

Digital Futures

Creating a roadmap for utility performance

The Digital Futures Symposium brought 20 utilities together with key vendors to discuss opportunities and learning points from their own experiences with digital technologies. The series took place over four sessions from August to November 2020, and covered data accessibility & integration, perfecting procurement, smart cities & IoT, and digital best practice. Although every utility is unique, they share many of the same challenges:

- Legacy systems and data silos prevent most utilities from fully accessing their data. They must then maintain control of their data, and avoid information overload.
- Customer engagement, sustainability, and resilience to climate change are joining cost savings as the key drivers of digitisation among water utilities.
- Pursuing digitisation requires a strong business case, but the difficulty of calculating ROI means that a leap of faith is also needed. Quick wins are essential to maintain buy-in.
- Off-the-shelf solutions are rarely suitable for a utility's needs. Instead, vendors need to understand their clients' pain points in order to focus on their most pressing needs.

Data accessibility



Almost all utilities have vast amounts of data, but struggle to turn this into actionable information.

- **Legacy and/or proprietary systems create data silos that stand in the way of successful digitisation.** Service-based offerings and migration to the cloud can be part of the solution, but many utilities still prefer the certainty of operating in-house and on-premise.
- **Artificial intelligence and machine learning are powerful tools, but are only as good as the data available to them.** A solid foundation of data collection and validation is key.

Smart cities



Connectivity provides data that can streamline existing processes - it can also lead to previously unimaginable functions and services.

- **Demand for connectivity is increasing.** Use cases that focus on sustainability, resilience and customer engagement are increasingly joining financially-driven projects. Implemented correctly, smart city initiatives can achieve all of these goals and more.
- **A small number of early adopters are shooting for large-scale visibility of data across their utilities and beyond.** From conservation efforts, to billing, to joining up climate adaptation efforts across a city, data unlocks new possibilities for collaboration and innovation.

Procurement



Procuring digital solutions requires a shift from vendor-client relationships to long-term partnerships.

- **Vendors need to be familiar with each client's needs and capabilities in order to address relevant pain points.** Utilities can find ways to increase contact with would-be suppliers, while remaining compliant with procurement regulations.
- **A partnership mindset is especially important once a contract is signed and the implementation of a solution begins.** Realistic expectations, proactive troubleshooting, and effective communication are vital to avoid costly project failures.

Best practice



Organisational culture is the greatest barrier on a utility's digital journey - as well as its greatest opportunity.

- **Sign-off from management is no guarantee of success.** Digital solutions will only succeed if the people who are expected to use them - be it operations or administrative staff, or even customers - are convinced of their value.
- **Outdated processes and technologies often result in utility staff having to spend time on tasks that do not match their expertise.** Making sure that staff perceive a solution as something that will help them, as opposed to replacing them, is essential.



Stephen Major

As Global Energy Practice CTO at Nokia, Stephen drives innovation in connectivity and IoT, considering new industry disruptions including smart water grids and smart metering.



Water utilities are facing substantial challenges, including changing customer demands and service requirements. They need new approaches that will help them adapt and grow their businesses, innovate effectively and address current challenges while adding value for customers and other stakeholders.

Water utilities' challenges are amplified by their investment in long-lived assets and limited visibility and control of these assets within their operational networks. This is due to the wide diversity of end devices and equipment owners, and the complexity of deploying and operating end-to-end solutions at scale. The result is that water utilities often rely on purpose-built solutions, which stifle innovation and lack the flexibility to adapt to new technologies and business requirements.

Today, water utilities are actively exploring the digitisation of water networks through the adoption of industrial internet of things (IIoT) solutions. These solutions can enable more intelligent assets and a more holistic management approach, which will ease the transition to smarter, more adaptive networks.

In particular, new open standards-based low power wide area (LPWA) communications and open digital platforms allow water utilities to gain low-cost access to meters and IoT sensor data. These technologies create opportunities to automate and optimise operations and support new services, applications and business models.

As part of this digitisation drive, water utilities are embracing LPWA communication technologies such as cellular-based narrowband IoT (NB-IoT) for their efficiency and enhanced battery

life. NB-IoT, a 3GPP open standard, has gained significant adoption because of its improved coverage, scalability and extremely low power consumption. These capabilities provide economies of scale that enable water utilities to develop better and more cost-effective IIoT applications.

The growing NB-IoT ecosystem of modules is increasing price competitiveness. Based on licensed spectrum, NB-IoT has the low interference and improved QoS and security to provide a field network that can support standards-based connectivity between the massive variety of devices and networks to ensure a more flexible, economical and sustainable system.



GW's Utility Performance Network

The Digital Futures Symposium brought together 20 utilities from across the world to share experiences and insights on implementing digital solutions. Combined, they serve over 65 million people in 12 countries and bring a wealth of knowledge, and were joined by leading technology providers from across the supply chain.



Recordings of the Digital Futures Symposium can be found at gwinetworks.globalwaterintel.com/utility-performance-network/

Data in action

When data is made accessible and converted into actionable intelligence, a wide variety of powerful tools become available to a utility.

The most high profile among these are advanced data analytics that use artificial intelligence. These include machine learning-based pattern recognition and simulation of part or all of a network using digital twins.

Savvy implementation can make data pay dividends long before the use of advanced data analytics. For example, intuitive dashboards can provide visibility on key performance indicators at a relatively low cost.

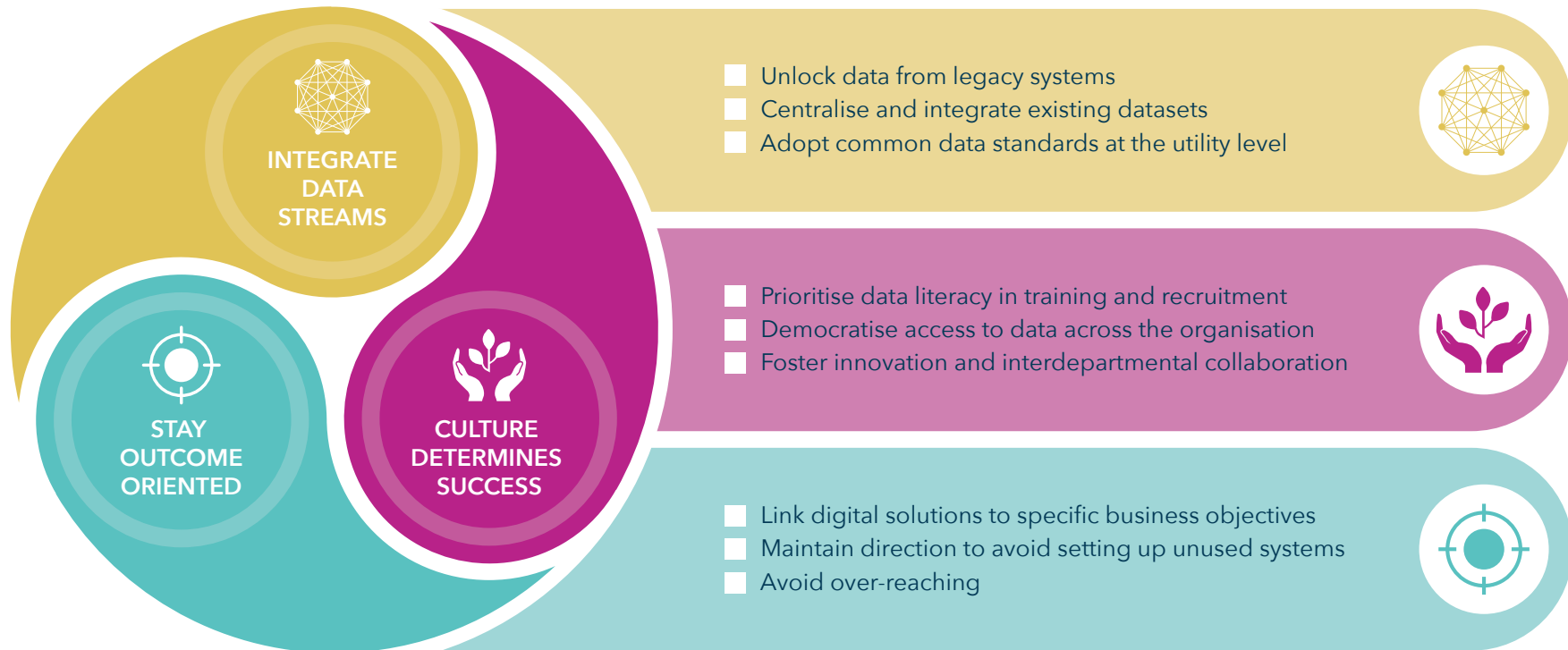
In order to realise these benefits, utilities need a solid foundation of data collection, as well as broad institutional acceptance of new projects as they move beyond the pilot stage.

Open data



Data sharing between utilities can lead to a better understanding of issues such as leakage or pollution. Pooling small datasets, for example information on health and safety incidents, also creates a more reliable basis on which to draw conclusions.

As well as providing a clear benefit to participants, successful data sharing schemes must address privacy concerns and avoid onerous reporting obligations.



Link digital solutions to specific business outcomes.

Implementation of digital solutions requires clear objectives against which to measure success. Without this, valuable data and functionalities can sit unused in a utility's system.

Outcome-oriented digitisation requires an organisation-wide culture shift. Utility staff will need to communicate across departments to gain buy-in for new digital solutions.

Ensure departmental alignment across the utility.

Data accessibility delivers utility-wide benefits, but the cost of collecting it is often concentrated in one department. Effective communication is essential.

Design projects to create benefits across a utility. For example, collecting pressure and temperature data alongside flow readings can maximise the value of smart metering.

Demonstrate value beyond return on investment (ROI).

The benefits of sharing and integrating data should not be measured only in a specific project's ROI, but also in the possibilities for further development that it can facilitate.

Large-scale digitisation will require a leap of faith from utility management. Effective communication and successful pilots are key to maintaining momentum.



BUILDING A BUSINESS CASE



Utilities at a glance

Hong Kong Water Supplies Department

Plans to create an integrated system to combine data from across Hong Kong's network to find and predict faults.

South East Water, Melbourne, Australia

Created a proprietary multi-parameter sensor, ensuring smart metering delivered value across the entire utility.

Northumbrian Water, UK

Transmits data from across its network to the cloud every 30 seconds. Operators can create work orders directly from their SCADA systems.

Idrica, Valencia, Spain

Calibrates valve pressure every 15 minutes, using outputs from a digital twin that forecasts water demand.

Getting the basics right

Procurement is often decried as the key obstacle to implementing digital technologies, but these issues are solvable, albeit not straightforward.

Many of these problems start – and can be fixed – long before a request for proposal (RFP) is issued, but require attention from both utilities and vendors.

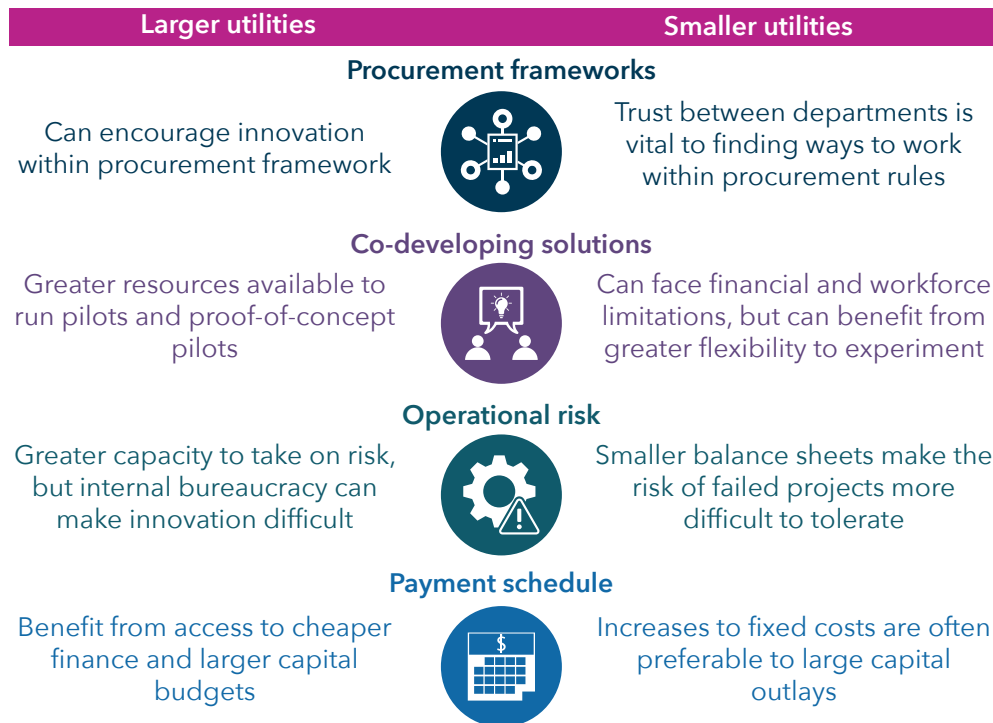
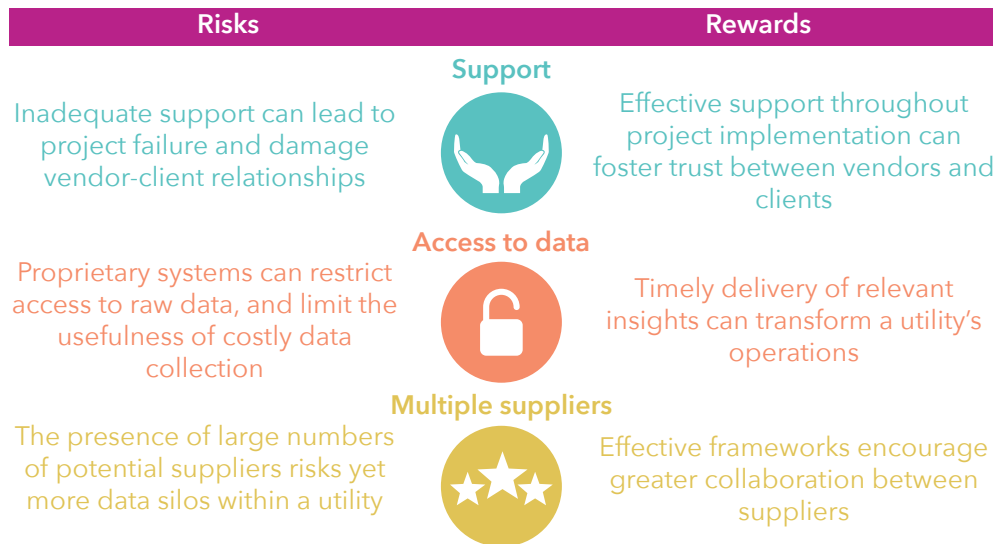
Vendors hoping to bring digital solutions to utilities need to take the time to understand a potential client’s utility’s capabilities and pain points. This allows the vendor to make a tailored value proposition to meet these needs, instead of arriving with a one-size-fits-all plan. From the outset, vendors also need to be aware of the long timeframes that are often involved in public sector procurement.

For utilities, working within existing frameworks to procure digital solutions can be challenging, but is possible. At the heart of this is a well-written, requirements-based RFP, which takes into account the technological and cultural readiness of the utility.

Relevant information must be accessible to vendors, so that they can pitch only solutions that the client truly needs. Widening access to relevant datasets has uses beyond procurement, since customers, the scientific community, and ultimately the utility’s reputation, will all reap the benefits.



Understanding the client



A service-based future?

Service-based contracts are increasingly prominent amongst digital offerings, be it a data, software, or platform-centred offering. Service-based solutions can be highly effective, but they can also have significant drawbacks. The graphic to the left shows the risks and rewards that come with the shift to service-based procurement.

New approaches to partnerships

Digital solutions often struggle with traditional procurement frameworks because of a lack of directly comparable technologies. This makes competitiveness and transparency more difficult to demonstrate in the tendering process. The graphic to the left shows the different dynamics at play in utilities of different sizes when creating new partnerships with vendors.

One way to deal with this is to use proof-of-concept schemes, in which utilities co-develop solutions with a vendor. Such partnerships can prove that a particular company is the sole suitable source for a given technology, and performance-based contracts can ensure that risks and rewards are allocated appropriately.

A further challenge faced by digital technologies is the movement from a vendor-client relationship to an ongoing partnership. Vendors that can successfully act as 'translators' to communicate across different specialisms, both at the pre-sales and implementation stages, will find a receptive client-base for their solutions.



Utilities at a glance

Anglian Water, UK

Created a network of approved contractors, who are invited to form partnerships for specific projects.

HERA Group, Italy

Used a proof-of-concept framework and performance-based payment to procure new wastewater modelling technology.

Metropolitan Sewerage District, Chicago, USA

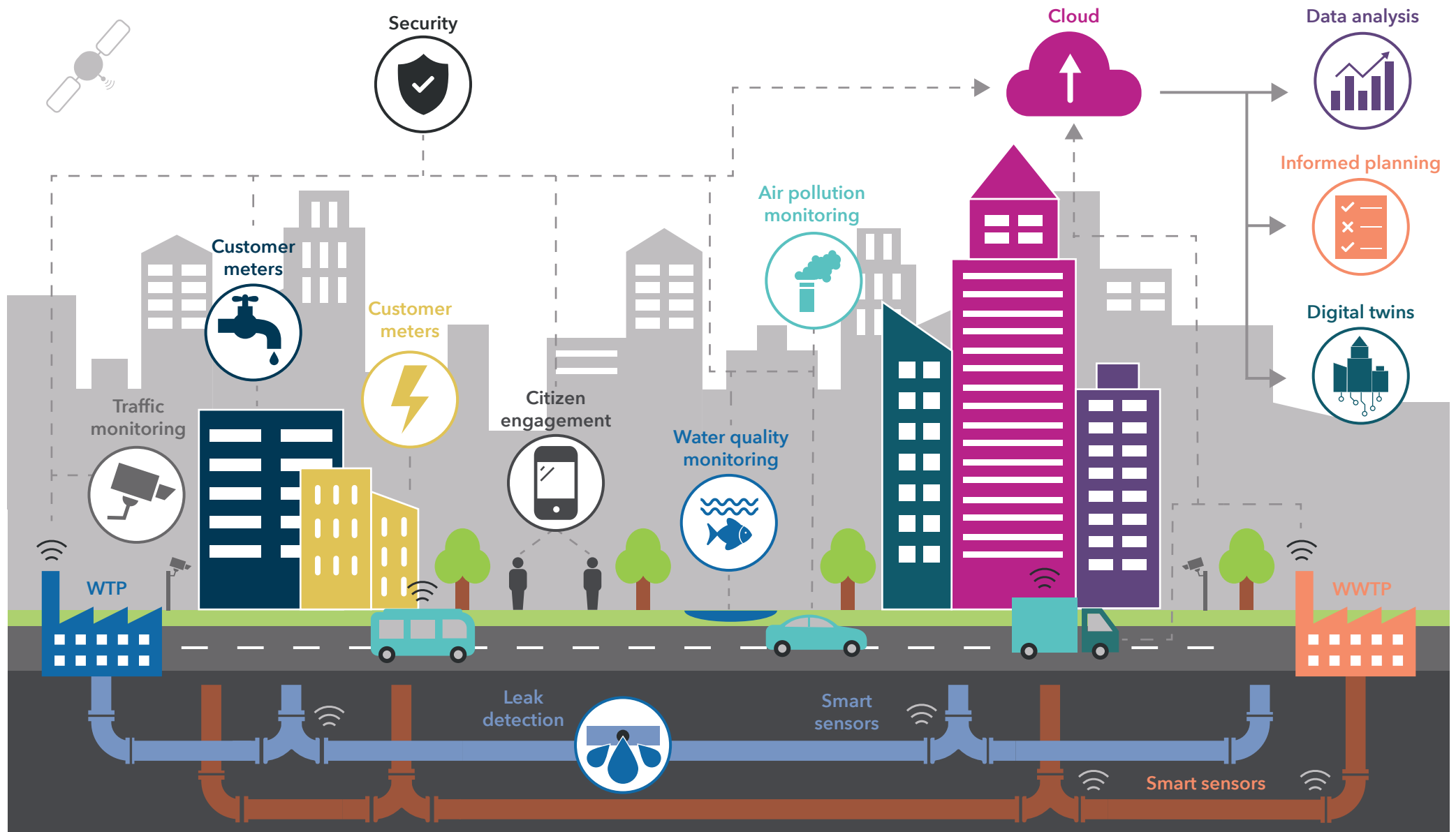
Uses professional services contracts to gain on-demand access to IT specialists, avoiding lengthy recruitment processes.

Raritan Township MUA, New Jersey, USA

Created an easily accessible online portal enabling customers to check if a lead service line is present in their property.

The connected city

Smart cities are enabled by the low-cost connectivity that is increasingly offered by monitoring technology. Combining data across agencies enables holistic planning to reduce costs and improve quality of life. This streamlines existing processes and opens the way for unprecedented transparency and collaboration.



What does the internet of things (IoT) mean for water?

Any water or wastewater network involves large numbers of physical assets, often dispersed across a large area. Increasing connectivity allows utilities to replace educated guesses with real data on network conditions, and to enhance their planning with predictive modelling and advanced analytics.



The water sector is facing an ageing workforce. IoT can capture the knowledge of experienced staff to ensure that it is not lost when they retire.



More connectivity means more data inputs. IoT can enable a utility to seamlessly integrate data such as weather forecasts into their maintenance and operations.



Additional data enables the use of digital twins to simulate all or part of a network. This reduces risk by enabling a utility to test-drive decisions virtually before real-world implementation.



Greater connectivity can mean more engagement with customers. Enabling the public to seamlessly monitor their own water consumption avoids surprise bills and improves public faith in a utility.



IoT enables process improvements and financial benefits, but it can also open the way for a utility or city to become more sustainable, and more resilient in the face of climate change.



Connectivity opens the way for data sharing between public entities, which in turn can enable a level of collaboration and transparency that would otherwise be impossible.

Getting smart about cities

There are as many ways to build a smart city project as there are cities. However, the fundamental needs of these clients remain the same:

1. Modularity

Creating a truly open ecosystem of data requires vendors to source solutions from outside their core business area. Maintain transparency with stakeholders, proceed with caution, and pilot, pilot, pilot.

2. Citizen engagement

Cost savings are no longer king. Cities are increasingly looking to engage citizens to create a more sustainable, resilient place to live. Think outside the box and ensure that a smart city project gains the buy-in of those who live there.

3. Flexibility

Common data architectures are attractive for vendors because they enable replication and scale-up of solutions. Avoid prescriptive methods, and instead use this foundation to tailor solutions to a client's needs.



Utilities at a glance

National Water Company, Saudi Arabia

Created an Uber-style tanker service to streamline delivery of water to off-network customers.

Las Vegas Valley Water District, USA

Plans to create a network-wide digital twin, starting with long term water resource projections.

Berlin Wasserbetrieb, Germany

Uses a digital planning room to ensure new projects receive input from all relevant agencies.

Clean Water Services, Oregon, USA

Built an in-house, low cost network of IoT-enabled sensors to build up a dynamic model of their watershed.

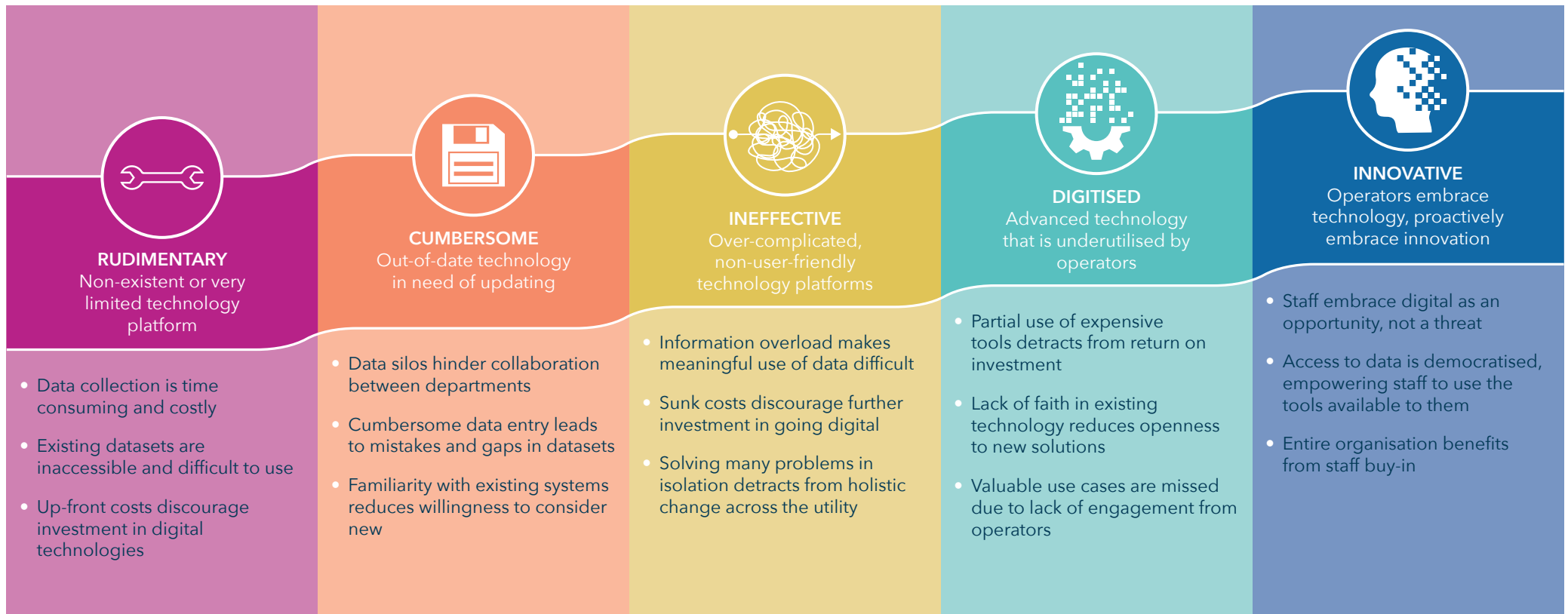
Ground truthing digital

One of the great challenges of digital development is tailoring the abundant varieties of digital technology to the unique demands of individual utilities. It is important to identify the digital maturity of a utility to provide bespoke solutions. By 'ground-truthing' in this way, a utility can pursue a digital strategy that suits its readiness to adopt new technologies, as well as its long- and short-term objectives.

Many utilities possess a huge amount of data that is not used to its full potential. Working out how to leverage pre-existing data is the most cost-effective first step, followed by ascertaining where gaps exist, and then investing in technology to add granularity. If investment in detailed intelligence comes too early, the result is often a surplus of data that operators are unable to use effectively.

A priority for many utilities is consolidating the digital technologies that they already have. It is not uncommon to have several incompatible legacy SCADA systems installed, which impedes rigorous data analysis. Unlocking legacy systems and improving connectivity allows a utility to begin analysis of historical data, together with data from new inputs.

Sharing data does not just enable the improvement of existing processes: it can realise completely new possibilities too. For example, smart meters provide accurate and timely billing information for customers, but they can also give local government real time information on population changes, informing the provision of public services.



Levelling up organisational culture

Departmental culture is the biggest hurdle to surmount when implementing new digital solutions. Utilities often report a lack of interest in breaking from old habits or in collaborating with different areas of operation. Whatever the strategic rationale, gains are unlikely to materialise unless a new way of working is fully embraced on the operational level.

Key to making digital work is a culture of 'collectivism' that values common platforms rather than individual solutions to problems facing individual teams.



Roles, responsibilities, and targets must be clearly defined.
Accountability and clear metrics for success are at least as important as making the right choice of technology.



Long term vision is essential.
Utility management must be transparent with staff about the ultimate aims of a digital strategy to avoid unpleasant surprises.



Team communication should be focused on 'the next ten feet'.
Staff will take to new tools with more enthusiasm if presented with one or two priority changes at a time.

Establishing a digital-friendly culture requires effective insitutional leadership

Once a technical foundation is in place, the most crucial ingredient for successful digital development is trust. Operators must trust strategic management, and utility management must also have the trust of customers to take calculated risks in investing in new solutions.

Staff must have faith that new solutions will improve their ability to do their jobs, instead of seeing it as a threat. These fears must be allayed in order to make an organisation's culture an asset to digitisation, as opposed to an obstacle.

Data sharing

When utilities are working with multiple partners, the question arises: who owns the data?

The question of ownership is vital because access to raw data empowers both utility staff and external partners to search for new answers to their problems. This makes it paramount for a utility to know the data that it has access to, and to avoid allowing data to be locked up in new proprietary solutions, even if this solves a short-term problem.

External partners - whether commercial, academic, or engaged citizens - can bring fresh insights to a utility's problems, which can shed light on better ways of doing things.

Ultimately, however, it is the engagement of operators, administrators and management with the utility's needs that will determine progress in the digital journey.



Utilities at a glance

York Region Environment Department, Canada

Is reimagining how staff use digital technologies, to create a 'single source of truth' across the utility.

Billund Vand, Denmark

Proved compliance with nutrient run-off regulations using remote sensing, avoiding costly network updates.

Moulton Niguel Water District, California, USA

Emphasises a culture of safety and accountability in enabling its vision for digital technologies.

Los Angeles Department of Water and Power, USA

Is exploring greater connectivity to reduce staff time spent checking geographically remote assets.

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