



## The Buy vs. Build Decision

Evaluation Factors when Deciding on a LIMS  
and Data Management Solution

This White Paper outlines the key factors to be considered when implementing a LIMS system, with consideration to the overall costs and benefits associated with buying a commercial LIMS system versus building a system in-house.



## LIMS Buy vs. Build Decision: Issues

The value of a lab information management system (LIMS) in the research laboratory is clear: improving lab operations and data management efficiency provides greater reproducibility of research results, minimizes the error introduced into workflow, increases the productivity of laboratory instrumentation, and enables greater user productivity. A strong LIMS system effectively manages the vast amounts of data generated from research, interfaces with a plethora of specialist tools for data analysis and visualization, and evolves raw data into health sciences knowledge, through efficient data gathering, exchange and analysis.

While the decision around whether to implement a lab information and data management solution may be clear, the approach to LIMS implementation is more complex, and requires careful consideration due to substantial investments of time, money and human resources.

Most laboratories have grown from using basic office productivity applications (such as Microsoft Word or Excel), recognizing that these tools are time-intensive and error-prone in the laboratory environment, and do not scale well. However, the next step in evolving laboratory infrastructure raises a more challenging question: whether it is better to buy a LIMS solution from a commercial vendor, or for internal IT staff to build, support and maintain a custom, in-house solution.

**This White Paper addresses the key issues and considerations that must be taken into account when deciding whether to buy an off-the-shelf LIMS from a commercial vendor, or build a LIMS in-house.**

Key issues are identified and evaluated in the following sections, and conclusions are drawn to provide guidance for laboratory managers considering the “buy vs. build” LIMS implementation. A specific LIMS and scientific data management system (GenoLogics’ Research Informatics solution) is introduced, specifically addressing the needs of investigators and researchers engaged in bio-molecular research disciplines, such as genomics and proteomics.

## Key Criteria for the Buy vs. Build Decision

The following sections in this paper outline the key criteria that should be evaluated to make a “buy vs. build” decision.

### **Delivery of Increased Productivity and Efficiency**

Delivering improved laboratory productivity and operational efficiency are clear criteria for successful LIMS implementations. Quantitative criteria include the greater number of samples processed, increased throughput to service requests entering the facility, and

decreased time to process a sample set. Qualitative criteria are more varied, and may include the ability to align LIMS data collection to the laboratory workflow requirements, reduced transcription from paper (and the associated reduction in data entry error), reduced duplication of effort in sample identification and handling, increased control over valuable samples, the overall quality of the software interface (a good user interface encourages LIMS use), and the ability to generate reports that satisfy the needs of information stakeholders. Identifying required quantifiable and qualitative requirements are crucial to the “buy vs. build” decision process, as this reduces the possibility of encountering project-endangering risks after key decisions (and investments) have been made.

When analyzing the list of productivity and efficiency requirements criteria, consider that the challenges encountered in each laboratory may appear unique, but have probably already been addressed by a commercial LIMS designed for life sciences. There are commercial LIMS solutions available that meet the complex needs of research laboratories and deliver key productivity and operational efficiency criteria.

### **Configurability and Customization**

Building an in-house LIMS provides the ultimate configurability to meet exacting lab requirements, but with the significant investments of time, money and human resources, and ongoing maintenance costs and the associated risks – IT staff turnover, etc.

Typically, commercial LIMS will require a degree of customization to meet specific laboratory requirements: the key question is how configurable is the commercial LIMS, and how much customization will be required for successful implementation.

When selecting a LIMS vendor, consider the amount of customization that will be required while undertaking the requirements-gathering and analysis phase. Can new workflows with new instruments and software be efficiently added? Can existing workflows be amended, to reflect changing infrastructure, upgrades, and new protocols? The commercial LIMS vendor must support customized workflows and protocols quickly and efficiently, preferably right “out of the box”. Customization for a proprietary commercial LIMS system may require development of custom code, usually in the programming language of the LIMS. This customization is not only complex, but it is expensive: professional services fees on implementation can soon eclipse the original license costs. To support extensive customization, it is best to consider a commercial LIMS that is written in a common programming language.

### **Scalability and Upgradeability Requirements**

Most core facilities and clinical research labs are facing sharp increases in sample throughput, with associated data generation growing at an increasing rate particularly with the introduction of next generation sequencing technologies. With more research focus being directed in post-genomics disciplines, more interest in drug discovery processes through new and novel means, and expanding core services utilizing a greater

diversity of lab instrumentation and platforms, automation equipment and software tools, laboratories are facing monumental challenges with managing vast amounts of data.

The combination of increased throughput of samples and data through the laboratory, and greater numbers of researchers requiring accessibility to services, are causing in-house-built LIMS systems to fail under the pressure of increasing loads. Effective commercial LIMS solutions, however, are designed to evolve on a defined software upgrade path, supported by vendors who can implement an IT architecture that supports scalability. This issue continues to grow in importance as research processes grow more complex, and must be considered when making the choice between “buy” and “build”.

### **Integration Challenges and Proprietary Systems**

Compounding the requirements for scalability and upgradeability, there are significant challenges associated with successfully integrating laboratory instrumentation and software with the LIMS. The complex mix of laboratory instrumentation and software makes seamless data integration extremely challenging for an in-house development team, and building a LIMS that can interoperate with critical laboratory infrastructure is a daunting task.

Conversely, it is important to carefully assess commercial LIMS vendors when examining integration capabilities. Many LIMS vendors offer integrations with genomics platforms such as next generation sequencing, microarray and real time PCR, genomics and proteomics analysis tools, mass spectrometers, and other informatics infrastructure, but the motives of vendors must be examined when making a selection to buy a LIMS: is the goal of the LIMS vendor to provide a system that can integrate with “best-in-class” lab instrumentation, or will the LIMS only serve to lock the laboratory into buying expensive consumables and marginal tools all from the same vendor? This decision must be carefully considered when choosing a commercial LIMS, and future investments in new laboratory hardware and instruments should be considered in light of the vendor selection. The LIMS vendor must be open and proactive in heeding the call to integrate to the growing variety of “best-in-class” instrumentation, software tools and processes.

### **Maintenance and Support: Ongoing Costs**

With custom-built LIMS solutions, when the system crashes or there are questions about the application, the first-tier support is usually delivered by the core laboratory or IT staff (often, the most technically-astute researcher). Second-tier support is often not readily available. Furthermore, updates and upgrades to the in-house LIMS are ideally implemented by the original system designers; these resources may be difficult or impossible to obtain: consultants are no longer available, or the employees who built and implemented the system may have moved on. Whether for system maintenance, support or upgrades, the disruption and frustration tied to problems associated with the in-house developed LIMS can be damaging to laboratory productivity.

While commercial LIMS solutions’ support and maintenance agreements may appear to be expensive, the total cost of ownership is usually less than the investment in in-house

support and IT staff, and the time lost by researchers in maintaining a custom solution. By relying on the expertise of commercial vendors for support, laboratory staff can focus on their science.

### **Training Considerations**

Another key consideration for the “buy vs. build” decision is the issue of training. For the custom-built LIMS, training requirements are unique and non-reproducible: human and capital resources must be allocated to capture processes, document laboratory workflows and IT resource configurations, and engage and train new technicians. This investment is mandatory to ensure that operational knowledge of the lab system is retained and protected.

Again, significant savings can be realized with the acquisition of a commercial LIMS: Lab managers do not need to dedicate scarce resources to documentation, end users benefit from gaining access to a library of proven training materials, and the entire laboratory team can take advantage of the professional training resources available through a commercial vendor.

### **Risk of Project Failure**

Undertaking the development of an in-house LIMS is a major information technology exercise, requiring careful planning, the expertise of a team of software developers, workflow process subject matter experts, instrumentation and software partners, LIMS consultants and experienced laboratory staff. Aligning these resources into a successful project team can prove to be tremendously challenging.

Working closely with the life sciences research community, GenoLogics has observed that the vast majority of in-house LIMS projects fail to meet their intended goals for functionality, completion timelines, and/or cost containment. Even with a strong development team in place that can execute efficiently against laboratory requirements, the time investment in developing an in-house LIMS solution can easily take years before it can approach the functionality of a commercial LIMS. When time to delivery increases, the overall risk of project failure increases correspondingly.

The Standish Group, a respected IT analyst organization, delivered a study<sup>1</sup> of the implementation of several thousand information technology applications, and revealed that 29% of all IT projects succeed (meeting criteria of on time delivery, within budget, with required features and functions); 53% are challenged (late, over budget and/or with less than the required features and functions); and 18% have completely failed (cancelled prior to completion, or delivered and never used).

By avoiding the associated risk of building an in-house LIMS project, the odds of deploying a successful LIMS implementation increase dramatically.

## **Total Cost of Ownership**

The preceding sections outline the criteria of implementing a commercial LIMS solution. From an analytical perspective, it is helpful to do a complete cost analysis in comparing the “buy vs. build” decision. Appendix 1 provides a breakdown of the total cost of ownership associated with the decision, along with one-year and five-year savings implications. Using basic assumptions on labor costs and development timelines, analysis reveals a cost savings in both initial LIMS implementation and ongoing maintenance costs.

This “Cost Worksheet” is available from the GenoLogics sales team, allowing you to enter the variables and costs associated with your own laboratory, and calculate the financial benefit.

## **Conclusions**

Taking into account the factors outlined in the preceding sections, the benefits of buying a “commercial-off-the-shelf” LIMS greatly outweigh the benefits of building an in-house LIMS. There are core facilities and laboratories that will elect to develop their own custom-built LIMS systems, accepting the challenge of building and maintaining proprietary software systems, regardless of cost or complexity. However, if the ongoing development, maintenance and support of complex laboratory information and scientific data management systems are a distraction to your scientific discovery process, then the implementation of a commercial LIMS is the best choice.

With this conclusion, we introduce our Research Informatics LIMS and data management solution as a viable choice when selecting a commercial LIMS, with capabilities that extend the lab information management process into an efficient, sophisticated data management and operations management system to speed scientific discovery.

## **Selecting a LIMS: Research Informatics Solution**

Across a the broad set of criteria that this paper has outlined, implementing a GenoLogics system such as our Research Informatics solution provides a capable and cost-effective LIMS for scientific data management and lab management in the life sciences research domain, when compared to custom-built, in-house solution.

Our Research Informatics solution provides comprehensive integrated laboratory, instrument and scientific data management that extends beyond a LIMS to provide an efficient, sophisticated informatics system to speed scientific discovery. Built on an open integrating platform called OMIX, our Research Informatics solution offers highly flexible and configurable experimental workflows that can map to the unique requirements of your lab in the same fashion as a custom-built LIMS, but at a significantly reduced total cost of ownership.

## **GenoLogics Delivers Increased Productivity and Efficiency**

GenoLogics solutions have a successful track record of helping investigators and researchers increase their effectiveness. From academic and core research facilities, and research institutes, to global pharmaceutical companies, GenoLogics users have provided many endorsements on how our LIMS system has streamlined laboratory workflow and data management, and made their laboratories more productive and operationally efficient in discovery research. Some qualitative benefits include:

- Streamlined sample tracking: users can easily locate samples in the laboratory and determine status in seconds
- Throughput of samples have increased without increasing staffing levels
- Client service is enhanced through providing a secure web interface for external collaborators, and invoicing tools to allow for customized reporting, and
- Unique workflows are supported through the provision of configurable processes, templates and protocols.

## **Configurability and Customization Concerns Alleviated**

With our Research Informatics solution, GenoLogics offers a solution architected for easy customization, scaling to meet the requirements of the largest pharmaceutical laboratory or academic core facility. GenoLogics' LIMS which is built on an open informatics platform means that workflows, protocols, and lab infrastructure can be easily introduced and supported. While GenoLogics Professional Services teams are available to assist with complex installations and customization work, the organization has built a strong reputation for providing comprehensive configurability in the core platform. Furthermore, all GenoLogics solutions are developed on a common Java computing platform, avoiding the cost and uncertainty of investing in a commercial LIMS that is based on a proprietary software language.

## **Superior Scalability and Upgradeability**

With Research Informatics, GenoLogics has designed a solution that scales to meet the throughput challenges of growing laboratories. With support for common databases, development on a robust computing platform, and a developed methodology for software upgrades, our Research Informatics solution can provide new features and functionality with a minimum of impact on the laboratory environment, and a product vision that cannot be matched with a custom-built LIMS solution. Research Informatics, our LIMS solution for genomics and proteomics research, also provides common data file formats and archiving capabilities to ensure that legacy data remains accessible.

## **Open Platform Embraces Integration**

GenoLogics' goal is to provide an open data platform that embraces open data standards and open laboratory systems, and avoids the provision of a proprietary LIMS system that promote expensive vendor lock-in.

A commitment to open data standards and an open technology platform allows GenoLogics solutions to be implemented directly into “best-in-class” laboratory infrastructure, providing automated data capture and integration with popular platforms, instruments and robotics and analysis packages, allowing users to connect directly with the informatics systems already in place in their own laboratories. This connectivity can be developed with minimal investment in new hardware, software or instrumentation. GenoLogics firmly believes that open standards lead to open science, and accelerated research and faster discovery and publishing.

## **Maintenance and Support Excellence**

GenoLogics solutions are backed by a highly-skilled service team, including software engineers, support staff and field applications scientists, ensuring total satisfaction through ongoing support and maintenance. GenoLogics is dedicated to partnering with customers to meet ongoing and evolving requirements.

## **Comprehensive Training Resources**

Through the deployment of many lab management solutions to customers, GenoLogics has developed a comprehensive set of training materials and resources. These materials are designed to engage end users, address their training requirements, and ensure that they become productive users in minimal time.

## **Mitigating Risk of Project Failure**

GenoLogics provides you with an unparalleled combination of expertise in software development, the understanding of the data management and integration issues facing principal investigators, life sciences researchers and lab managers, and the proven capabilities of a lab information and data management solution that has delivered successful implementations for customers.

In summary, building a custom-built LIMS provides no assurances of realizing the same benefits that GenoLogics customers see with our LIMS solution. GenoLogics is dedicated to delivering outstanding solutions and support to laboratories and research institutes around the world, and we are confident that principal investigators, life sciences researchers and lab managers will maximize their financial and time investment with the GenoLogics LIMS platform.

Please contact GenoLogics to discuss your unique requirements; we would be happy to answer any questions or arrange a demonstration.

## Appendix 1: Cost Worksheet

Stakeholders in the lab and data management process can significantly benefit from the implementation of a commercial LIMS. The following worksheet provides sample calculations for the value of implementing a commercial LIMS system, compared to the costs of developing a comparable system in-house.

**Instructions:** Enter your lab operation costs and time estimates for developing a fully-featured LIMS in the yellow cells, and run through the calculations described at left. You may also request this spreadsheet from your local sales representative.

	Assumptions – General	Example	Your Lab
<b>A</b>	Number of laboratory users using lab management system	12	
<b>B</b>	Lab software engineer – average cost per week[i]	\$2,600	
<b>C</b>	LIMS Project consultant - average cost per week [ii]	\$3,800	
<b>D</b>	Internal staff for project liaison - average cost per week	\$2,000	
<b>E</b>	Number of instruments in lab requiring integration into LIMS	5	
<b>F</b>	Database and hardware (dual CPU), Linux OS and dual CPU server hardware	\$7,000	
<b>Assumptions: "Build" In House - Implementation Costs</b>			
<b>G</b>	Software costs per user	0	
<b>H</b>	Number of lab software engineers for LIMS development	2	
<b>I</b>	Training on IT infrastructure supporting LIMS software, weeks	2	
<b>J</b>	Lab software engineer training costs (B x H x I)	\$10,400	
<b>K</b>	Number of LIMS Project Consultants for LIMS development	2	
<b>L</b>	Weeks in development of in-house LIMS	26	
<b>M</b>	Development costs - labor (B x H x L) + (C x K x L)	\$332,800	
<b>N</b>	Annual help desk support and training costs per user	\$300	
<b>O</b>	Number of lab staff software engineers for LIMS maintenance	2	
<b>P</b>	Number of LIMS Project Consultants for LIMS maintenance	2	
<b>Q</b>	Weeks of maintenance, annual	3	
<b>R</b>	Maintenance costs - labor, annual (B x O x Q) + (C x P x Q)	\$38,400	
<b>S</b>	Annual in-house training support costs (A x N) + R	\$42,000	
<b>Assumptions: "Buy" Commercial LIMS Implementation Costs</b>			
<b>T</b>	LIMS user license costs per user	15,000	
<b>U</b>	Total LIMS license costs (A x T)	\$180,000	
<b>V</b>	Number of lab software engineers for LIMS	1	
<b>W</b>	Number of internal project liaisons with external vendor	0.5	
<b>X</b>	Weeks in development	3	
<b>Y</b>	Development costs - labor (B x V x X) + (D x W x X)	\$10,800	
<b>Z</b>	Annual support and license fees as a % of license	20%	
<b>ZZ</b>	Annual support and license fees (Z x U)	\$36,000	
<b>Cost Analysis</b>			
<b>AA</b>	Total: In House Development Costs (F + G + J + M)	\$350,200	
<b>BB</b>	Total: Commercial LIMS Implementation costs (F + U + Y)	\$197,800	
<b>CC</b>	<b>Savings in development costs by buying LIMS (AA - BB)</b>	<b>\$152,400</b>	
<b>DD</b>	<b>Savings in annual operating costs by buying LIMS (R - Z)</b>	<b>\$6,000</b>	
<b>EE</b>	<b>Savings over 5 years of operation (CC + (5 x DD))</b>	<b>\$182,400</b>	

## References

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<sup>i</sup> The Standish Group 2004 CHAOS Demographics and Project Resolution Study, Third Quarter Report Summary, <http://www.standishgroup.com>

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## Contact Us

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GenoLogics is the leading provider of informatics solutions for translational research, spanning both the discovery and biomedical research domains. Our science-purposed modules for discovery research are complemented by a highly configurable, integrating LIMS platform that is scalable to service many labs and sciences across an organization. Our Biomedical Informatics product suite allows labs to track and manage their biospecimen and clinical data, while aggregating results with our Research Informatics LIMS solution for a holistic view.

For more information, please visit [www.genologics.com](http://www.genologics.com).

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