navify › Lab Operations

Optimizing lab operations through digitized processes

Case study

Synopsis

Burjeel Holdings is a healthcare provider in the Gulf Cooperation Council (GCC), established in delivering specialized care for complex therapies[1]. In the UAE, Burjeel Holdings has 12 Joint Commission International (JCI) accredited hospitals taking care of more than 5.5 million patient visitors per year. Its Laboratory Services arm, coLAB manages more than 10 million tests annually. The high volume of patients and tests placed unique challenges for Burjeel Holdings, specifically, for their operational efficiency, testing capacity and quality. Before using **navify**® Lab Operations, the legacy procedure for running this large volume of testing entailed staff manually completing a number of pre- and post-analytical tasks, which were physically and mentally demanding and error-prone. This lead to high Full-Time Equivalent (FTE) cost and long Turnaround Time (TAT). Hospital leadership urgently wanted to identify a solution to transform their manual processes to digitization, starting with laboratory sample management. After thoroughly assessing laboratory applications across the industry, they chose **navify**® Lab Operations, because it offered advanced end-to-end sample management capabilities with a high degree of interoperability and data aggregation. **navify**® Lab Operations allowed information to flow seamlessly within the network, including the twelve clinical laboratories and four different health information systems.

navify® Lab Operations was implemented at Burjeel Hospital Abu Dhabi Lab in September 2021. Three months after implementation, evaluation teams assessed the performance of **navify**® Lab Operations with a combined qualitative and quantitative approach. After mapping out the workflows in the legacy approach (using the manual process) and the workflow after implementing **navify**® Lab Operations, they found that the new process was much more streamlined, and the number of key tasks were reduced by 69%.*

For the quantitative evaluation, the Burjeel evaluation team collected TATs for all tests extracted a month before and a month after implementing **navify**® Lab Operations. A comparison of the median TATs before and after implementation revealed that the median TATs across all 114 tests on average were reduced by 46%. For some tests (e.g. Testosterone calculated Panel), the reduction was as much as 93%. The reductions in TATs were statistically significant.

> "The digital transformation of the laboratory processes helped us unlock efficiencies in our network and redeploy resources to expand other service lines. We now deliver results faster to the physician and patients to facilitate easier consultations."
>
> **Mr. John Sunil**
> CEO Burjeel Holdings

As a result of these significant benefits from **navify**® Lab Operations, Burjeel Holdings has begun a full lab operations digital transformation with the support of the Roche portfolio. The **navify**® Lab Operations manager now provides multi-site integration to consolidate care across their 9 hospitals by streamlining process efficiency, reducing expenses and increasing diagnostic services.

Background

Founded in 2007, Burjeel Holdings evolved into a quaternary care provider, with a growing presence in Oman and Gulf Cooperation Council. The facility provides world-class healthcare services and facilities to patients, visitors and residents. In the UAE, Burjeel Holdings has over 1500 doctors, 12 JCI accredited hospitals, 1600 beds, 69 operation theaters taking care of more than 5.5 million patient visitors per year. Its Laboratory Services arm, coLAB manages more than 10 million tests annually.

The legacy procedure for running this large volume of testing before **navify**® Lab Operations entailed staff manually completing a number of pre- and post-analytical tasks, which were physically and mentally demanding, required high manpower cost and were error-prone.

After sample collection, staff packed all the tubes individually together with the clinical order, then a courier transported the samples to the laboratory. Upon arrival at the laboratory, a technician checked each specimen one-by-one and documented them in a log sheet. Afterwards, a technician entered the information into the Electronic Medical Record (EMR) to register the sample and print a label for each specimen. After completing the sample arrival process, the samples were then processed using various instruments and methods. Once ready, the results were reviewed and validated by the laboratory professionals in the Laboratory Information System (LIS). The last step was to generate a report including all of the test results, which were then sent back to the physicians.[2]

Because the laboratory process was manual, complex and time consuming, Burjeel Holdings wanted to improve process efficiency to deliver more specialized care for its patients. When the team conducted a thorough assessment of the operations to understand the change implications on each personnel, they quickly realized that an advanced laboratory process manager could be built on the existing EMR and LIS, in order to avoid a complete change of their IT solution.
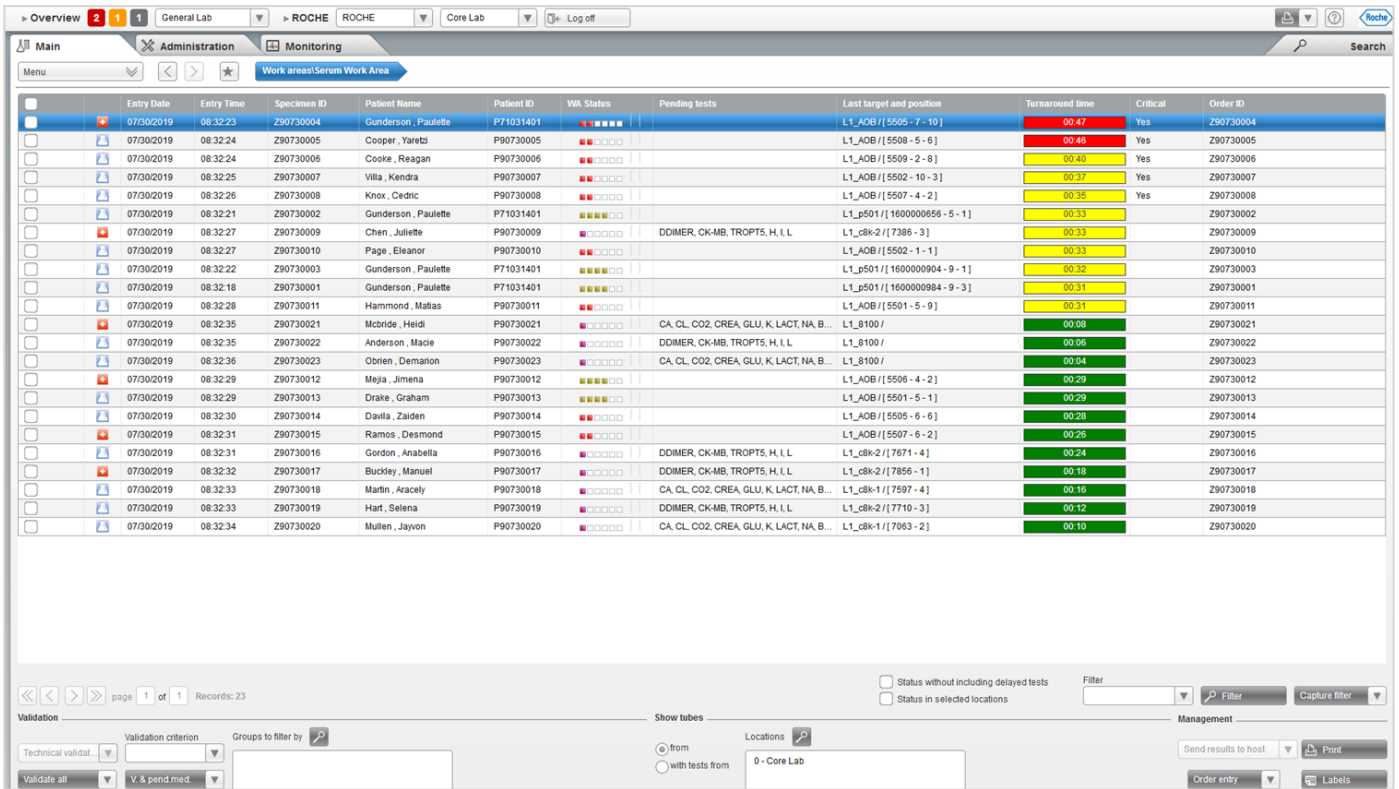
Figure 1
One example of a validation screen in **navify**® Lab Operations. It is intuitive and easy to use.

Implementation of navify® Lab Operations solution

coLAB team at Burjeel holdings implemented **navify**® Lab Operations at Burjeel Medical City. It is a laboratory process management solution that integrated the existing IT infrastructure and connected different health information systems. It has been shown to be highly competent, enabling seamless integration between data producers and consumers, while at the same time being easy to use and understand (Figure 1). **navify**® Lab Operations streamlined information management as it provided laboratory personnel with relevant information at all times with an interface for alerts, required actions and system overview. Laboratory personnel could simply navigate the platform, with the support of task notifications. What has been unique with the **navify**® Lab Operations process manager is it does not only streamline sample processing from order to result, and from pre-analytics to archiving, it also has been completely browser based, allowing users to access and use the software from any desktop computer.

In addition to driving intelligent sample processing, **navify**® Lab Operations efficiently managed the samples with the advanced workflow engine integrating the process, from ordering to test result, with paperless reports. After sample processing, structured options for both manual and automatic archiving have been available for a defined period. It orchestrated all the lab processes and enabled a personalized automation for enhanced operations in all different types of laboratories from low to high-volume output.

## Automation of manual tasks and streamlined workflows

The implementation of **navify**® Lab Operations demonstrated increased laboratory efficiency within and across departments[3]. With a simple scan, laboratory personnel sent data directly to electronic medical record systems. Leveraging the tight integration between **navify**® Lab Operations and **cobas**® infinity POC solution, diagnostic devices could easily be managed and connected, therefore eliminating the need for manual documentation tasks such as order entry printing, logging, result management, quality control, etc.

Furthermore, lab personnel no longer had to ensure that samples were manually identified and entered into the system. With the significant reduction in clerical steps because of automation, lab personnel could now work on more complex duties. Standalone automation delivered enhanced transcription error handling, safety and process quality with an intelligent and customizable sample distribution.

The end-to-end process manager enabled full traceability of samples regardless of it being processed manually or automatically; lab personnel could now easily determine where the sample was, where it has been and where it was going. Increasing the availability of the software solution leveraging the proactive maintenance capabilities in addition to the advanced remote troubleshooting features bolstered business continuity.

Figure 2
Example of patient samples sorted and packed in a specimen bag, prior to being sent to the laboratory.
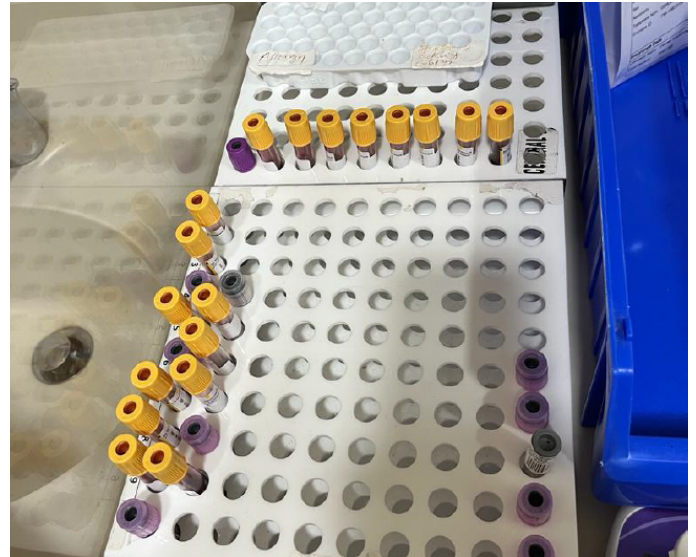
Figure 3
Example of samples sorted into automation racks at the time of sample drawing, prior to being sent to the laboratory.

After the implementation of navify® Lab Operations, arrival registration time was reduced to 9.0 seconds on average (45 seconds total for 5 consecutive samples), resulting in a **72% reduction**.

After implementation of **navify**® Lab Operations, the automation of pre-analytic tasks resulted in faster sample reception registration procedures, including arrival registration and sample review. Pre-implementation sample arrival registration time was on average 31.6 seconds (SD = 21.5), ranging from 4 seconds to 52 seconds based on observations of 5 consecutive samples.

In addition, pre-implementation sample reviewing time was on average 13.2 seconds (SD = 5.9). In post-implementation of **navify**® Lab Operations, all normal results were validated through **navify**® Lab Operations, at no time cost for the lab technicians. Only the abnormal results required lab technicians to validate, and it took on average 4 to 8 seconds to validate each abnormal result.

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## Legacy workflow at Burjeel Holdings

1. Staff manually completed a paper order of the test that was individually packed with each bag of blood collection samples.

2. Courier transported the samples from the collection site to the laboratory.

Streamlined workflow

3. Once the samples arrived at the laboratory, a lab technician checked each specimen individually and documented information in three different places: log sheet, referral book, and the billing sheet.

4. A technician manually entered the content of each paper order into the Electronic Medical Record (EMR) to register the sample and print a label for each specimen.

5. After testing the sample, the results were manually validated for sample integrity, system errors, result range and delta check, etc.

6. A lab technician manually ordered reruns or additional testing based on the validation outcomes.

7. A report was generated and then emailed to the physicians[2].

13 steps
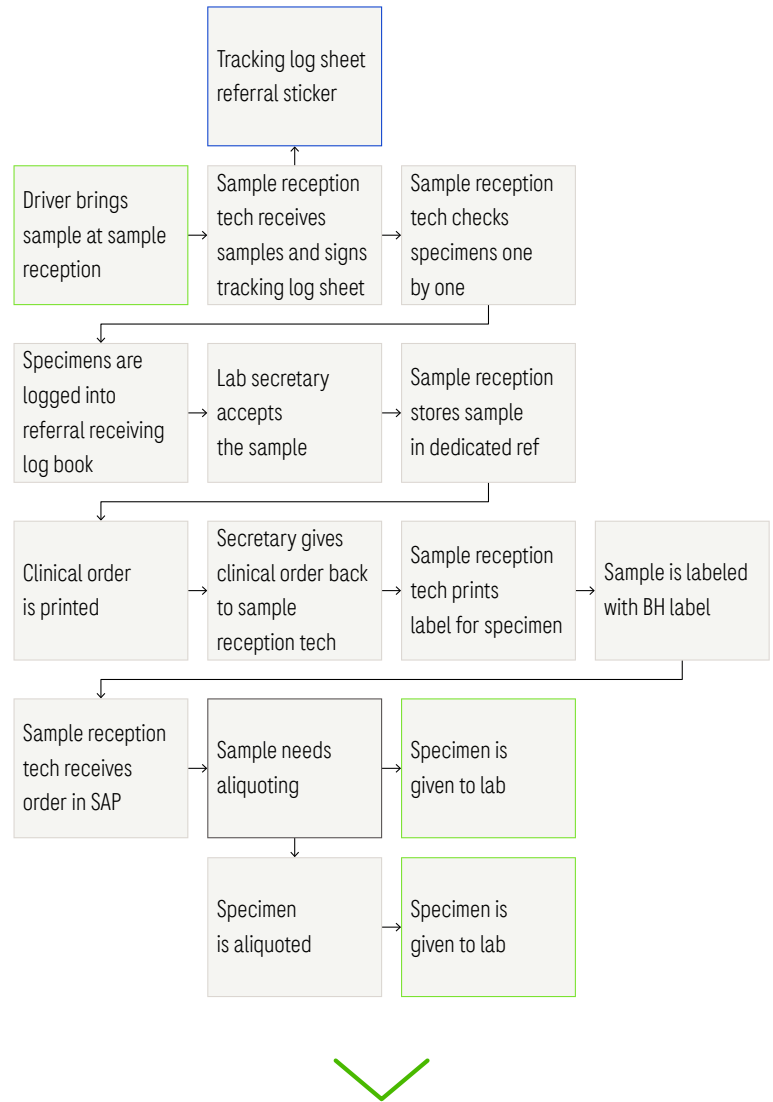
4 steps

After the implementation of **navify**® Lab Operations there was a 69% reduction in the number of steps.
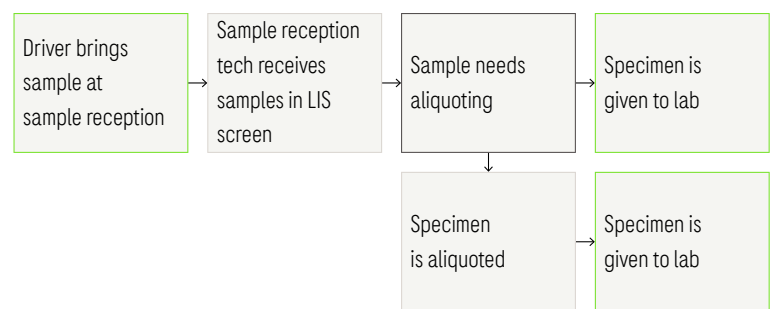
Lab technicians can have more time for clinical tasks due to the time saved through the auto-validation process

Value creation with lean validation

Manual validation of test results became a story of the past with **navify**® Lab Operations. Sample quality checks were conducted early on with the support of **navify**® Lab Operations for tube type identification, liquid and volume detection, spin status and sample quality checks. With lean validation, lab personnel analyzed the test results through an advanced set of rules and criteria, enabling them to focus on those test results that really needed attention.

Technical results verification could be conducted for sample images, instrument flags, reference ranges, previous test results and more. In addition, **navify**® Lab Operations supported clinical result verification based on rules and criteria, to identify those abnormal test results that required extra attention and automatically released those that met the criteria.

These rules also allowed reruns and further testing to be automatically arranged. Manual work was further reduced by the capability to reformat test results and add comments. Altogether, **navify**® Lab Operations has been highly valued for its advanced automation with lean validation feature[3]. "**navify**® Lab Operations is the one-stop-shop for pathologists," says Mayur, as it dramatically reduces manual work on all fronts.

Moreover, **navify**® Lab Operations has enabled a complete overview of their quality control processes and how their instruments performed across devices and location.

Reduced turnaround time

The Burjeel evaluation team collected sample turnaround time (TAT) data to evaluate the impact of navify® Lab Operations. Turnaround time (TAT), defined operationally as the difference between verification time and extraction time, was available for each test. 183,177 runs data were collected before the introduction of navify® Lab Operations and 575,231 after, and therefore, in total 758,408 runs were collected from a total of 114 unique test types.

The distributions of all TATs for all test types before and after the implementation of navify® Lab Operations are illustrated (Figure 4). Overall median turnaround time before navify® Lab Operations implementation was 7.0 hours (Median Absolute Deviation = 5.2 hours), and after implementation, it was 4.0 hours (Median Absolute Deviation = 2.9 hours).

For each test, the percentage reduction in median turnaround time was calculated for before and after the introduction of navify® Lab Operations, defined as $100 \times (T_b - T_a) / T_b$, where T_b, T_a are the median turnaround times before and after navify® Lab Operations, respectively. The distribution of the percentage reduction in median turnaround time, (Figure 5) demonstrates vast majority of tests benefited from a substantial reduction in median turnaround time. On average there was 46% of reduction in TATs. The difference between TATs before and after was significant.
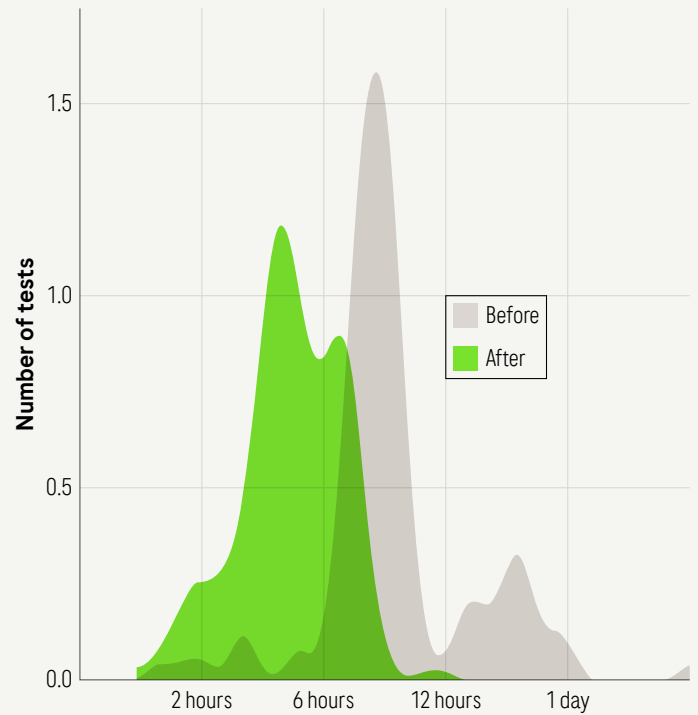
Turnaround Time

Figure 4
The distributions of all TATs for all test types before and after the implementation.

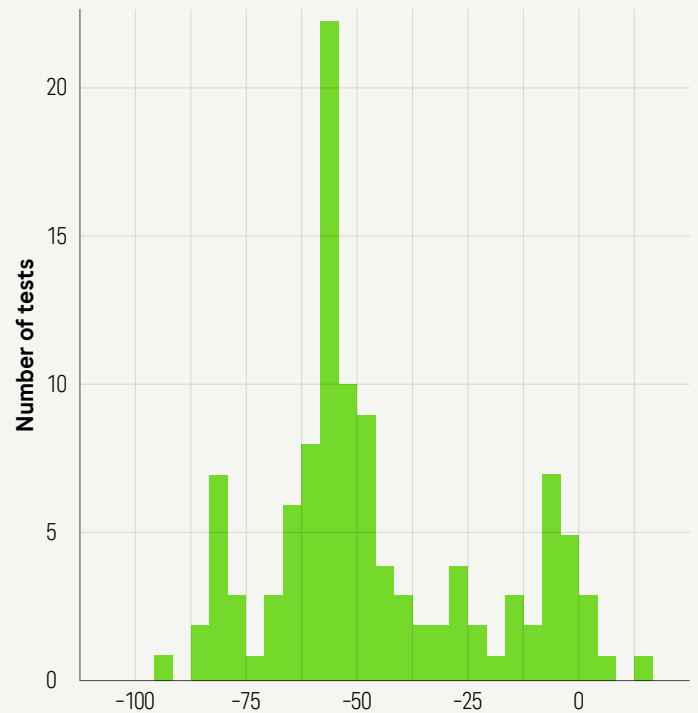## Percentage of TAT Reduction (before vs. after)

Figure 5
Demonstration of the distribution of the percentage reduction in median turnaround time.

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Improved operational efficiency and potential impacts on financials

Burjeel Holdings observed financial improvements as a result of shortened turnaround time, greater throughput, increased testing volume, staff productivity, and improved patient satisfaction. For example, certain immunoassays that only ran once a day before were now running multiple times in a day. With connected automation, **navify**® Lab Operations connected different instruments to increase the predictability of time to test results. Physicians who have been impressed by same-day turn-around of test results, increased uptake and utilization of laboratory services.

In parallel, the cost of running immunoassays was observed to have a reduced nearly 20%[3]. The analysis was done through regular quarterly and semi-annual laboratory processes as well as performance assessments performed by Roche Healthcare Consultants at the site. The time spent by the lab personnel doing the tasks at the sample reception area, accessioning area, analysis and post-analysis area (including results validation and release) were all measured. Additionally, a set of samples was timed and the average time to complete the steps per sample for each full time employee was measured. The laboratory process and performance assessments also included complete workflow analysis and process maps to identify non-value adding tasks and wastage in movement and time.

Manual process
Lots of tests prone to error

Sample reception	Extra barcodes
	Complex process led to increased TAT
	Barcode label didn't show required tests
Burjeel samples	Billing process was long and time-consuming for Burjeel Holdings samples
	Sometimes samples came without stickers
	IT integration was the major draw back
Clinical chemistry	Sorting and testing distribution consumed a lot of time and effort
	No auto-verify and reviewing was done manually
	Big batches overloaded the systems
Improvements	No routine sample receival log books
	No recapping with original caps, disposable caps were used
	Maintenance and QC were done in the evening

Major improvement
Time, cost and people

Sample reception	Only needed barcodes printed (ESR, OPD, Pediatrics, Multiple orders)
	All samples are pre-sorted in phlebotomy before sending to the lab
	Majority of samples are just scanned in **navify**® Lab Operations
Burjeel samples	Every 40–45 minutes samples are collected from phlebotomy
	All samples are placed in one pouch with no papers inside
	Samples will be sent to PTS to lab to be collected by driver
Clinical chemistry	No sorting is happening and no request forms are sent inside the lab
	Samples are also accepted in chemistry: 36 samples in 3 minutes
	Samples are run in small batches
Improvements	Reduced TAT: Results are ready within 4 hours
	Reduced paperwork (no request forms, no barcodes wasted)
	Increased staff satisfaction

Facilitating digital transformation

The **navify**® Lab Operations implementation has been a flagship success; a "proof of concept for digitalization," as stated by the Director. Hospital personnel have been excited for more digitalization changes.

Building on this momentum, implementation plans for **navify**® Lab Operations quickly rolled out for all the patients needed to Burjeel Holdings hospitals. With **navify**® Lab Operations, Burjeel Holdings brought improved experience for patients. Before the implementation of **navify**® Lab Operations, patients had no visibility into their patient journey. Patients needed to wait for test results from their healthcare providers (HCPs). In contrast, **navify**® Lab Operations enabled the delivery of test results to patients digitally. This enabled patients to better plan and schedule their consultation with HCPs, instead of waiting for days or even longer.

navify® Lab Operations has been designed to evolve with the needs of customers and the healthcare industry. Roche has been committed to build on its existing software portfolio, and invest in a new digital backbone that will aggregate data across lab disciplines and across locations. With new tools and services, Roche will continue to improve the quality and efficiency of laboratory diagnostics.

References

1. https://burjeelholdings.com/about-us/
2. Based on the laboratory workflow analysis and mapping activity provided by Burjeel Holdings
3. Based on interview with Burjeel Holdings
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