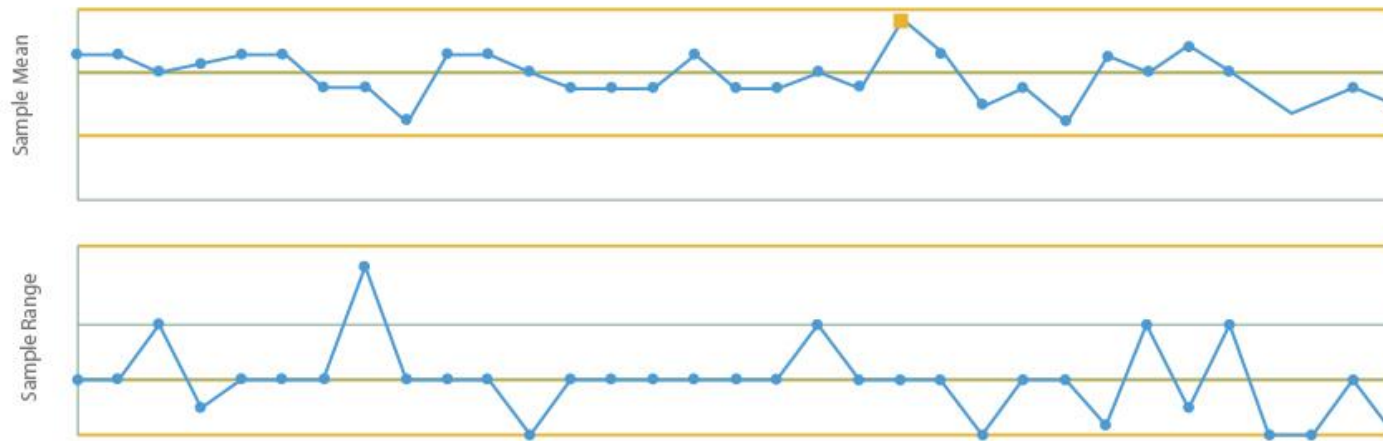




## The Pursuit of Manufacturing Excellence



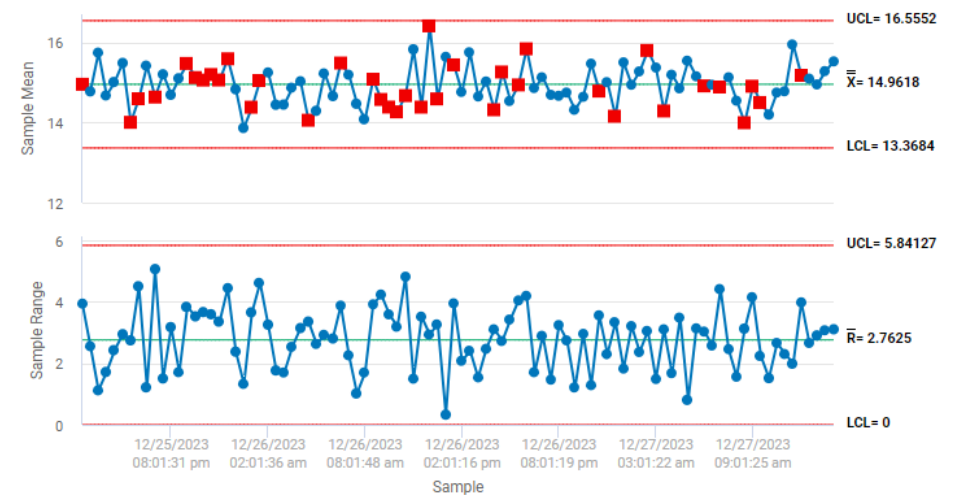
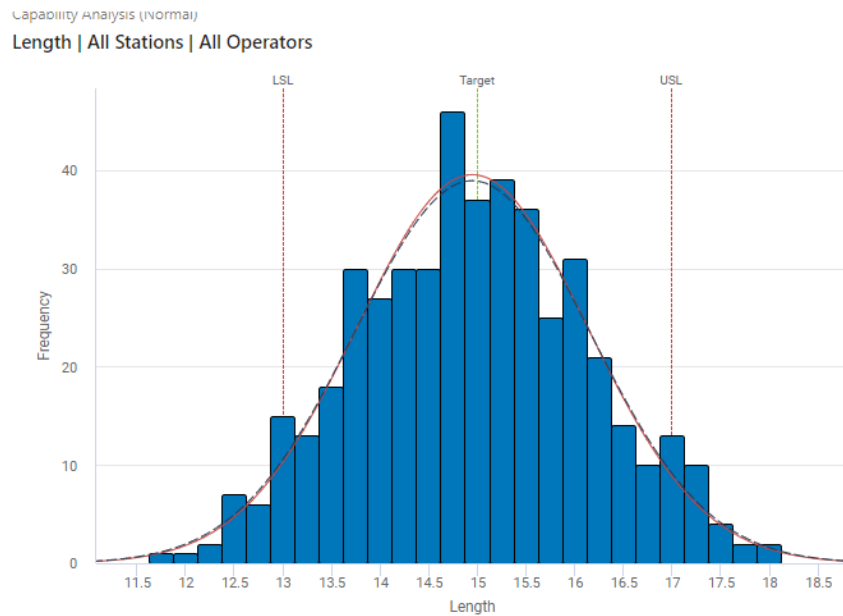
**This partnership with Minitab extends the functionality of SAP® Digital Manufacturing, allowing our customers to achieve manufacturing excellence.**



# What is Statistical Process Control?

Statistical process control (SPC) is defined as the use of statistical techniques to control a process or production method.

Real-Time SPC maximizes the performance of a system by continually improving processes.



# Real-Time SPC ensures that a process operates in a predictable manner

Real-Time SPC

Engineering Portal

Process Quality Snapshot

None

Check Subgroup Dimensions (5 Units | 3 Measures) ( 4) Cedar chests

For Measure: All One analysis for all stations

Control Charts Capability Analysis Assignable Causes

General Settings

Capability Analysis (Normal)  
Length | All Stations | All Operators

Real-Time SPC enables the detection of process variations in real-time, allowing for immediate corrective actions to prevent defects

**Process Data**

LSL	13
Target	15
USL	17
Sample Mean	15.0902
Sample N	470
StDev(Overall)	1.16401
StDev(Within)	1.17267

**Overall Capability**

Pp	0.57
PPL	0.60
PPU	0.55
Ppk	0.55
Cpm	0.57

**Potential (Within) Capability**

Cp	0.57
CPL	0.59
CPU	0.54
Cpk	0.54

**Performance**

	Observed	Expected Overall	Expected Within
% < LSL	3.83	3.63	3.73
% > USL	5.74	5.04	5.17
% Total	9.57	8.67	8.90

# Real-Time SPC quickly identifies areas for improvement

Real-Time SPC

Operations Dashboard | Jenn Atlas

20 Stations 20 Running, 0 Idle, 0 Shutdown

Start Time: 12:00 AM

Station	Status	Next Collection	Product		↑ % Out-of-Specification	% Out-of-Control
> (23) Station [I-MR]	✓	Automatic	(8) Closet rods		38.08%	1.47%
> (19) Station [I-MR]	✓	Automatic	(4) Cedar chests		36.26%	2.91%
> (24) Station [I-MR]	✓	Automatic	(9) Barrels		36.26%	1.47%
> (26) Station [Xbar-R]	✓	Automatic	(1) Brush handle		35.15%	0.00%
> (34) Station [Xbar-R]	✓	Automatic	(9) Barrels		35.01%	0.00%
> (21) Station [I-MR]	✓	Automatic	(6) Benches		34.76%	0.98%
> (30) Station [Xbar-R]	✓	Automatic	(5) Cedar		33.89%	0.00%
> (28) Station [Xbar-R]	✓	Automatic	(3) Canes		33.41%	5.80%
> (33) Station [Xbar-R]	✓	Automatic	(8) Closet		33.28%	2.86%
> (27) Station [Xbar-R]	✓	Automatic	(2) Cable reels		32.95%	2.86%
> (17) Station [I-MR]	✓	Automatic	(2) Cable reels		32.74%	1.94%
> (25) Station [I-MR]	✓	Automatic	(10) Crutches		32.63%	2.44%
> (35) Station [Xbar-R]	✓	Automatic	(10) Crutches		32.36%	2.94%
> (31) Station [Xbar-R]	✓	Automatic	(6) Benches		30.54%	2.94%
> (18) Station [I-MR]	✓	Automatic	(3) Canes		30.21%	3.87%
> (16) Station [I-MR]	✓	Automatic	(1) Brush handle	Chris Butler	29.53%	0.98%
> (20) Station [I-MR]	✓	Automatic	(5) Cedar closet lining	Check Individual Dimensions (1 Unit, 3 Meas... Jake Lidwell	26.85%	4.33%
> (29) Station [Xbar-R]	✓	Automatic	(4) Cedar chests	Check Subgroup Dimensions (5 Units, 3 Me... Jake Lidwell	25.57%	2.86%
> Station Measure: Diameter	✓	150 minutes	Product	Process Step Jenn Atlas	0.00%	100.00%

Real-Time SPC also provides valuable insights into the overall process performance

# Real-Time SPC addresses common business challenges



## Business Challenges

Process inefficiencies are discovered too late, creating waste and costly process disruptions

Products being manufactured are out of specification or not meeting customer expectations

Processes are not being optimized to maximize performance

## Solutions

Early detection of process issues allows for timely corrective action, preventing the production of non-conforming product and reducing the risk of costly process disruptions

Statistical Process Control provides quality assurance to ensure the final product meets specifications and customer expectations

Engineers can make real-time, data-driven decisions for process optimization, reducing waste, improving efficiency, and minimizing defects



# SAP & Minitab's development partnership enables SAP Digital Manufacturing customers to achieve manufacturing excellence

SAP RTSPC\_WC\_POD Plant: TIMBCO ( Timber Woodworking RTSPC Hierarchy ) Search In: "Apps"

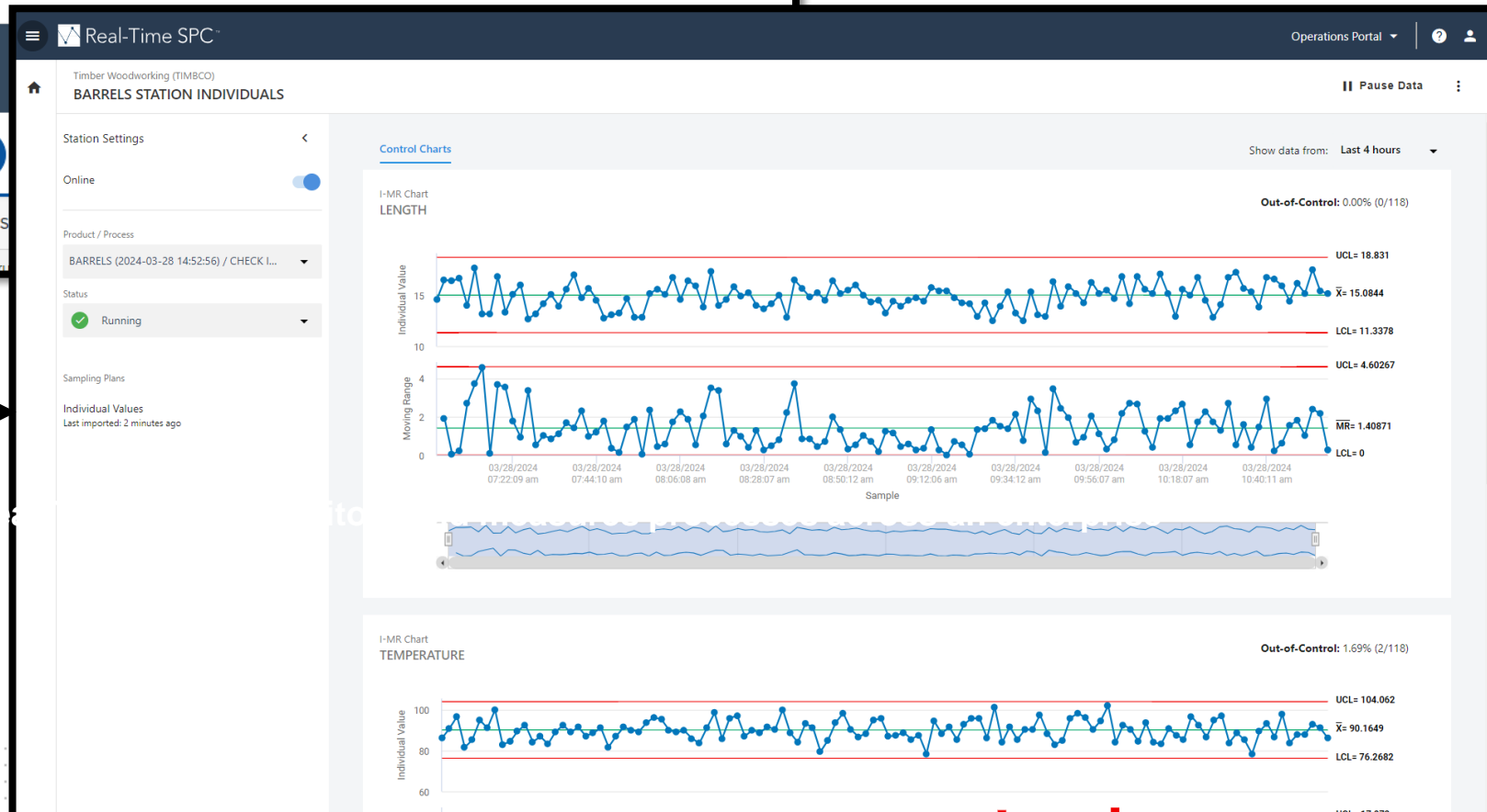
Main / Activities  
TIMBCO3 SFC

Status: Work Center: BARRELS STATION INDIVIDUALS Resource: COLLECT INDIVIDUAL DIMENSIONS Quantity: 50,000 SFC Quantity: 50,000 Order: TIMBCO3 Material: BARRELS/1 Material Description: TIMBCO - Manufactured Pro

Start Sign Off Complete Nonconformance Actions Real-Time SPC

Operation Activity List (1)

Operation Activity/Step ID	Activity Description	Stat
CHECK INDIVIDUAL DIMENSIONS/10	CHECK INDIVIDUAL DIMENSIONS	



Minitab's best-in-class Real-Time SPC™ solution is directly accessible to SAP Digital Manufacturing customers so they can gain deeper production insights resulting in significant process improvements.

# Real-Time SPC integration is exposed through a POD

The image illustrates the integration of Real-Time SPC into the SAP S/4HANA manufacturing execution system through a POD (Point of Display).

**SAP S/4HANA Home Screen:** The top navigation bar includes 'Home', 'Plant: TIMBCO (Timber Woodworking RTSPC Hierarchy)', and a search bar. The main menu contains various functional areas like 'Manufacturing Insights', 'Manufacturing Execution', and 'Manufacturing Configuration'. A 'Launch PODs' button is visible in the 'Manufacturing Execution' section.

**Operation Activity List (OAL):** The screenshot shows the OAL for the 'BRUSH HANDLES STATION INDIVIDUALS' work center. The activity 'CHECK INDIVIDUAL DIMENSIONS/10' is selected. A 'Real Time SPC' button is highlighted in the 'Actions' column, with a green arrow pointing to it.

**Real-Time SPC Dashboard:** The dashboard displays control charts for 'BRUSH HANDLES STATION INDIVIDUALS'. The top chart is an 'I-MR Chart LENGTH' with the following statistics:  $\bar{X} = 15.1112$ ,  $UCL = 18.6185$ , and  $LCL = 11.6039$ . The bottom chart is a 'Moving Range' chart with  $\bar{MR} = 1.31873$  and  $LCL = 0$ . The data is shown for the last 4 hours, with a 'Pause Data' button.

# Real-Time SPC benefits different roles and responsibilities



## Operators

- **Collect manual data & monitor automatic data collections** from the manufacturing floor
- Enable **manual data entry** as needed
  - **Validation** to protect against data entry errors and alerts operators to out of spec data points
  - Ability to **document assignable cause** and corresponding **corrective action**



## Supervisors

- Verify all operations are performing at **peak efficiency**
- Ensure all stations are **collecting data as required**
- **Monitor automatic data collections** from a centralized location



## Engineers

- **Monitor overall performance** of product areas
- Get **immediate alerts** about issues
- Determine the source of any problems and **get to root cause quickly**

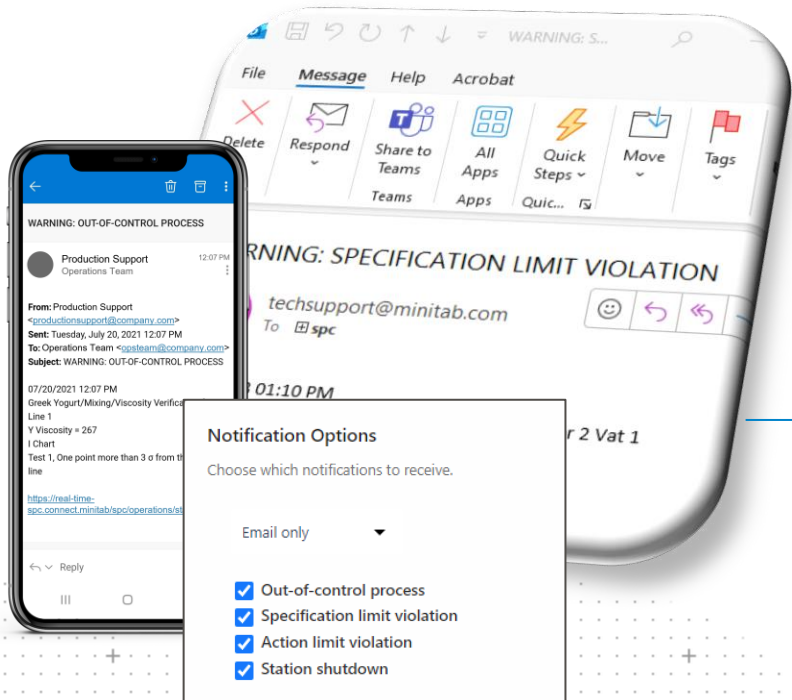


# Features: Data analysis in real-time



## Real-Time Visual Process Monitoring

Dynamic control charts and dashboards update automatically in real-time.



## Customizable, Immediate Alerts

Detect quality issues and prevent waste with immediate process feedback and notifications.

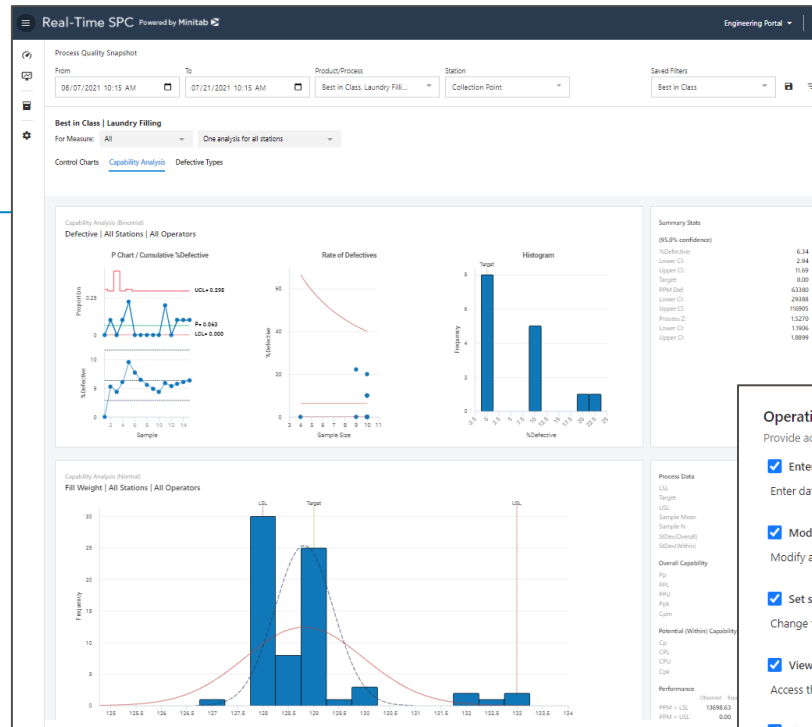


# Features: Easy set-up



## Easy Configuration & Data Collection

Set up, deployment, and data collection created with simplicity in mind.



## Empower All Users

Grant access to anyone responsible for a process, including operators, supervisors, engineers, and management.

**Operations Portal**  
Provide access to the data collection forms and the operations dashboards.

- Enter new data  
Enter data observations through the data collection forms or a data import.
- Modify flagged points  
Modify assignable causes, corrective actions, and comments for flagged points.
- Set station status  
Change the station status to running, idle, or shutdown.
- View station dashboards  
Access the station dashboards. These dashboards display the station status, the quality charts, and the sampling plans for each station.
- View supervisor home page  
Access the performance summary for all measures from the active stations. Uncheck this permission to display the operator home page.

**Engineering Portal**  
Provide access to the Workflow Library, the analysis preferences, and the summary reports.

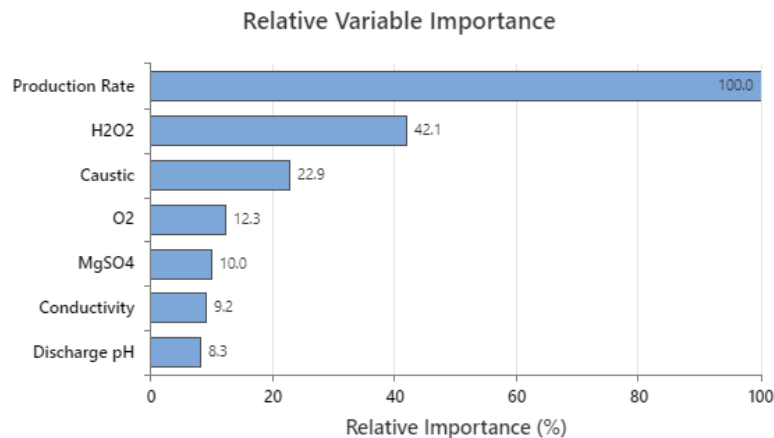
- Edit processes  
Create, edit, and delete processes.
- Edit products  
Create, edit, and delete products.
- Edit stations  
Create, edit, and delete stations.

# Real-Time SPC provides statistical tools for root cause analysis

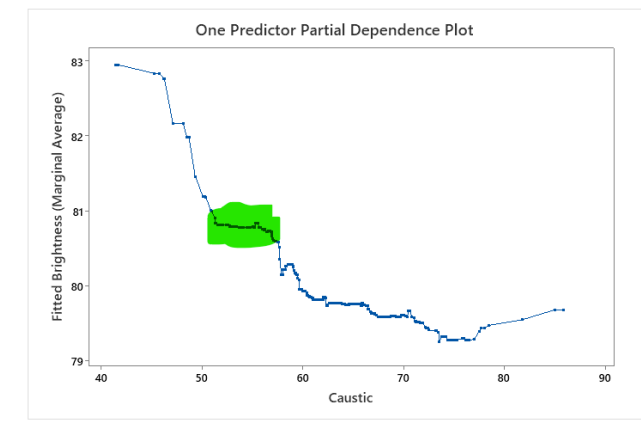
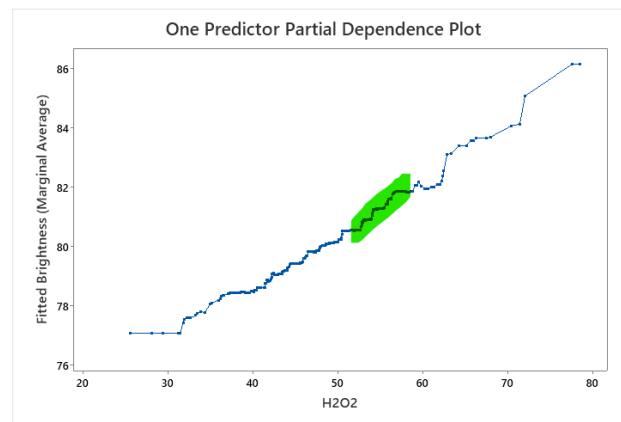


## Integrated Ecosystem with Robust Analytics

Utilize with Minitab® Statistical Software for deeper statistical insights like root cause analysis and predictive analytics.



Variable importance measures model improvement when splits are made on a predictor. Relative importance is defined as % improvement with respect to the top predictor.



# Real-Time SPC supports organizations on their journey to manufacturing excellence

## Where are you on your journey?

**65.4%**

of organizations collect quality data and perform capability studies at ad hoc or regular intervals to demonstrate the ability to meet specification limits

**19.8%**

strategically use data to monitor quality in real-time and are working to achieve sufficient process stability to better utilize SPC

**11.1%**

have systems for defining statistical control limits and an internal culture for stable and capable manufacturing responding to SPC signals

**3.7%**

have achieved manufacturing excellence. They can: leverage process understanding and parameter relationships; parameters are monitored & controlled to ensure predictable outputs



**You** have data.

[analytics]

[dashboards]

[machine learning]

We have **Solutions Analytics™**.

[training]

[visualizations]

[innovation]

# Minitab Delivers a Data-Driven Continuous Improvement Platform

