Biotechnology Company Improves Lab Throughput With Simulation

SITUATION

An Analytical Lab for one of the world's leading biotechnology companies was struggling to keep up with the current workload and had a highly variable future project forecast. Furthermore, they suspected they lacked staff and needed additional equipment, but could not specifically determine how many full time equivalents (FTE's) and pieces of equipment were required. Therefore, they could not request from management the appropriate additional resources.

The lab conducts approximately 1,000 tests per month. A major challenge was their ability to respond to demands for expedited test analysis without compromising the ability of the lab to continue to meet delivery targets for their standard workload.

The lab analytics team needed a way to determine the optimal number of resources for the current unpredictable workload and to project required resources for their volatile future demand. Based on previous success working with ProModel, the organization felt that predictive analytics would allow them to address their challenge both now and into the future.

OBJECTIVES

- Identify the correlation between serviceability (% of analytical lab tests completed within target turnaround time) and lab capacity
- Determine the number of FTEs or contract workers (CWs) needed per project
- Reveal instrument bottlenecks and justify spending on additional instruments
- Find gaps in analyst or reviewer training to cover the projected lab workload
- Optimize temporary regroupings and/or reassignments in response to unplanned events such as expedited investigations
- Improve resource planning for upcoming projects

RESULTS

The analytics team utilizes the model to determine the number of necessary FTE and CW resources for their current and future projects. The model confirmed the under-resourced status of the analyst group. A scenario run with 20% overtime (OT) for analysts produced better results for the existing workload. Therefore, management approved 20% OT for analysts.

The model also aided our client in identifying gaps in assay training and instrument purchases. They now

proactively pull in members from other groups and/or train new resources based on their expected adherence to their required turn-around times. These new members provide review and free up previously occupied analysts to run more samples.

Finally, management also approved the purchase of two additional instruments to support their current throughput based on analysis from the model.


Serviceability Percentage: Projected On Time Test Completion

Improved completion % with recommended skill changes implemented (56%)

Baseline completion % with original staff schedule (40%)
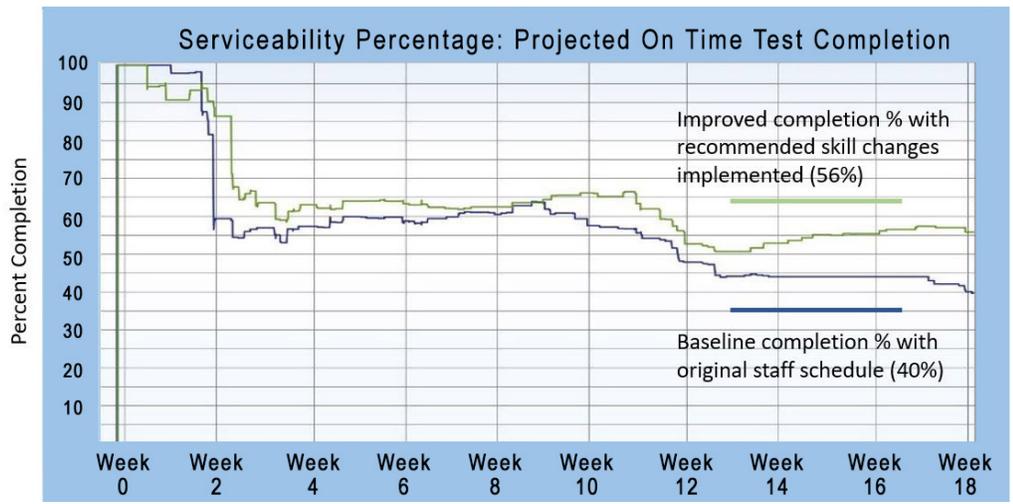
Output chart showing predicted total serviceability.

SOLUTION

The solution consists of two models. The first model forecasts demand upon the lab for the next six months. The second model uses the demand forecast from the first model to predict the serviceability percentage (Turn-Around-Times) for the next six months to determine if they are within the standard time allowed. If serviceability is projected to be below the committed target, the second model also helps determine what actions to take with staffing (schedule more appropriate skill mix, train new resources, and/or run overtime) to bring the serviceability metrics back up to the target levels.

Model two defines different process flows for each assay type. Process flows include the type and quantity of FTEs as well as the directions for assigning FTEs to the tests. A set of rules based on actual process flow allows the expedited samples higher priorities in scheduling and equipment access. The model includes all planned and current equipment and accounts for analytical labs common practice of test batching. Simulation allows the team to evaluate the impact of adding both standard and expedited tests to the standard test schedule.

The models are run monthly to see projections for the next 6 months. If there is a predicted drop in serviceability below standard, they use the solution to find the most effective way to prevent the drop. In the case where it requires training an FTE(s), which could take up to 90 days, they will be prepared to face the situation before it arises. The model can also be updated as necessary to support changes required by the analytics lab team.
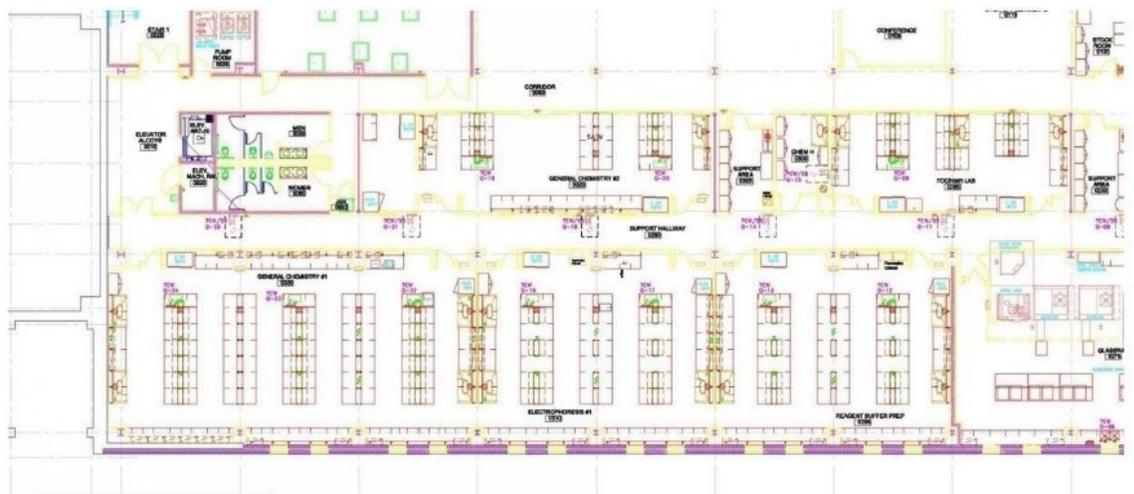
High Level CAD View of Analytical Lab Model