Creating The Right Conditions to Enable Digital Innovation at Water Utilities

Graham Nasby
Water SCADA & Security Specialist
City of Guelph Water Services
I wanna be a Water Guy when I grow up!
So I got to live the dream!
City of Guelph Water Services

- Guelph, Ontario, Canada
- 130,000 residents
- 21 groundwater wells
- 3 water towers
- 549 km of water mains
- 49,000 service connections
- 2,750 fire hydrants
- 46,000 m$^3$/day [12 MGD]
- 60,000 m$^3$/day peak [15 MGD]
New Technology is Cool!

But...

“Genius is one percent inspiration and ninety-nine percent perspiration.

Accordingly, a 'genius' is often merely a talented person who has done all of his or her homework.”

--Thomas Alva Edison
Taking on a Digital Innovation Project is a lot like Selling Lemonade

It’s usually the new kids....

The adults will play along and humour you....for a while...

It takes additional resources from mom and dad.

It often costs a lot more than it seems.

Sometimes the lemonade tastes awful.

Can have a lot of fun and learn interesting things along the way.

Sometimes you can create something really neat and useful...
Keeping your Science Fair Project under control

Decide on what you are trying to accomplish. Write it down.

Set limits of how much time, money, and resources you want to spend. Don’t underestimate impact on the Operations team. Set milestones. Know when to stop.

Don’t try to do everything at once. Do smaller projects, and aim for incremental changes.

Document, test, and demonstrate as you go. The traditional design-bid-build approach does not work.

If businesses/consultants are involved you must ensure that there are benefits for them, and that everyone profits.

Don’t proceed with a large roll-out of technology, without doing a test run/proof of concept first.
More Tips for Success: Digital Innovation Projects

Understand the problem you are trying to solve.

Look carefully at the marketplace and talk to other utilities. There may be something already out there that does what you seek...or at least can be used as a starting point. What are other industry sectors doing?

Understand with whatever you are developing, the core goal of the water utility is still treating/providing water. Operations and compliance are #1.

If you are developing data analytics, the base data on which you build your system on must be reliable, timely and valid. This must be checked first.

Keep track of the resources you spend: cost, schedule, staff hours.

Once you build it, you will need to operate and maintain it. Do you have the resources to do this?

When is the project over? Has it become an operational program? What happens when key personnel move on?
The SWAN Data Model

Each level depends on the level below it functioning reliably/correctly.

Remote data collection challenges:
- Telemetry
- Signal Coverage for Radios/Wireless/Cellular
- Bandwidth and Latency
- Limited Power Available, especially with battery-based systems
- Real-time data vs. Logged with periodic uploads
- Protection from Vandalism
- How to install on existing physical equipment

Any Data, before it can be used, must be checked for validity. Data that is spotty/wrong will cause major problems.

Gaps of “missing data” have to be accommodated in any solution.

Data can sometimes be stuck in “silos” with no communication/connectivity interface available. Getting automated access to this data can be difficult.
Some Cool New Technologies Guelph Water is working with...
Electricity Monitoring & Pump Efficiency
Fire Hydrant Data Logging
District Metered Area (DMA) Flowmeters in the Water Distribution System
## Water Supply Operations SCADA Dashboard

### System Dashboard

<table>
<thead>
<tr>
<th>Station</th>
<th>Lift</th>
<th>Booster</th>
<th>Voltage (kV)</th>
<th>Power (kW)</th>
<th>Pressure (psi)</th>
<th>Flow (gpm)</th>
<th>Reactor</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arched 1 Well</td>
<td>OFF</td>
<td>ON</td>
<td>4.1</td>
<td>200</td>
<td>55</td>
<td>80</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Arched 2 Well</td>
<td>OFF</td>
<td>ON</td>
<td>4.1</td>
<td>200</td>
<td>55</td>
<td>80</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Arched 3 Well</td>
<td>OFF</td>
<td>ON</td>
<td>4.1</td>
<td>200</td>
<td>55</td>
<td>80</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Arched 4 Well</td>
<td>OFF</td>
<td>ON</td>
<td>4.1</td>
<td>200</td>
<td>55</td>
<td>80</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
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<td>OFF</td>
<td>ON</td>
<td>4.1</td>
<td>200</td>
<td>55</td>
<td>80</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

### Water Supply Operations SCADA Dashboard

- **System Dashboard**
  - Production Wells: 12.4, Woods Booster: 8.1, Arched 7 Well: 17.9, Arched 8 Well: 9.0, Arched 14 Well: 83.6, Arched 15 Well: 0.0
  - City of Booster: 10.1, Parolee Station: 9.0, Robertson: 0.0, Himear Well: 4.8, Calico Well: 12.8
- **Well Production**: 1467.6 m³/s, **Storage**: 43181 m³, **84.6 %

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North American SWAN Forum – Nov 4, 2018 – Montreal, Quebec, Canada
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Water Supply Facilities Power & Standby Power Monitoring
Web-Based SCADA Network Status Monitoring

Open Source Software
Involving the Next Generation: SCADA Co-op Students