

Case Study



Developing a Cell Line Registration and Analysis System

Biopharmaceutical and biotechnology companies conduct discovery research using biological entities to develop therapeutic products. Scientists reference various biological entities including plasmid systems, antibodies, or cell lines as primary vehicles to conduct experimental research. Unlike a chemical registration system, which is established and serves as the foundation of discovery research, a biological registration system is only taking shape. Infosys partnered with a US based biopharmaceutical to build a registration and analysis system for cell line based experiments. The design of the system was based on requirements from scientists and reviewed alongside available vendor product information. The system was iteratively built with prioritized functionalities in a time-boxed feature development program plan. The cell line system built had the following objectives: convert paper to electronic records, minimize cycle time to complete registration, provide an electronic inventory reference map for sample management, provide visual analytics on cell based assays, and enable scientists with a collaborative wiki page for reference.

Client

The client, headquartered in the US, is leading biotechnology company that is focused on discovering, developing, manufacturing and marketing advanced therapies in neurology, autoimmune diseases, and pain.

Business Context

Biopharmaceutical research requires biological entities, of various combinations, to run assays. Therefore scientists need to register these biological entities and request for requisite amounts to conduct experiments. Cell lines are one of the important components of pharmacology assays along with plasmids, antibodies, and proteins. In assays, these biological entities are used for analyzing the ability of therapeutic compounds to initiate or inhibit biological activity. Registration of biological systems has no well-defined boundaries, unlike its chemical counterpart. Therefore biopharmaceutical and biotech research organizations feel an increasing need for a system that can define, archive, search, track, and analyze biological samples, including transgenic and RNA knockdown in the future.

Use cases

The following use cases and its manual operations were captured from cell line scientists:

- Register a new parent cell line and modify its records if necessary
- Register derived cell lines from a specific parent. One could derive a stable clone, hybridoma, or a subclone. Again modification of any record is allowed
- Search for a typical cell line or a type of cell line with a given set of feature specifications. Results can be viewed for similar cell lines searched. One can view the genealogy of a cell line derived from its parent
- Register a cell line or its derivatives as an inventory stock item. Assign a cell line with a freezer container location. Modify stock features as necessary. Track the stock in the various freezer maps for depletion and offsite storage
- Requests to get cell lines from the stock inventory and fulfill requests as needed
- Visually analyze standard sensitivity analysis against cell-based assays. Capture key snapshot of graphs that can add value to a project trimester report
- Refer to bio-therapeutic properties of a protein target from a collaborative knowledge asset
- Provide role-based access to processes and provide suitable administrative rights

Infosys Solution

Infosys collaborated with the client to develop a collaborative research application with the following features and functions:

- Registration of a cell line and its derivatives and the ability to search
- Manage inventory and track depletion and offsite storage
- Requisition to get a cell line from freezer and fulfill its request
- Cell line based assay performance on Spotfire
- KinaseWiki

First, Infosys' domain consultants undertook a detailed study on the different methods to register cell lines and hybridoma and learned how a cell line is derived from a parent cell line, and how critical ones were expanded for a particular therapeutic project. Cell lines require study of appropriate protein, media, or an antibody with which it interacts for a particular hypothesis testing. Further, a detailed account on how cell lines were stored in freezers and thawed as needed was obtained. The client shared information on how cell line stock items were tracked in the freezer and what is currently lacking to have a good traceability of stocks. Scientists shared binder and notebook information on quality analyses of cell lines and how they were archived in a layout map. Cell lines-based assays were analyzed for routine sensitivity analysis for competitive inhibition assays. Background knowledge on protein targets of interest will be useful reference information as a collaborative knowledge framework which scientists can reference. Based on the above theme, requirement gathering sessions were conducted to clearly identify and elaborate the requirements for the new collaborative research information system for registration and analysis.

Technical Solution: Infosys established a dedicated technology team which determined the optimum architectural roadmap and designed a well-researched cell line data schema. This team focused on:

- Defining a robust cell line data schema which would encapsulate not only Cell Line information but also information pertaining to Plasmid, Antibody, Proteins, and Projects
- Design a collaborative workflow framework which can act as a workbench interface for cell line research community
- Integration of Spotfire to leverage its visual analytics features for sensitivity analysis
- Defining design standards and guidelines that can be reused across the organization
- Develop a structured wiki that serves as a thematic knowledge base for reference

The domain experts in the team provided background knowledge, current trends, and insights to enhance the quality of the application delivered.

The prototype was built on Microsoft Office Sharepoint Server 2007 and Microsoft .NET 2.0 as the technology of choice for this solution. TIBCO Spotfire product was integrated with Microsoft .NET technologies for collaborative visual analytics capabilities. Additional .NET scripts were developed to customize the Wiki features in MOSS 2007. Oracle database supported the application schema and raw data from binders and notebooks were updated into tables. Web services were developed around data for plasmids, antibodies, projects, and investigators. Default SharePoint features were configured to provide role-based access and Web part development around specific business activities.

Project Management: The application features were developed in a time boxed approach. The SCRUM method was adopted for rapid feature development together with global delivery model. Daily meetings were conducted to share information about what was developed each day, what challenges were faced, and what will be the next

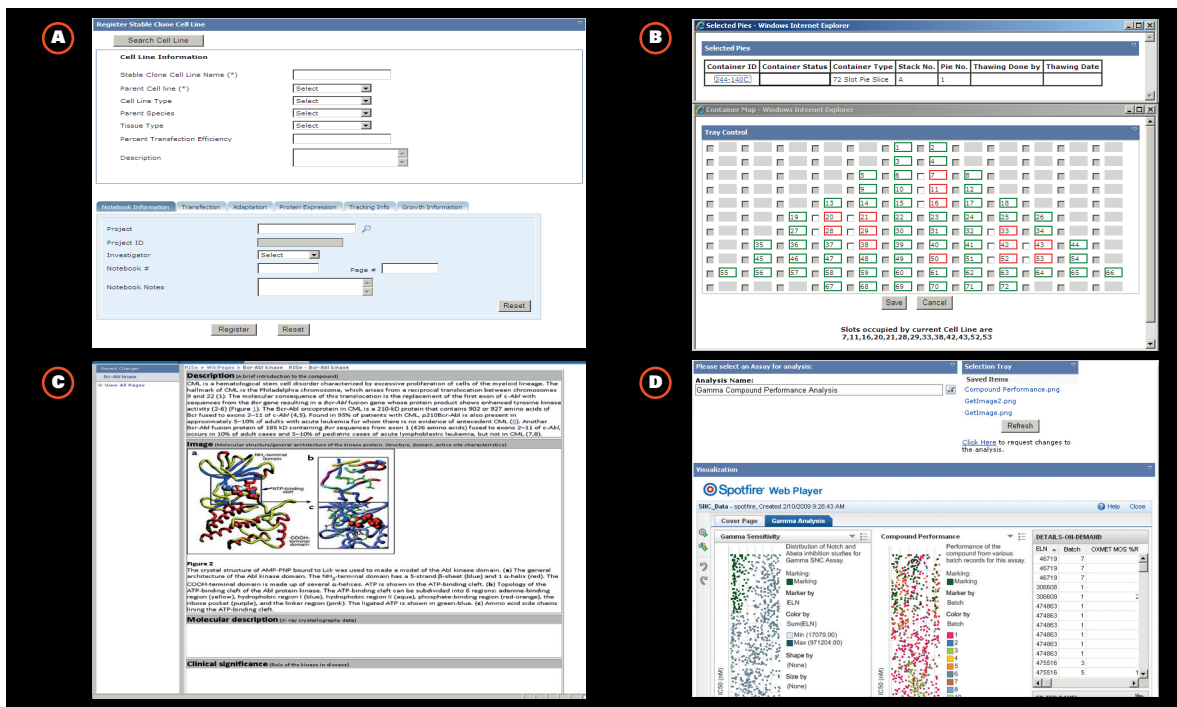


Figure above shows A. Cell line registration, B. Container map allocation, C. Wiki screen, and D. Results visualization

course of development. Flexibility on scope of the feature was maintained in case there was prioritization of features expressed by scientists, or a certain data was not available for testing, or a technology proof of concept would take longer than specified timeframe. The project was accomplished by a 5 member team in 6 weeks period with additional time for final bug fixing and training.

Impact to the Business

The system is a collaborative research platform containing information from disparate biological data sources. Scientists from molecular biology and pharmacology research units now do not have to switch between siloed systems to search registered entities and stock items for experiment preparation.

The client scientists now can:

- Register and modify a cell line and its derivatives
- Develop genealogy map of all derivatives from a parent cell line
- Track all vials of a particular cell line is located in a container map
- Make requests to get a cell line
- Deplete a cell line after thawing from freezer
- Identify which cell lines have been sent for offsite storage
- Visually inspect cell line based compound performance
- Refer a KinaseWiki for knowledge attributed to a protein of interest

This cell line system facilitates considerable reduction in the time by converting the entire paper based process to electronic format. An efficient system was built for cell line registration, visual analytics, and knowledge management to aid in cell based pharmacological assays. Such a system is a start point for a biological registration system which is perceived to be far more complex and inter-dependent than a chemistry registration system.



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