

Embracing change delivers SMART benefits

Neil Croxton at Stantec explains why it's not enough just to adopt new SMART technologies and how successful business change is key to ensuring a sustainable return on investment.

Over the past several years, the water industry has increasingly investigated new technologies to address performance gaps and improve efficiency. Across water network distribution systems, the use of self-monitoring, analysis, and reporting technology (SMART) is becoming more prevalent and developments in Operational Technology (OT) are providing solutions, which are starting to meet many of the challenges a 21st century utility company faces.

Overview of SMART water technologies

The Smart Water Networks Forum (SWAN) defines SMART water network technology as the collection of data-driven components helping to operate the data-less physical layer of pipes, pumps, reservoirs, and valves. These technological solutions seek to improve the efficiency, longevity, and reliability of the network by better measuring, collecting, analyzing, and acting upon a wide range of network events. However, experience in other sectors has shown that the adoption of a SMART network needs to be fully considered if the benefits of such solutions are to be realized. Many of the challenges of adopting new solutions result not from the technology itself, but from how successfully the new technology is embedded within the organization.

As water and wastewater companies embrace new operational technologies, it may be time to take a step back and learn from other industries that have already followed the path of performance improvement through new data-driven solutions.

Perhaps the most closely linked technological developments in recent decades, which could provide insight into the successful adoption of operational technology across water networks, are from the information technology (IT) revolution. In fact, the integration of IT, operational technology (OT), and engineering technology (ET) including comprehensive network models, is a key emerging trend in the area of SMART water networks under

the concept of “digital twins,” which creates a digital replica of the physical system where data is seamlessly transmitted and tracked. But before the integration of these three technologies is fully embraced, lessons of past technology integration issues would be worthwhile to learn.

IT has undoubtedly influenced the way people work and live, yet concerns remain about its failure to deliver the expected benefits to both industry and to society in general. IT was once seen as a means of increasing productivity so we would have much more free time. But, we are not quite there yet. Whether the initial aspirational impact of IT was unrealistic, or it simply has yet to deliver such widespread changes, there is potentially a lot to be learned when looking to adopt OT or developing and using digital twins.

The apparent mismatch between IT investment and the observed increase in productivity has led to a number of high-profile research projects. Massachusetts Institute of Technology (MIT) Professor Erik Brynjolfsson – who led a US\$4.5-million study across 800 firms in the United States to show the correlation between IT investment and productivity – concluded in 2002 that “IT is significantly more productive when combined with organizational change,” as stated in his 2003 seminar on IT spending and productivity.

Organizational change enables SMART solutions

The amount of organizational change required to support SMART solutions should be considered at the very outset of assessing

a performance issue. In fact, one of the first questions to ask should be: “do we need a new technology or a solution to bridge the performance gap?” Whether the performance gap relates to water loss or improved customer service, the development of a strong case for investment should be driven by the range of potential benefits the solution can provide. For example, the replacement of one range of sensors for a new set with a better battery life

has only local and marginal benefits. Likewise, the degree of business change is also relatively small. However, compare that with SMART solutions that have high-range potential benefits, such as the deployment of Advanced Meter Infrastructure (AMI) – which provides customer consumption data in real time to both the utility company and the customer. The potential benefits of this AMI technology are wide-ranging and significant in terms of proactively managing and understanding true network usage and leakage, as well as driving behavioral change across the customers that have adopted these meters.

To achieve these significant benefits, companies will need to address a whole host of organizational and technological enablers. This will range from a potential change in the companies metering policy; how the company promotes the use of meters to its customer; the change in processes and personnel required to manage and respond to more informed customers; and the IT systems, which can store, integrate, and analyze this new and vast amount of time-series data to enable it to provide better insights in network management.

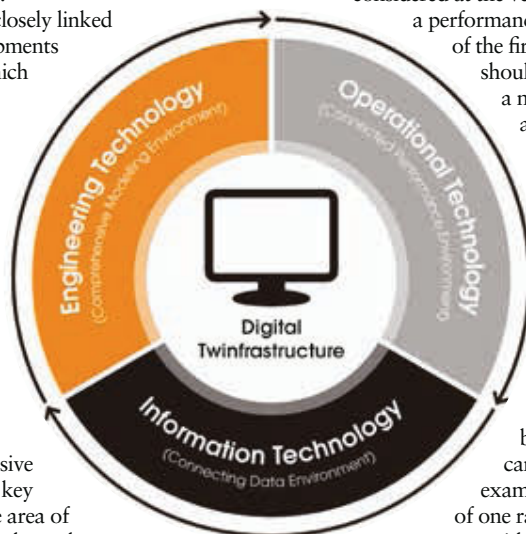
Achieving significant benefits means making new OT part of the fabric of the company.

While there are a number of challenges with successfully embedding SMART water network solutions there are also vast benefits for having more data-driven technologies supporting network management.

The benefits associated with embedding SMART solutions across water networks include reduced leakage, improved resilience, and enhanced customer service (Figure 2). And, while understanding the potential level of business change required to enable the successful deployment of SMART solutions is important, the implementation can face potential pitfalls that can impede the transformation process.

Past failures signpost the way forward

Learning lessons from past business change initiatives can provide insight into the factors that can halt successful business transformation and the integration of new SMART solutions. In 2006 the authors Oakland and Tanner under-



took a piece of research that identified the potential reasons why business change initiatives failed or proved less successful than was originally anticipated. The aim of their project was to identify factors that were reported as being critical to managing change successfully across 32 public and private organizations. From their research, the seven key factors identified as impacting business change are:

- External events often drive successful change, above and beyond internal drivers. For the water industry this may be from a key event or incident that has put the organization under the spotlight from one of its regulatory organizations.
- Leadership sets clear direction and strategic intent. This can be in the form of a single vision for the organization or department, and should be aligned with the need for a new technological solution, such as improved customer focus, after having taken full account of the alternatives or the “do nothing” option. This should then provide the initial momentum require to overcome change inertia due to doubt surrounding the need to change.
- Change requires operational alignment. While top-level leadership is key, so too is the support of those that are required to implement change at an operational level. Oakland and Tanner’s research explains that changes that attempt to resolve real operational issues tend to be embedded more successfully than those that don’t have operational buy-in.
- A process approach is central. The number of processes affected by the integration of any new type of technology is often vast and far-reaching. Even at the initial concept phase of reviewing any new technology, the impact upon existing processes needs careful consideration,

Change was found to be most successful when aligned to the existing culture of an organization.

as it is these processes that will set the blueprint for how the technological solution will support the day-to-day activities of the organization. Past failures have identified that these processes need to be fully understood, mapped, and impact-assessed in line with a new future operating model that enables the benefits of any new technology to be realized.

- Change management is best when it is clearly measurable. The pre- and post-performance of the issue being addressed by new technology needs to be fully understood and measured in order to ensure the performance trajectory heads in the desired direction. This is even more critical when multiple changes are being introduced. For example, if new advanced pressure management is introduced alongside the use of real-time noise correlators for leakage management, the impact each change has on the desired performance parameter needs careful assessment. This measurable and visible success will often create a momentum for further change, as the benefits become clear to all.

SMART Solutions	Business Performance Outcome Impacted
Network optimization	Reduced interruptions to supply
	Reduced leakage
	Improved resilience
	Enhanced asset reliability
Water network visualization	Enhanced customer service
	Reduced interruptions to supply
	Reduced leakage
	Improved resilience
Decision support & dynamic modelling	Enhanced customer service
	Reduced leakage
	Improved resilience
	Enhanced asset reliability
Automation and control	Improved customer service
	Enhanced operational efficiency
	Enhanced asset reliability

Figure 2. Potential business outcomes impacted by SMART solutions

- External support adds value. The Oakland and Tanner research identified that, as well as external events triggering the need for change, a new pair of eyes external to the organization can often support successful change initiatives. This included the use of external consultants to review the proposed need for change or to project manage its implementation
- Culture is key. Change was found to be most successful when aligned to the existing culture of an organization. Identifying elements of the existing organizational culture that reinforced the change could successfully enable future change.

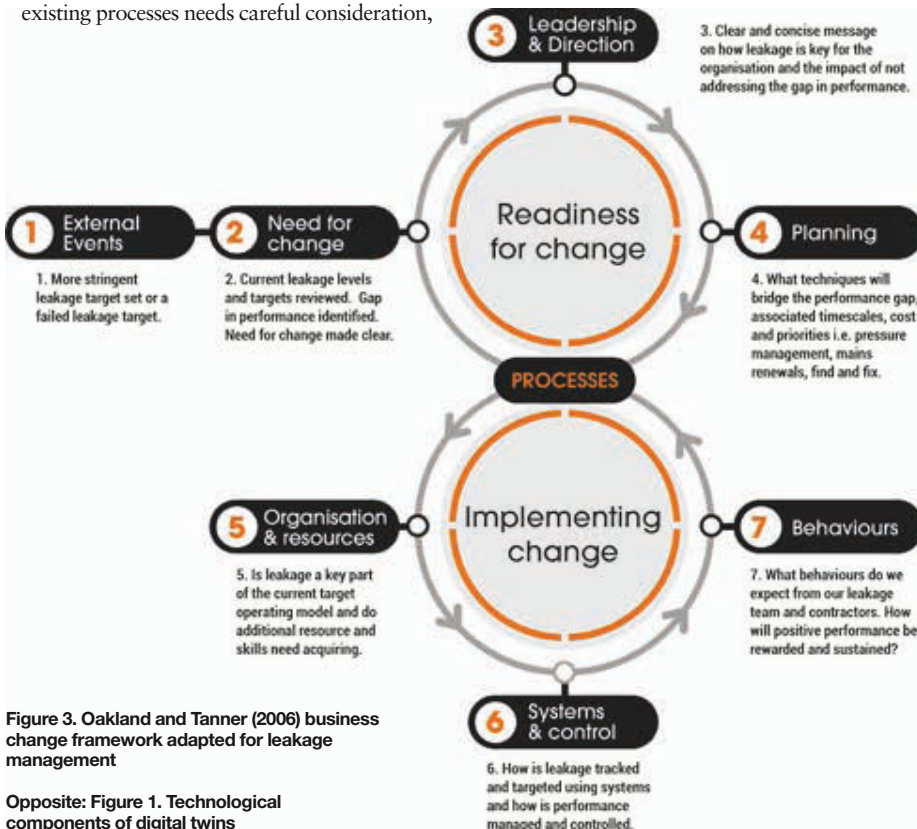


Figure 3. Oakland and Tanner (2006) business change framework adapted for leakage management

Opposite: Figure 1. Technological components of digital twins

These key enablers for successful change management provide the input into the change framework (Figure 3), according to Oakland and Tanner. This framework can be used to support the successful implementation of SMART water network solution, and is made up from the two main constructs of change management: readiness for change and implementing change.

The flow in the framework is read as a figure eight. It illustrates how a technology that could assist in leakage management might move through the system and present the implementing organization with a greater chance of success.

It is this type of learning – from change initiatives that have failed, stalled, or only partially delivered the benefits expected – that will enable water companies to successfully embrace and embed new technological solutions, such as those that fall under the broad heading of SMART networks.



Author’s Note

Neil Croxton is the technical director for water distribution at Stantec and is based in the company’s head office in Warrington, United Kingdom.

Reference

Oakland J. S. & Tanner, S. J. (2007). A new framework for managing change. *TQM Magazine*. Volume 19 (Issue 6)