

TEMPERATURE & PRESSURE



FLOW



TEMPERATURE



PRESSURE



GAS SENSORS



CONTROLLERS



LIQUID SENSORS



HAND-HELD
DEVICES

Three Ways Instrumentation Engineers Strengthen Digital Transformation Projects

Get the most from what exists currently
and take advantage of new methods.

By Nicholas Meyer, Yokogawa

Digital transformation projects compel teams to spend time and effort in the development of data strategies, data requirements, and key metrics. The investment can be extensive. As a critical part of digital transformation, the delivery of accurate and analyzable data from instrumentation in the field will help deliver success. It cannot be an afterthought.

Teams today are discovering short- and long-term successes when they invite input from experienced personnel who understand measurement instrumentation—the potential as well as the limits—in streamlining the setup, distributing the data across the organization without data overload, and helping temper expectations to avoid dead ends. Ultimately, the instrumentation experts can help meet digital transformation goals in capabilities, schedule, and budget.

First, however, the instrumentation expert must understand the goals of the organization's digital transformation. Is the first objective to create an area of industrial autonomy in, for example, tank inventory management? Is one of the goals to improve supply chain management through streamlined sharing of data? Without question, one of the goals is to remain within budget.

Instrumentation experts both inside and outside the organization can assist in at least three ways:

1. Help the digital transformation team understand the instrumentation potential they already have in their facilities.
2. Identify returns on the investments that innovative instrumentation technologies can bring.
3. Integrate benefits that come from choosing high-quality devices.

One: Find sound value in previous investments

Instrumentation can play a major role in forming the solid data foundation that all digital transformation projects require. The information that is widely used throughout a digitally transformed enterprise originates in instrumentation. In addition to process monitoring and control, the measurements are used by digital twins for optimization of process units, advanced analytics using artificial intelligence and machine learning (AI/ML) for value chain optimization, and cloud-based predictive asset management applications.



According to one expert, "If an organization is not willing to take the steps necessary to establish a solid data foundation before applying advanced analytical methods, the likelihood that those methods will provide the correct answer is greatly diminished."

A digital transformation project in an existing facility can benefit from many intelligent field devices already in place. Although sometimes well hidden, existing instrumentation capabilities can help the project avoid unnecessary waste in schedule and budget.

The instrumentation expert will help discover the device capabilities, will know which devices bring extra value, and will know where to add devices. Once the team is fully aware of the available devices and their capabilities, the instrumentation expert can share how they can help meet current project goals.

For example, consider communication protocols. A transmitter currently in the facility might be able to communicate additional information on a protocol that was not previously used in the facility but that will move the project toward the digital transformation goal. For example, in addition to a process variable, the transmitter could also source information that is used for asset management and process diagnostics.

Consider the evaluation of wireless devices rather than making them a requirement. Many digital transformation teams can expect gains from wireless, but they should weigh the costs of the devices, the maintenance tools, and training versus the savings of bringing in remote data. Often, the wireless convenience will pay for itself, but there might be a simpler path already available. Existing wired devices might do just as well and save project resources and future operating costs.

Instrumentation experts in the facility will be familiar with existing transmitters that have a wealth of stranded data and offer options for multiple measurements. For instance, a transmitter currently used for differential pressure might also be capable of static pressure or temperature measurements. And since not all traditional technology needs to be replaced, the facility will save on training costs. Instead, teams can focus education on the new processes, methods, and technology that digital transformation will naturally bring.

Two:

Maximize returns on investments

As investments in instrumentation are planned, many opportunities will arise for innovative technology and methods to bring transformational growth. One of the keys to success lies in realistically determining what instrumentation can do to help attain digital transformation goals. Seeing realistically includes both working within instrumentation limits as well as pushing them.

Digital transformation projects require thorough assessments of all data sources early on. Applying advanced methods such as analytics, AI/ML, and digital twins is prone to failure if the information feeding them is inaccurate and unreliable.

With instrumentation knowledge on the team, the digital transformation effort can deliver data needed to develop process improvements. Not only can instrument experts direct the team to sources of data and innovative ways to gather it, but they will also have the background to understand that not all data is what the team might expect.

For example, many pressure measurements are dampened to “smooth out” process control, or temperature transmitters might be set to filter out transients and avoid spikes. To receive the data that will help drive analytical models or machine learning, it might be necessary to remove some filters or to set a method that enables access to the raw data.

Discover returns in plant operations management and maintenance by asking the instrumentation expert to identify smart devices that help improve human productivity through plant as-



Setting realistic expectations for instruments includes both working within limits as well as pushing them.

set management, including asset monitoring and health analysis. Embedding the potential for predictive maintenance in devices saves maintenance teams hours of troubleshooting and repair, thus avoiding time wasted in both reactive and preventive maintenance. Not only can the data be used for predictive maintenance, but it can also be fed into analytical models that drive recommendations to improve plant operations.

Another significant return relates to changing how data is gathered. For instance, general pressure and temperature data might have been received periodically as technicians and operators performed manual rounds. If a digital transformation goal includes moving toward industrial autonomy to improve human productivity, the digital transformation team might consider adding a wireless sensor or transmitter to relieve personnel from the data-gathering task—allowing them to concentrate on tasks where people have the greatest impact.

Gathering large quantities of meaningful data might help meet goals, but the returns will be realized only if the organization has tools to maintain, analyze, interpret, and act on the results. Plan to gather what is required—and no more—and be prepared to use the data to find patterns. An instrumentation expert can assist by determining, for example, if a transmitter has the power to gather data fast enough to meet the analytical model's demands. But make sure the data is required before the team pursues that path because it could also require additional infrastructure costs. By the way, the instrumentation expert will know that too.

Pump cavitation diagram

The team might then push to have that data sampled at a greater frequency, but just because a wireless pressure or temperature device can update every second, does not mean that it should. While temperature measurements are practically never required at high sampling rates, fast pressure measurements might be required by an edge device to prevent [pump cavitation](#). Refer to pump cavitation diagram on previous page.

Before moving ahead with what might seem like an improvement—to get more data—think about how much data is needed to generate an impactful result and how much the extra data will cost in terms of battery life. Find the fine balance between the cost of maintenance, the expense of added sensor replacement, and the savings of personnel time and process improvements. The instrumentation expert will be familiar with that information and can compare solutions.

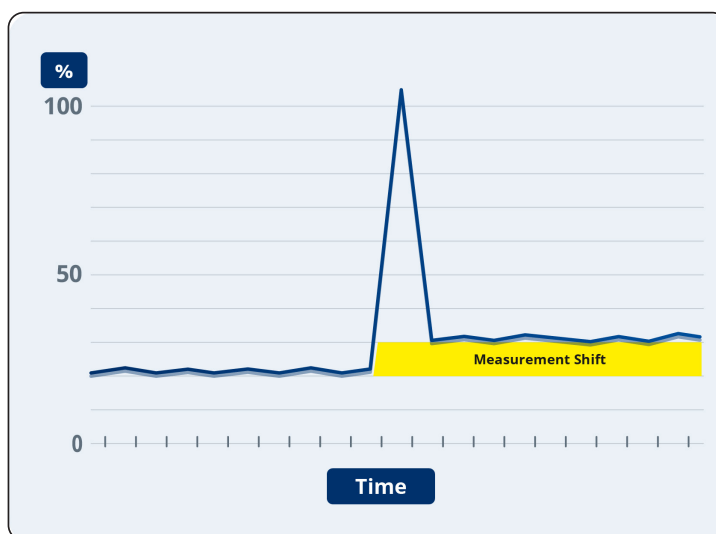
Three: Improve long-term digital transformation by emphasizing quality

In a digitally transformed enterprise, a “single version of the truth” is essential. The data validation process is critical. Every member of the digital transformation team—and every person in the organization for that matter—understands the adage “garbage in, garbage out.” Since the foundation of success for digital transformation is good data, the adage applies well here.

If field data is inaccurate or misapplied, the analysis results will be suboptimal, the aim of future direction will not be true, and the work initiated by the analysis will be misdirected and wasted. A habitually incorrect measurement can magnify and multiply errors throughout the organization. The way to obtain data quality appropriate to the need is to assess its accuracy, reliability, and consistency. Understanding and striving for quality data will greatly improve everything downstream in the digital transformation process/project.

Be cautious of simply adding wireless capabilities to devices that will consistently and reliably deliver *poor data*.

Device accuracy requirements must be fully understood. Be aware that communicating the data in the desired way, whether via wired or wireless, is relatively simple compared to obtaining accurate measurements. Be cautious of simply adding wireless capabilities to devices that will consistently and reliably deliver *poor data*. The instrumentation expert can help make sure of sensor accuracy for the process conditions and that it is manufactured by a trusted partner who will stand by the device for the long term—digital transformation is a long-term journey.



After a process spike occurs, some devices continue operating while delivering inaccurate data. The requirement for maintenance might go unnoticed due to seemingly continued correct operation.

Instrument installation best practices are very important to obtaining high-quality measurements. Sometimes digital transformation requirements and best practices conflict with measurement best practices. For example, mounting a pressure or temperature sensor directly on process equipment can eliminate errors associated with impulse piping or sensor wiring, but wireless best practices favor a remote mount to achieve a better signal. Which is more important to meet the goals? Can the process afford to compromise a certain level of accuracy? Will the choice cause the facility to incur additional maintenance costs?

To assess reliability, evaluate instrument devices for how well the sensors can recover from extreme conditions in the process. If a process spike occurs, some devices cannot recover and might be damaged or impaired. Unfortunately, these devices require maintenance to restore proper functionality, and incorrect measurements might go unnoticed (see the figure). Ideally, analytical models will detect irregularities. But if they cannot, the instrumentation team needs to know so they can give the situation proper attention. The instrumentation expert can direct the digital transformation team to devices that can recover to deliver accurate, consistent, and repeatable data.

Also, assess whether devices can deliver data at the right time. For example, achieving the digital transformation goal might require that a certain set of data must be collected within a small window of time. If each device does not deliver in the appropriate window, the analysis

will be incorrect. Deterministic networks—wired or wireless—are important in this case. Instrumentation experts can assist with evaluating the best protocol standard for the team’s digital transformation requirements.

Predictions for success

Navigating digital transformation in an organization is a long-term initiative with potentially significant results. Get the most from what exists currently, take advantage of new methods, and consider quality by inviting instrumentation expertise into the digital transformation team. The planning and execution are worth doing well to lay the groundwork for the organization’s future in the use of smart manufacturing and digital technology to accelerate business strategy.

REFERENCES

[A Basic Guide to Understanding Pressure | eBook](#)

[Attaining Proficiency in Industrial Pressure Measurements | Webinar](#)

[Field Instruments and Analyzers Overview | Brochure](#)



ABOUT THE AUTHOR

Nicholas Meyer is the chemical industry marketing manager for Yokogawa Corporation of America. He graduated from the University of Minnesota with a degree in chemical engineering. His experience with field instrumentation spans two decades including pioneering the shift from traditional to digital enterprises. Meyer holds multiple patents from wireless technology, cybersecurity, and digital work practices.

Bad data ruins good intentions.

Accurate and reliable field instruments provide the foundation necessary for a successful digital transformation.

Our Total Insight technology creates value throughout the product lifecycle and enables digital transformation at the Edge for sustainable, continuous business operations improvement.



Simplified Selection



Easy Installation



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