



A Yokogawa Company

A stylized graphic of a winding road with dashed white lines, set against a red background. Several red location pins are scattered around the road, suggesting a path or journey. The road curves from the bottom left towards the top right.

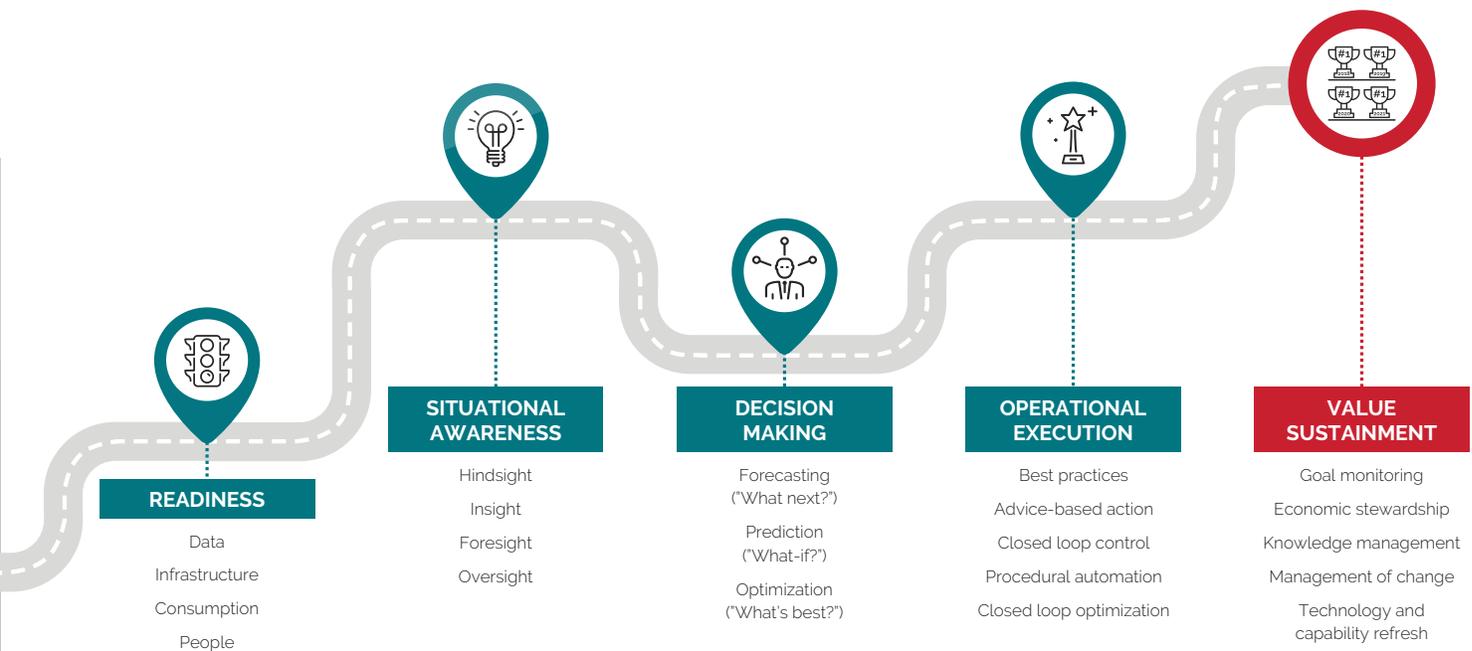
# DISCIPLINED DELIVERY OF DIGITALIZATION RESULTS

For many beginning their Digitalization Journey, there is a strong pressure to deliver something big using one of the latest buzzwords – IIoT, Industry 4.0, Cloud, Edge, Big Data, Analytics. Proponents of this input-oriented approach risk applying technology for the sake of technology, without realizing its true value. Here, we look at outcomes; we explore how Digitalization can deliver and sustain true value to the Energy and Chemical Industries.



## Sticking to the Digitalization Roadmap

All Digitalization initiatives lie somewhere on the journey shown in this map. For any initiative to be successful, no matter where it lies on the journey, the earlier stages must have been taken already.



For example, most analytics projects ('Situational Awareness' ambition) fail due to poor data quality (lack of 'Readiness'); most advanced controls ('Operational Execution' ambition) are turned off (a sure sign of failure) because their strategy or constraints are not up to date (poor 'Situational Awareness') so the operator can do better.

## Exploring these further:



### READINESS

It has been estimated that process industries utilize less than 5% of the data that is collected – 95% of the data is either siloed (used selectively), dark (unused data) or lacks consistency in use. Problems of assigning context to data, and poor quality have also been identified.

To be ready for Digitalization, the impediments to data utilization must be addressed: (i) Data readiness (data sufficiency; data trust; data propagation and data governance); (ii) Infrastructure readiness (physical infrastructure; security, privacy and confidentiality; software infrastructure and cloud infrastructure); (iii) Consumption readiness; and (iv) People readiness.

A wise approach is to perform a readiness assessment and to tackle any readiness issues before embarking on (or perhaps in parallel with) a Digitalization Initiative.



### SITUATIONAL AWARENESS

To improve a plant's operation, it is important to understand its potential for improvement so that the right actions can be taken. Situational awareness is therefore a crucial step – knowing how the plant is and has been performing in absolute terms ('Hindsight'); understanding where it has capacity for improvement vs its constraints and optimum capability ('Insight'), predicting responses to changes ('Foresight') and assessing the success and value of such changes ('Oversight').

Tools associated with hindsight and insight are largely visual in nature – dashboards, BI tools, spreadsheets. These gain significant value when they align with goals, targets, and constraints. Therefore, to provide decision makers with valid information to present in dashboards, for example, the right tools must be applied to each situation being analyzed.

Analytics are necessary for foresight and oversight, and we also consider it beneficial for hindsight and insight. We are strong believers in the use of first principles-based analytics tools in conjunction with emerging correlation-based analytics (also known as statistical or stochastic analytics) for situational awareness – a so-called 'Ensemble Approach'. First principles tools bring rigor due to their built-in understanding of physics, chemistry, and dynamics, but at the cost of complexity and relatively high computation time. Correlation-based analytics suffer from lower fidelity without any guarantee of feasibility, but with the advantage of simplicity and speed of solution.



**95%**  
**OF DATA IS**  
**NOT UTILIZED**



## DECISION MAKING

**In the same way that we recommend an ensemble approach to situational awareness, we also believe that decision making should be grounded on first principles in conjunction with correlation-based tools as necessary.**

Decision-making is about looking for answers. In an operating plant seeking to improve performance, there are three main qualities of answer that can be sought: (i) Forecasting (“What Next?”) - a judgment of what is likely to happen in the future based on knowledge of the past; (ii) Prediction (“What If?”) - an estimate of what will happen in the future based on changes that could be made in the present; and (iii) Optimization (“What’s Best?”) - answers the question “Of all possible changes that can be made, which has the best economic outcome?”;

In the Energy and Chemical Industry, there are many complex decisions to be made due to the vast number of variables that can be controlled and the large quantity of disturbances and constraints. Correlation-based decision tools are useful when accuracy is not as important as feasibility, and when the answer lies within an already-experienced operating window. However, sloppiness in accuracy comes at a cost – the actual optimum solution is likely worth a lot more than a simply feasible solution. Rigorous models will always find the best answer. Always.



## OPERATIONAL EXECUTION

**Being ready, situationally aware, and making the right decisions only guarantees success with efficient and effective operational execution. Digitalization compresses time horizons which means not only doing the same thing faster, but becoming liberated to do completely new things.**

The more encompassing the decision, the longer it takes to make and the more economically and organizationally impactful it is, and for a longer time. A wise business decision may reap rewards for years, whereas a poor business decision may have long term costly consequences.

Automation, on the other hand, by its inherent nature, makes decisions very quickly based on very recent limited data, and the scope is typically much more contained, and the automation actions can be suspended or terminated quickly. So, the timelier and more informed the decision process becomes, the better chance that the decision will be good, the quicker it will be to execute, and the easier it will be to course-correct.

Digitalization accelerates information flow, increases the power of analytics and automates much of the execution. This greatly condenses the decision/execution time horizons. It allows strategic business decisions to be made in real-time, and the results to be visible and available almost immediately.

The tools of operational execution (advice-based open-loop actions, closed loop control, procedural automation and closed loop optimization) start with best practices. Replicating poor or average business processes in a digital environment does not assure delivery of superior results. The focus should be on acquiring best practices to execute the organization’s work, and thereafter on finding the digital means to institutionalize automation of as much of each of these processes as possible.

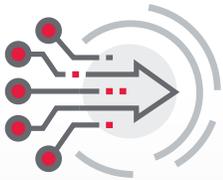


## VALUE SUSTAINMENT

**Digitalization is typically not a one-time hit, where the benefits are achieved and stay forever. Unless proactive steps are taken, benefits will almost always decline over time. The opportunity to capture incremental benefits will diminish too. This happens for a number of reasons:**

- The economic basis for the solution changes
- The goals change
- The plant performance changes
- Business priorities change
- Focus by people (management, engineers operators) changes
- Technology changes

Our approach to sustainment of Digitalization Value entails going above and beyond compliance with how new digital applications are implemented. It includes one where there is a clear sense of ownership by the organization, especially front-line operators, through recognition of the added value of the applications. Achieving this entails (i) Goal monitoring and economic stewardship; (ii) Knowledge management; (iii) Management of change, and (iv) A value vs cost mindset around technology and capability refresh. No doubt this will entail a significant cost. However, the value that it unlocks will be orders of magnitude greater, enabling sustainment actions to pay for themselves many times over.



## Digitalization – don't get left behind

**Digitalization creates and sustains competitive advantage and is one of the key strategies a plant can adopt in pursuit of operational excellence. Despite this, many in the industry still remain confused or irritated by Digitalization. Some feel it is merely an IT issue and do not understand its relevance for operations; some are frustrated by the plethora of buzzwords; some see it as hype and fail to see the value proposition.**

Digitalization leaders, however, see it as a holistic business issue and are already making huge strides forward in productivity, efficiency, flexibility, and agility. Those who are not realizing the value Digitalization has to offer risk being left behind. Failure to adapt and transform means that the magnitude of value being lost will continue to increase – the digitally wise will consume the laggards in the market.

*All about*  
**EXCELLENCE**



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