THE POWER OF WATER INDUSTRY COLLABORATION

Smart water technologies are changing the way water networks are monitored and controlled, and as the cost of these technologies decreases and the deployment process becomes easier, more and more utilities will adopt a "smart" approach to managing their network, writes AMIR CARN.

A "smart water network" is a fully-integrated set of data-driven components and solutions which allow water utilities to optimise all aspects of their water distribution system. By using data to generate knowledge, a utility can accurately set goals, plan investments, and address some of its largest challenges such as water quality, leakage, or energy efficiency.

The Smart Water Networks Forum (SWAN) brings together key players in the water industry to promote the global development and adoption of data technologies in water networks, making them more efficient and sustainable. One of the main goals of SWAN in 2014 was to create an industry tool that could help bridge the information gap about how to successfully adopt a smart water network. A product of cross-industry collaboration, the SWAN Interactive Architecture Tool captures the many-to-many relationships inherent in a smart water architecture. A web-based application, the tool is intuitive and easy to use, gathering industry technology information in a central location. The tool's key feature is the ability to navigate through interactive, solution architecture maps and drill down on connected, data-driven technologies for more information.

The SWAN Tool is valuable for all stakeholders in the water industry. Water utilities can evaluate their network intelligence by taking the SWAN Smart Score and access industry technology information based on their business drivers, challenges or solutions spaces. Utilities can then view real-life case studies and benefit analyses. Academics, investors and innovators can use the tool to learn more about the smart water sector and identify white spaces in the...
market. Solution providers can also share their case studies, explain how their technology fits within a solution architecture map, as well as discover potential partnerships or integration opportunities.

This article will explain the key features of the SWAN Interactive Architecture Tool and examine how four global utilities employed the tool: Welsh Water in the UK, Protagos in Brazil, Global Water in the United States and Unitywater in Australia.

DEVELOPMENT OF THE TOOL

The initial research for the SWAN Interactive Architecture Tool began in mid-2013 with the SWAN Global Utility Survey. Completed by 33 utilities from 15 countries, the survey identified utilities’ top ranked business drivers and challenge areas among other network trends. These results served as the basis for the tool. Throughout 2014, various SWAN members including solution providers, utilities, consultants and academics contributed their vast expertise to the tool. All content was peer-reviewed to ensure that the tool would be vendor-neutral. Several global water utilities then beta-tested the tool site and provided their critical feedback. Below is a brief description of the tool’s main features.

THE SWAN SMART SCORE

When utilities arrive at the tool homepage (www.swan-tool.com), they are presented with four choices:

- Evaluate;
- Drivers;
- Challenges; and,
- Solutions.

The ‘Evaluate’ button takes a utility to the SWAN Smart Score. The Smart Score is comprised of 13 multiple-choice questions that assess how well a utility is taking advantage of existing technologies (see Figure 1).

Upon completion, utilities receive a quantitative score out of 100 points, as well as a qualitative gauge of their level of network intelligence. Utilities can then use this information to assess their state of technology adoption.

THE SWAN INTERACTIVE ARCHITECTURE TOOL

Tool users can begin or continue their “smart journey” by exploring smart water technologies according to their specific business drivers (e.g. regulation, customer service, operational expenditure, etc.) or challenge areas (e.g. water quality, leakage, energy efficiency, etc.). By navigating through interactive architectural maps on the solutions pages, utilities can discover how different technology components interconnect to form an overall solution area. There are currently five solution areas in the Tool: Water Quality Monitoring, Leak Detection, Pressure Management, Energy Management and Water Network Management. Customer Metering is the next solution in development and more solutions will be added in the coming months. In each solution area, users can “drill down” on individual technology components to view their specific functions, benefits and system requirements.

Figure 2 displays the solution architecture map for Energy Management. The technology components within this solution include variable speed pumps, remote terminal units (RTUs), programmable logic controllers (PLCs), communication technologies, SCADA, hydraulic modelling, and energy optimisation systems (see Figure 2).

As shown, technologies are categorised by their different layers from Level 1, the Physical level, through Sensing and Control, Collection and Communication, Data Management and Display and up to the most advanced, Level 5: Data Fusion and Analysis. Each of these levels may be clicked on to learn more information. Users may also view relevant, solution case studies and benefit analyses.

TOOL FEEDBACK

SWAN designed a utility questionnaire to determine how water utilities in different geographies with different business drivers, challenges and levels of technological advancement could benefit from using the tool. The four utilities surveyed included Welsh Water in the UK, Protagos in Brazil, Global Water in the US, and Unitywater in Australia. Each utility provided unique insights into the following three questions:

- Did your SWAN Smart Score results change or influence your perception of your utility’s level of technological advancement?

- What were the Tool’s top benefits?

- How could the Tool be improved?

Dr Cymru Welsh Water, UK: Dr Cymru Welsh Water (DCWW) provides water and sewerage services to more than three million people living and working in Wales as well as some adjoining parts of England. DCWW operates 66 impounding reservoirs, 63 water treatment works and supplies an average 828 million litres of water every day through a network of 28,500 kilometres of water mains. For this case study, SWAN surveyed Mike Bishop, Head of Operational Services at DCWW.

DCWW has been planning its smart journey over the past two years and the Smart Score was helpful in reinforcing DCWW’s understanding of its relative standing. Bishop commented, “It would be a good tool for anyone starting to think about planning their Smart journey flagging up areas they need to consider to improve their score.” According to Bishop, the tool was very useful in helping to shape DCWW’s investment plans and ensure that all technologies are considered. He said, “It [the tool] gives a clear structure to the definition of what a smart network really means… By aligning the tool to the ‘SWAN’ layers, the building blocks for smart infrastructure can be easily identified and the benefits associated with each solution easily identified for further detailed analysis based on the company specifics.”
SMART WATER SYSTEMS & TECHNOLOGY

Bishop also stated that the benefit cases provide a good starting point for developing a business case for investment within the company. To improve the tool, Bishop suggested, “Linking the architecture tool into the vendors and products offered would help formulate the strategy for selecting a supply chain to deliver these solutions.”

Prologos, Brazil: Prologos is a water utility responsible for delivering water and sewerage services to five municipalities in the Rio de Janeiro State in Brazil, covering approximately 1700 km of distribution pipeline. Prologos is a concession of AESEA, a private group which operates in 35 cities across six Brazilian states serving 2.4 million people (AESEA, 2015). For this case study, SWAN spoke with Wagner Oliveira de Carvalho, Senior Project Manager at Prologos.

Currently, Wagner is responsible for managing his utility’s Water Master Plan, updated every five years. Wagner strongly believes that Prologos has the opportunity to plan a qualitative step forward by predicting actions and strategising investments in order to raise awareness of its system, improve efficiency and reduce non-revenue water. Prologos is now testing some smart water technologies and has contracted a specialist consultant firm which is customising its GIS with some iterative hydraulic applications.

When asked about the SWAN Smart Score, Wagner responded: “I think that utilities, municipalities and engineering firms need a decision support tool like this in order to support the best technical solution for the wide range of different daily challenges in water management systems.” In regards to the tool’s benefits, Wagner stated: “The key current aspect for the utilities is how to deal with the large amount of information, and the SWAN Forum Tool presents the systemic approach of how to integrate the data from all devices and instruments of the water network in order to optimise the water and energy used.” For Wagner, the tool could be improved by: “Shoving the potential saving in a new water distribution system like using the internationally known equation to calculate unavoidable annual real losses (UARL) and the economic level for investment in water loss.”

Global Water, US: Headquartered in Phoenix, Arizona, Global Water is a private utility that owns and operates 16 regulated water and wastewater utilities in the state of Arizona serving over 68,000 people. Global Water deploys an integrated, Total Water Management approach to managing the entire water cycle, both to conserve water and to maximise its total economic and social value (Global Water, 2013). For this case study, SWAN interviewed Jon Convin, General Manager at Global Water.

After taking the SWAN Smart Score, Convin said: “It was interesting to get an independent assessment score of how well we use smart water technology within our own utilities.” Convin valued the case studies in the tool: “These provide the most detailed information to bring context to the rest of the tool.” Convin further reflected: “Understanding common challenges to smart water technology may help a utility identify which challenges their system may present before implementing a technology and help guide them in their decision-making process.” In the future, Convin would like to see the Consumer Metersing solution included in the Tool: “Customer metering is a very important component to our company because we are regulated to have water losses below 10 per cent, and it can be significant loss of revenue.”

Unitywater, Australia: Unitywater is a statutory authority that serves the Moreton Bay and Sunshine Coast communities in Queensland, Australia. Unitywater operates and maintains more than $3.1 billion of essential service infrastructure, supplying water and sewerage services to residential and business customers spread across 5713 kilometres (Unitywater, 2015). For this case study, we surveyed, Adrian Bird, System Loss Engineer at Unitywater.

After completing the SWAN Smart Score, Bird commented: “The score did not impact our perception of our position. It confirmed where we thought we were after the initiatives we had installed to date.” For Bird, the greatest tool benefits were the “provision of case studies” and “simple one page [technology] descriptions.” When asked if he thought the tool could benefit other utilities, Bird responded: “The tool provides excellent information for companies seeking to expand existing programs or commencing their journey of implementing smart systems to enable cost reductions and reduce non-revenue water. The information provides invaluable outlines of systems and benefits which can be used in the presentation of business cases.” In the future, Bird recommended, “A better menu structure would make the tool easier to navigate.”

CONCLUSION

This paper demonstrates how four, geographically and technologically diverse water utilities were able to benefit from the SWAN Interactive Tool. For DCWW (Welsh Water), the tool provided “…a clear structure to the definition of what smart networks really means.” For Prologos, the tool presented “…the systemic approach of how to integrate the data from all devices and instruments of the water network.” Unitywater appreciated the “provision of case studies” and “simple one page descriptions” and for Global Water, the tool case studies “…provide the most detailed information to bring context to the rest of the tool.” Hence, the tool was able to provide an important framework about Smart Water Networks and guide utilities through their decision-making process. SWAN now plans to encourage more utilities to use the tool: provide more detailed information, as well as develop more solution areas beginning with customer metering. Together, we can improve water network management by leveraging best, smart water practices from around the world. It is time to reinvent our water future.

REFERENCES


