all the departments in a company in one single place, in order to increase efficiency, productivity and profit. The adoption of such solutions faced the same issues the LIMS & ELN is currently facing: high cost, complexity and time consuming.

Another obstacle linked to LIMS/ELN deployment is the fact that it is much more difficult to establish procedures in R&D than in other departments such as production, marketing, sales or accounting.

The first implementation of ELN & LIMS started in 1990 for LIMS and 10 years later for ELN in the Chemical and Pharma industry. Those companies had the internal skills in-house to lead the successful implementation of data management solutions. Nowadays, the Pharma industry spends about 20% of IT budgets for ELN and LIMS. As described in this report, there are very few solutions currently available for SMEs and academics. To face the limited number of solutions as well as the non-satisfying commercial offer, a community of open source providers has emerged since 2005. These communities are small and do not ensure technical upgrades of available solutions over time.

The unavailability of adapted solutions (from either commercial or open source providers) led to the development of in-house solution by internal resources. Developing in-house customized tools instead of adopting commercial solutions (too expensive and time consuming in early deployment) is a first step of maturity but the in-house solutions are not guaranteed to be long lasting over the years. Users can be divided in 3 communities:
- Early Adopters & Visionaries
- Early majority
- Late Majority & Laggards

Since commercial solutions are not suited to the early adopters’ needs, they develop their own tools and handle the maintenance themselves. As a result there is no commercial reference that can be implemented by the rest of community (early and late majorities) expecting well-established LIMS and ELN solutions. Therefore, the mainstream adoption is delayed.
4 - Suppliers
The introduction of new laboratory activity management methods have been possible by reproducing the tools designed in-house to meet specific needs: production department with MES (Manufacturing Execution system), marketing and sales departments with CRM (Customer relationship management tools) and the overall resource planning in companies (ERP tools).

Even if LIMS/ELN tools are less developed than similar solutions, the market growth remains high. Since 2009, the suppliers’ strategy has changed and is more established as a result of the market entry of major equipment suppliers such as Perkin Elmer, Thermo and Abbott. Activity growth is led by the adoption of those tools by the main service providers of the Chemical and Pharma industry. These companies already have feedback on functionalities developed by ELN and LIMS from their clients in Life Sciences. Moreover, they have the required internal resources to implement data management solutions (dedicated resources for IT and quality).

In SMEs and academic laboratories, the resources dedicated to IT are embryonic. The deployment of ERP in SMEs was done through computer engineering service providers that developed simplified and customized solutions and placed skilled resources not available internally. Since the competitive landscape has been reconfigured and because there is a high demand for less complex solutions, the LIMS/ELN suppliers will now need to develop a proximity service market according to their clients’ expectations.

5 - Corporate groups
Large corporate groups are not currently requesting from their partners (SMEs and academic laboratories) any specific quality or data management tools because today the tools available are designed for large organizations and not for small structures. The data management/ELN are considered as too complex and even disruptive in the collaboration. However the environment is changing and regulatory bodies are becoming more and more demanding. SMEs and academic laboratories need to be aware that in the near future, corporate groups will raise their expectations and require data management tools and quality systems. Therefore, to continue working with corporate groups, Biotechs and academic laboratories will need to implement data management tools, quality system and also hire and train skilled resources.

6 - Academic laboratories and SMEs
The targeted population in the ShareBiotech study (mainly academic laboratories and SMEs) was surveyed to understand its maturity regarding the ELN and LIMS tools. Results showed that there are external and internal incentives to implement a data management solution, however the complexity and the lack of resources do not allow SMEs and academic laboratories to invest in such tools. As a matter of fact, less than 5% of the survey respondents have indeed implemented LIMS/ELN.

However the activity is slowed down by the complexity to bring new and specific
customized solutions since they are fundamentally different according to the targeted segment. As the SME may need to meet an external constraint (a client request for example), academics are mostly looking for an internal way to protect and organize the flow of information and data traceability linked to their research. The most frequently expressed downside of ELN and LIMS are the specifications of the available tools, still expensive, not adapted and inflexible. The tools available, mainly commercial, is seen by SMEs and academics as complex to set-up and too expensive to implement on many workstation. Moreover, the upgrading process to integrate new functionalities is perceived as complex.

**Recommendations**

How will the actors in the field evolve in the upcoming years?

The effect of critical mass can certainly be taken over by clusters that have a scope of activity adapted to collect and share the needs of hundreds of actors. LIMS/ELN suppliers have also identified clusters as cornerstones for information and solution implementation. However, clusters will face the same limitations as academics and SME: lack of budget and internal resources.

The penetration and implementation of LIMS/ELN in the Life Science market will depend on the ability of the actors to adapt to a changing environment:

- **Suppliers**
  - Suppliers will need to develop new products more flexible at a lower cost adapted to small structures to meet users needs and enhance penetration.
  - They will also need to come up with new business models to fund the initial customer implementation cost
- **Clusters**
  - The clusters have been identified by suppliers in the procurement process and therefore can be instrumental in the process
  - Clusters will play a key role in education and training of their members (Lab Managers from technological core facilities and SMEs)
  - They can also play a key role in connecting with Life Science Corporate groups to assess current and future needs for Biotech companies and CRO
- **Academic laboratories & technological core facility**
  - It is foreseen that IT tools knowledge will become a key competency in corporate recruitment
  - Students will need to be properly trained with up-to-date IT tools
- **Biotech & CRO**
  - Adequate tools and market pressure are the key drivers for a wider implementation of the data management tools
  - It is essential to foster close contact with Corporate groups to keep abreast of IT evolution

Recommendations from the surveyed contacts can be found in Appendix 4.
APPENDICES
Appendix 1: Online survey

1. Dans quel type d’organisation travaillez-vous ?
   - Laboratoire académique
   - Plate-forme technologique
   - Entreprise de prestation de services /recherche sur contrat (CRO)
   - Entreprise (PME)
   - Entreprise (grand groupe)
   - Autre : __________________________

2. Quelle est la taille de votre laboratoire /entreprise ?
   - <10 personnes
   - 10 à 50 personnes
   - 50 à 100 personnes
   - 100 à 500 personnes
   - >500 personnes

3. Quelle est votre fonction au sein de votre laboratoire /entreprise ?
   - Manager /encadrement de personnel
   - Chercheur / chargé de R&D
   - Doctorant
   - Ingénieur / Assistant ingénieur
   - Technicien
   - Autres : __________________________

4. Quelles sont vos responsabilités au sein de votre laboratoire /entreprise ?
   - PDG /DG
   - Directeur de laboratoire
   - Responsable R&D
   - Responsable d’équipe de recherche
   - Chef de projet /chargé de projet
   - Lab manager
   - Responsable Qualité
   - Responsable Informatique
   - Responsable Hygiène & Sécurité
   - Responsable de plate-forme technologique
   - Responsable d’un centre de ressources biologique /d’une animalerie
   - Autre(s) : __________________________

5. Avec quel type de structure travaille votre laboratoire /entreprise (collaboration, prestation, sous-traitance) ?
   - Laboratoire académique
   - Plate-forme technologique
   - Entreprise de prestation de services /recherche sur contrat (CRO)
   - Entreprise (PME)
   - Entreprise (grand groupe)
   - Autre(s) : __________________________
Si applicable, dans quels domaines plus précisément ?

- Industrie Santé
- Industrie Cosmétique
- Industrie Agroalimentaire
- Agriculture
- Environnement
- Autre(s) : ___________________

6. Un système qualité est-il en place actuellement dans votre laboratoire / entreprise ?

- Oui
- Non

<table>
<thead>
<tr>
<th>Si Oui :</th>
<th>Si non :</th>
</tr>
</thead>
</table>
| Depuis combien de temps est-il en place ?
  - <1 an
  - 1 à 2 ans
  - 2 à 5 ans
  - >5 ans |
| Actuellement, quelle(s) certification(s) suit votre laboratoire / entreprise (sans pour autant être certifié) ?
  - ISO9001
  - ISO27000 /1
  - ISO17025
  - Bonnes pratiques de laboratoire-BPL
  - Bonnes pratiques de fabrication-BPF
  - Aucune
  - Autre(s) : ___________________ |

| Quelle(s) certification(s) votre structure possède-t-elle ?
  - ISO9001
  - ISO27000 /1
  - ISO17025
  - Bonnes pratiques de laboratoire-BPL
  - Bonnes pratiques de fabrication-BPF
  - Aucune
  - Autre(s) : ___________________ |

| Votre laboratoire / entreprise a-t-il prévu de mettre en place un système qualité dans les années à venir ?
  - Oui
  - Non |

(Si oui) Dans quel délai votre laboratoire / entreprise prévoit-il de mettre en place un système qualité?

- <1 an
- entre 1 et 2 ans
- >2 ans

(Si oui) Comment votre laboratoire / entreprise compte-t-il mettre en place un système qualité?

- Recrutement de personnel qualifié
- Repositionnement de personnel actuel
- Design d’une solution en interne
- Design d’une solution par un prestataire
- Autre(s) : ___________________ 

(Si non) Pourquoi votre laboratoire / entreprise ne prévoit-il pas de mettre en place un système qualité ?
7. Quels types de données sont gérées au sein de votre laboratoire /entreprise?
   - Equipements
   - Echantillons
   - Stocks de matériels, consommables et réactifs
   - Ressources bibliographiques
   - Documents qualité
   - Documents administratifs, de management
   - Protocoles/procédures standardisées
   - Données expérimentales informatiques
   - Données clients
   - Images
   - Autres: ____________________________

8. Comment les données générées par votre laboratoire /entreprise sont-elles gérées ?
   - Cahier de laboratoire papier
   - Cahier de laboratoire électronique (ELN)
   - Serveur classique (rangement de dossiers et fichiers)
   - Système de gestion de laboratoire/Système de management de l'information du laboratoire (LIMS)
   - Pas de gestion spécifique des données
   - Autres: ____________________________

9. Etes-vous familiers avec les solutions de gestion de données suivantes ?
   - Système de gestion de laboratoire/Système de management de l'information du laboratoire (LIMS)
   - Cahier de laboratoire électronique (ELN)
   - Non, aucun

10. Quel système de gestion de laboratoire/de management de l'information du laboratoire (LIMS) utilise votre laboratoire / entreprise ?
    - Solution commerciale : Nom____________________
    - Solution open source : Nom____________________
    - Solution développée en interne : Nom___________
    - Aucun, mais nous prévoyons d'en implémenter un dans le court terme
    - Aucun, et nous ne prévoyons pas d’en implémenter dans le court terme
    - Autre : ____________________________

11. Quelle solution de cahier de laboratoire électronique (ELN) utilise votre laboratoire / entreprise ?
□ Solution commerciale : Nom____________________
□ Solution open source : Nom____________________
□ Solution développée en interne : Nom___________
□ Aucun, mais nous prévoyons d’en impléanter un dans le court terme
□ Aucun, et nous ne prévoyons pas d’en impléanter dans le court terme
□ Autre :_____________________________________

12. Quels ont été ou quels seraient les facteurs déclenchant l’adoption d’une solution de gestion de données au sein de votre laboratoire / entreprise ?
□ Démarche stratégique du laboratoire /de l’entreprise
□ Prérequis qualité (FDA, ISO9001, etc.)
□ Demande d’un client
□ Demande d’un collaborateur
□ Souhait d’organisation interne
□ Disponibilité de budget / budget dédié
□ Personnel qualifié déjà en place
□ Besoin d’augmenter la productivité /l’efficacité
□ Besoin d’améliorer le partage de données
□ Besoin de sécuriser les données
□ Besoin de stockage à long terme des données (mémoire)
□ Besoin d’améliorer l’accessibilité aux données
□ Besoin de traçabilité des données /stocks / réactifs /équipements
□ Besoin de gestion des stocks /équipements
□ Autre(s) : ______________________

13. Quels sont ou quels ont été les facteurs limitant l’adoption d’une solution de gestion de données au sein de votre laboratoire / entreprise ?
□ Pas de besoin
□ Solutions existantes non adaptées à l’activité
□ Coût / absence de budget dédié
□ Absence de ressources humaines qualifiées
□ Complexité de mise en place
□ Difficulté de mises à jour
□ Manque d’intérêt par les utilisateurs finaux (avant la mise en place de la solution)
□ Manque d’implication des équipes (après la mise en place de la solution)
□ Autre(s) : ______________________

14. Quels bénéfices votre laboratoire / entreprise retire ou retirerait il de la mise en place d’une solution de gestion de données?
□ Augmentation de la productivité
□ Augmentation de l’efficacité
□ Meilleur partage des données
□ Meilleure gestion du risque de perte des données
□ Meilleure sécurité des données
□ Meilleure organisation
□ Respect des réglementations
□ Avantage concurrentiel
□ Mise en place d'une nouvelle offre /extension d'offres actuelles
□ Accès à de nouveaux clients
□ Meilleure satisfaction des clients
□ Autre(s) : ____________________________________________

Quelles recommandations ou remarques auriez-vous ou avez-vous pour mener à bien la mise en place d'une solution de gestion de données et /ou de cahier de laboratoire électronique?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
## Appendix 2: Supplier company profiles

<table>
<thead>
<tr>
<th>Labtronics</th>
<th>PerkinElmer</th>
<th>Users: International</th>
<th>Disclosure: Undisclosed</th>
</tr>
</thead>
</table>

### General Information
- **Solution type:** LIMS
- **Solution name:** LIMS Link/Labtronics
- **Supplier:** CambridgeSoft (PerkinElmer)
- **Website:** [www.labtronics.com](http://www.labtronics.com) | [www.lims_interfacing.htm](http://www.lims_interfacing.htm)

### Specificty
- **Type:** Commercial
- **Targeted market:** Life Science
- **Price estimation:** annual fee per user: 2000 to 4000€

### Product specifications & characteristics
- Automation of routine manual tasks
- Maintain control needed over sample data management
- Unique graphical configuration process eliminates the need for custom coding or scripting, simplifying implementation
- Security, audit trail and archiving features meet regulatory requirements
- Scalable architecture suits all requirements from single workstation to enterprise wide deployment.
**General information**

- **Solution type:** LIMS
- **Solution name:** LabWorks LIMS
- **Supplier:** PerkinElmer
- **Web址:** www.perkinelmer.com/pages/010/labworks/default.xhtml

**Specificity**

- **Type:** Commercial
- **Targeted market:** Life Science (water, process, food, green)
- **Price estimation:** Unknown

**Product specifications & characteristics**

- Ultra-configurable to fit a wide variety of laboratory needs and workflows
- Collect, analyze, and report on your processes and products
- High-level throughput and backlog reports, schedules and operational summaries
- Analyses providing highly detailed information about samples and their tests (performance history, comments, industry-focused solutions)
- Undisclosed
<table>
<thead>
<tr>
<th>General information</th>
<th>Product specifications &amp; characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solution type:</strong> LIMS</td>
<td>Supports complex processes, ensure regulatory compliance and promote collaboration</td>
</tr>
<tr>
<td><strong>Solution name:</strong> STARLIMS</td>
<td>Award-winning off-the-shelf LIMS</td>
</tr>
<tr>
<td><strong>Supplier:</strong> Abbott</td>
<td>Integrated SDMS (Scientific Data Management System) and ELN (Electronic Laboratory Notebook)</td>
</tr>
<tr>
<td><strong>Website:</strong> <a href="http://www.starlims.com">www.starlims.com</a></td>
<td>Enhanced laboratory process and data management, for improved data sharing within the laboratory and across the enterprise</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specificity</th>
<th>Users - International</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type:</strong> Commercial solution (100% web based)</td>
<td>United Kingdom’s National Health Service</td>
</tr>
<tr>
<td><strong>Targeted market:</strong> Lifescience (including quality assurance and control, testing and monitoring, research and development, forensic, and clinical testing)</td>
<td>UK NHS Clinical Genetics Laboratories</td>
</tr>
<tr>
<td><strong>Price estimation:</strong> unknown</td>
<td>NAACP</td>
</tr>
<tr>
<td></td>
<td>US Department of Defense Cyber Crime Center</td>
</tr>
<tr>
<td></td>
<td>Rutgers University, etc.</td>
</tr>
</tbody>
</table>
General information

- **Solution type:** Type of LIMS
- **Solution name:** PPMS (Pasteur Platform Management System)
- **Supplier:** Stratocore
- **Website:** http://stratocore.com/

Product specifications & characteristics

- Adapted to core facilities: developed from the “inside” of core facilities, by core facility staff, during 8 years
- All features are developed and tested on site to handle the very specific work-flow of core-facilities
- Web-based client interface
- Up to date information on maintenance, problems, and cancellations
- Management administrative documents, incident reporting, service history and maintenance
- Main advantage: scalability

Specificity

- **Type:** Commercial
- **Targeted market:** Lifescience core facilities (institutions)
- **Price estimation:** Unknown

Users - International

- Pasteur Institute
- Curie Institute
- Génopole
- Rockefeller Institute
General information

- **Solution type:** ELN
- **Solution name:** E-Notebook
- **Supplier:** CambridgeSoft (Perkin Elmer)
- **Website:** www.cambridgesoft.com/softwads=9

Product specifications & characteristics

- Smooth web-based interface with a fully configurable, secure system for organizing the flow of generated information (such as reactions, Microsoft Office documents, spectra and other types of data)
- Possibility to search this data by text, substructure or meta data
- Organization of electronic pages by projects, experiments or any other classification conforming to a specific workflow
- Promote lab productivity and information sharing with procurement and inventory management systems to save time locating chemicals and entering structures
- 21 CFR part 11 compliance
- High expertise worldwide leader in ELN solution for the past 20 years
- Advantage to be integrated to some equipment manufactured by Perkin Elmer

Specificity

- **Type:** Commercial
- **Targeted market:** Life Science
- **Price estimation:** Annual fee per user: 1000 to 5000€

Users - International

- Undisclosed
Product specifications & characteristics:

- Manage the entire lifecycle of complex biological experiments and studies.
- From setup and data capture, through analysis and graphing, to report creation, sign-off, and publication.
- 21 CFR Part 11 compliant environment.
- Real-time data sharing, analysis, and rapid delivery of reports.
- BioBook enhances productivity, reduces data transcription errors and protects corporate IP.

Users - International:
- Undisclosed

General Information:
- Solution type: LIMS/ELN
- Solution name: BioBook
- Supplier: IDBS
- Website: www.idbs.com/products-and-services/e-workbook-suite/biobook/

Specificity:
- Type: Commercial
- Targeted market: Biology, mostly Pharma
- Price estimation: Unknown

Investing in our common future
Appendix 3: Surveyed contact list

Phone survey, 15 contacts:
- 8 academics (laboratories and technological core facilities)
  o IBCP – Plateau technique production et analyse de protéines
  o Institut de Biologie du développement Marseille Luminy (IDBML)
  o LABGeM (Laboratoire d’Analyses Bioinformatique pour la Génomique et le Métabolisme)
  o Laboratoire microorganismes: Génome et environnement UMR6023
  o Plateforme génomique santé – UFR140 – Université de Rennes
  o Plateforme transgénèse rat – Biogenouest, Université de Nantes 643, IFR 26
  o Université de Grenoble – Institut de Biologie Structurale - CNRS
  o URGV (Unité de Recherche en Génomique Végétale)
- 3 industries (Biotechs and CROs)
  o Deinove
  o C-RIS-Pharma
  o Vectalys
- 4 Corporate groups
  o GSK
  o Sanofi
  o Danone
  o Cosmetic leader (confidential)

Online survey, 47 contacts:
- 30 academics (laboratories and technological core facilities)
  o Bio-imaging center Lille (BICeL)
  o GENTYANE (x2)
  o IGBMC Microarray and Sequencing Platform (Biopuces et Séquençage)
  o Imagif
  o ISdtV: La Plateforme d’Imagerie et Sciences du Vivant
  o Institut Curie (x2)
  o Institut Pasteur
  o INRA
  o MGX - Montpellier GenomiX
  o MICA - Microscopie Imagerie Cote d’Azur (x2)
  o MRI: Montpellier RIO Imaging
  o Plate-Forme Cochin Imagerie
  o Plate-Forme de Recherche (PFR) "Imagerie des processus dynamiques en biologie cellulaire et biologie du développement", Institut Jacques Monod (x2)
  o Imagopole Institut Pasteur
  o Plateforme de Transcriptome et Microarrays d’Evry
  o Plateforme anexplo (Plateforme Transgenèse / Zootechnie / Exploration fonctionnelle)
  o Plate-Forme d’Infectiologie Expérimentale - Pôle santé animale de Tours
  o Plateforme Génomique. UMR BioGeCo. INRA
  o Plateforme Biopuces du Genopole Toulouse (GeT-Biopuces - Plateforme de Genotoul) (x2)
  o Plateforme de Transcriptome et Microarrays d’Evry
  o Plate-forme transcriptome de Marseille (TAGC: Technologies Avancées pour le Génome et la Clinique)
  o Plate-forme transcriptome de l’ENS
  o Plate-forme Montagne Sainte-Geneviève
  o ProfileXpert
  o Plate-forme de génomique fonctionnelle de Sophia Antipolis
- 17 industries (Biotechs and CROs)
  o Ambiotis
  o Bertin Pharma
  o Bioquanta
  o Biosystem International
  o Collectis
  o Cellprothera
  o Conarma
  o Evic
  o Genticel
  o Neuronax
  o Nokad Pharma
  o Phinc Development
  o Photoemix
  o Rhenovia
  o Tebu bio
  o Urosphere
  o Xentech
Appendix 4: Peer recommendations

For academics:
- Do not set-up solutions not suited to your needs because you will end-up not using it.
- Avoid complicating the system by adding a difficult process. Beforehand, define a clear workplan to adapt the tools to your needs (and not the opposite).
- The data management system has to simplify the internal organization and lab management. If it is not the case, it is useless, inefficient and disruptive.
- Make the solution available to everyone and make it easy to use directly when the data is generated (avoid the reediting afterwards).
- The paper laboratory notebook is not efficient for services using different acquisition software, generating separated and heterogeneous data. The paper notebook can also lead to multiplying the tasks, with little time (?) to follow the procedures.
- Need to homogenize inter-academic collaborations.
- Lack of qualified human resources so need to simplify the data management.
- Need to dedicate time to set-up the solutions, which is not always possible.
  Laboratory Heads are aware that they need solutions for data management, so they start dedicating a budget as well as the human resources.
- We need to let researchers do their research and stop hassling them with unrealistic administrative procedures.

For Biotechs and CRO
- Define a well established, well thought through and process documented workplan in order to obtain a satisfying and sustainable solution and choose the most adapted solution.
- Solutions need homologation to be recognized by authorities for use in procedures and IP litigation.
- Multiplied data collection processes are time consuming and can become a limitation to adoption by users.
- Access to computer based solutions is difficult in confined areas/laboratories.
- In GLP and GMP environments, data management/validation process needs to be implemented at the very start of the project (by editing the users’ needs) in order to define more easily the risk analysis, validation plan and tests datasheets.
ABBREVIATIONS
B$: Billion Dollars
CRO: Contract Research Organization
ELN: Electronic Laboratory Notebook
ERP: Enterprise Resource Planning
FDA: Food and Drug Administration
IT: Information Technology
IP: Intellectual Property
LIMS: Laboratory Information Management System
M$: Million Dollars
M€: Million Euros
QA/QC: Quality Assurance/Quality Control
SME: Small & Medium Enterprise
R&D: Research & Development