

Survey Form

Input on Digital Water Issues

Advisory Group on BAYWORK White Paper on The Digital Worker

Respondent

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Date November 3, 2020

A. Your ideas and questions

This is a word document, so your answers can be as short or as long as you want.

1. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Selection of digital tools**

Selection requires input from staff that will ultimately be using the tool, whether it be data input/output, process control, process decision making, reporting, measuring, etc. Input from those that will be the technical managers and will implement systems. Will the system need ODBC (Open Data Base Configuration), security considerations, etc. All of this information will play into the development of a Request for Proposals (RFP) or bidding documents required by Procurement.

Selection is phase 2. Begin looking at systems that fit the requirements from the user input phase. Attend vendor demonstrations and ask questions. Visit area utilities that are using the software you are considering or even that you are not considering.

Phase 3: It is really helpful if you can make a short list based on meeting the criteria you have established from Phase 1 and 2 and send RFP to only those firms. Limit the number to 5 (3 is even better). This will hopefully separate the "I can do anything" from the "I can do what you need." Don't waste time listening to a presentation of something that you are not going to use. Also be careful not to

have companies assemble very expensive bid proposals, just because you need to go through a bid process. This gets around very quickly and you will be the big loser in the long run.

2. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Corporate culture, leadership, and change management**

There needs to be a relentless champion for these projects.

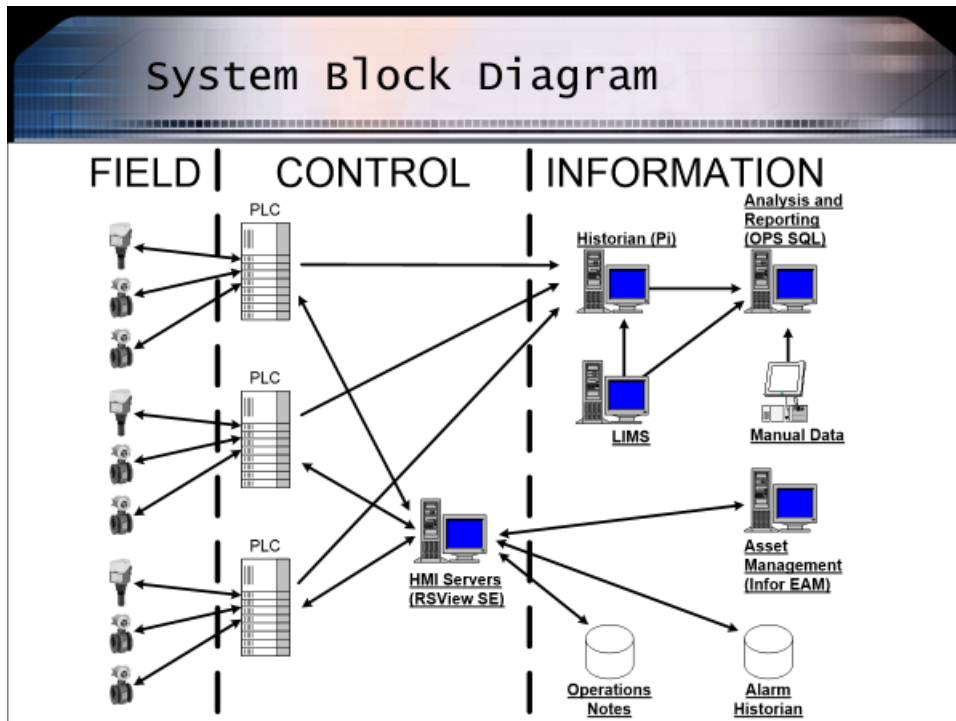
3. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Coordination with existing workflows and systems**

Integrated systems are important and have a positive effect on useability and usership. The foundation of integrated systems at my former employer was the equipment numbering system in SCADA. This numbering system was used in Infor EAM (Enterprise Asset Management System), Pi Historian (granular data stored as historical), Hach WIMS (process control/reporting), FlexOps (automated field data collection for readings and rounds), LIMS (Laboratory Information Management System), and SOP nomenclature. This provides ease of use for staff, i.e. no need to get out of SCADA and into EAM to write a work order. Work order boxes were pop-up in SCADA and information on the equipment is automatically populated, along with date, time and person ID. The information automatically populated in EAM and any other systems required.

Systems don't get used if they are too cumbersome or difficult to use. Ease of use was always the goal of any software or process control system implementations. Staff involvement to find glitches, tweaks, new ideas etc. is very important. Buy-in on systems equals system success!

Documented business practices and workflow documentation is important to system implementation. If you have selected well, the system should support the business practice. The business should almost never have to be modified to fit the system.

You can't manage what you don't measure. It is important to get management, supervisors, regulatory folks to identify what they need to see as a result of the data collected. Are you collecting data that is meaningless junk? What does a manager dashboard look like? It won't get used if it is not useful.



4. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Human Resources support for modifications needed to job descriptions, job categories, and recruitment practices**

Human Resources, particularly those HR departments that are a City department rather than a district department, typically have little to no understanding of the knowledge, skills and abilities required to support, maintain and repair an automation and control system. This presents a problem for developing accurate job descriptions and placing the positions on an appropriate pay line. This results in SCADA and EI&C staff performing higher level skills for lower level skill pay.

Human Resources is very prone to comparing automation positions to those of the Information Technology department whose responsibilities are support of the business network. Completely different skill sets. This is the invisible bed-partner of the IT department who thinks they have to preside and control plant operating systems simply because computers are used at the water or wastewater treatment facilities for Human Machine Interface (HMI). The skills of Business Network Administrators and Business Network engineers are not comparable to those of automation engineers, SCADA engineers and programmers, Smart Network administrators and Instrumentation & Control specialists.

At my former organization, I wanted to add an additional I&C Specialist position. I had previously developed the job description, complete with a knowledge, skills and abilities inventory with percentages of time performing each, when the first I&C specialist was hired. I was making a pitch for a pay line increase, so I invited the HR person to attend a very thorough presentation including a trip to look at equipment in the field. I presented with the person that was in the original I&C position and had been promoted. She thanked us and assured us that all of the information was valuable and she had a whole new understanding of the position. A few days later she met with me and the person who had helped me present and said she had found a pay line match for the position: Desk-Top Support Specialist in the City IT Department! Needless to say, the fight was on and I was eventually victorious.

Part of my victory came from the relationships I developed with other water and wastewater treatment facilities on the front range that had advanced automation and control systems. I spent many hours exchanging job descriptions and pay lines and visiting these utilities to understand what and how they were using their systems and associated software. We're all in this together and leveraging and lending support to and from other utilities is powerful.

I also did a lot of work with the local County Workforce Center (Arapahoe/Douglas Works). They were very helpful with providing salary numbers as provided below. These numbers were used in a SCADA Business Case I developed with a small committee for the Get-Into-Water Project.

Competitive Wage Scales: 4 Selected Production Side Occupations

Denver-Aurora Metropolitan Statistical Area								
SOC Code	Description	2011 Jobs	2010 Median Hourly Wage	2010 Avg Hourly Wage	Entry Level	1-4 Years Experience	5-9 Years Experience	10+ Years Experience
17-3023	Electrical and electronic engineering technicians	1,357	\$27.31	\$27.28	\$18.19	\$22.97	\$31.46	\$36.47
17-3029	Engineering technicians, except drafters, all other	630	\$24.37	\$25.57	\$15.74	\$18.80	\$31.35	\$38.14
19-2090	Physical scientists, all other	613	\$40.46	\$40.26	\$22.38	\$28.42	\$49.61	\$60.21
49-2095	Electrical and electronics repairers, powerhouse, substation, and relay	228	\$31.10	\$30.52	\$24.61	\$28.10	\$34.11	\$36.22
	Total	2,828						

Source: BMSI Complete Employment 1st Quarter 2011

Colorado								
SOC Code	Description	2011 Jobs	2010 Median Hourly Wage	2010 Avg Hourly Wage	Entry Level	1-4 Years Experience	5-9 Years Experience	10+ Years Experience
17-3023	Electrical and electronic engineering technicians	2,615	\$26.40	\$26.78	\$17.38	\$21.80	\$31.27	\$36.77
17-3029	Engineering technicians, except drafters, all other	1,196	\$25.91	\$26.63	\$16.13	\$20.25	\$32.58	\$38.91
19-2099	Physical scientists, all other	983	\$36.27	\$37.28	\$20.40	\$25.71	\$46.13	\$57.86
49-2095	Electrical and electronics repairers, powerhouse, substation, and relay	475	\$29.77	\$29.66	\$19.06	\$24.45	\$35.39	\$40.32
	Total	5,269						

Source: BMSI Complete Employment 1st Quarter 2011

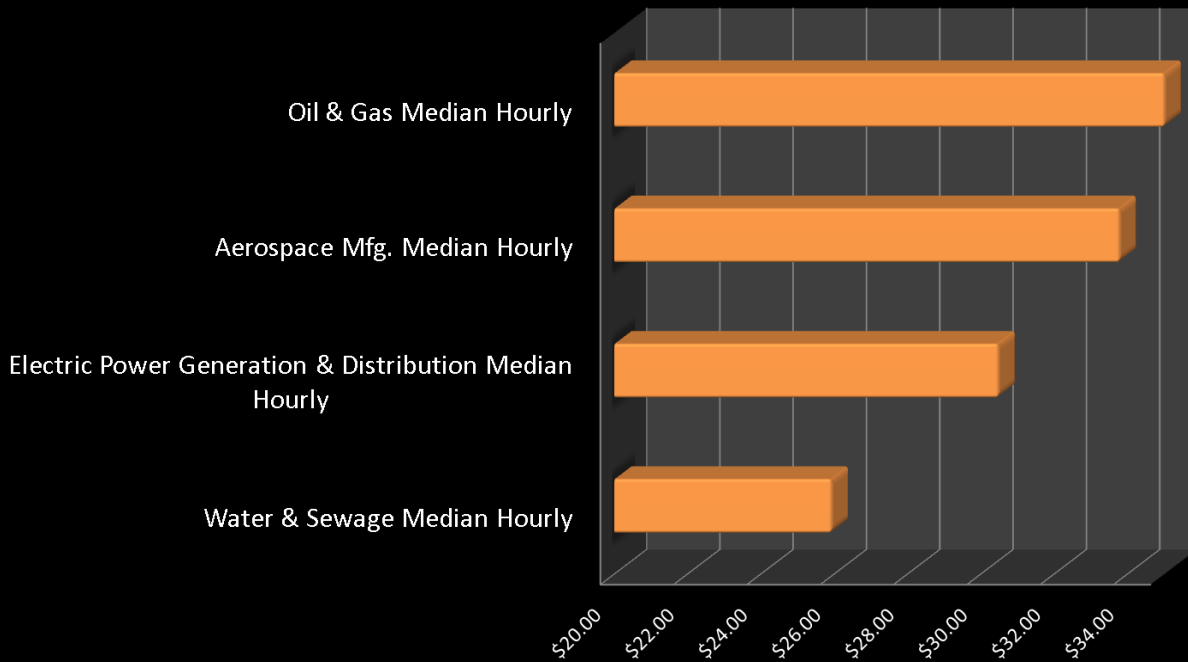
Though these numbers are 10 years old, they are still fairly representative of today's market.

“The Arapahoe/Douglas County Workforce Center then pulled data from the national, state and regional (Denver MSA) level comparing the water industry to three other industries including:

- Oil & Gas
- Aerospace Manufacturing
- Electric Power Generation and Distribution

The Figure below shows that water industry salaries are significantly lower than salaries in other industries.”

Differential; Median Hourly Wage, Four Selected Industries, May 2009



Source: Arapahoe/Douglas Works!''

5. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Support from Information Technology staff**

Support from IT staff may be required if there are network connections provided to the SCADA system via the internet. Managing interfaces to software that resides on the Business Network may require IT services. Working closely with IT is critical to ensure security, system integrity, process control and data integrity.

My experience is with City IT staff. What we consistently found was though we needed their assistance with the business network, City IT staff generally didn't have the skills or our best interest in mind and never had a shared vision or urgency for getting system failures or problems resolved expediently to support utility operating and permit requirements. Beware the service level agreement that does not serve the utility!

The most successful staffing structure for our facility was as follows:

1 Network Administrator: Manage all aspects of the utility networks, Business and SCADA connectivity to the Business Network. Must be well versed in Automation and Control Systems, Smart Networks and SCADA networks.

1 Software application and desktop support.

1 Data Administrator

1 SCADA Network Administrator: Network administration, minor programming and programming adjustments, Smart Network administration.

2 I&C Specialists: Instrumentation installation, maintenance and repairs; Smart Network troubleshooting, maintenance and repair; IO maintenance, repair, troubleshooting.

This is a really important structure to have in place at the utility. External of any of this is sure failure!

6. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Initial and ongoing staff training**

We found that we had to continuously search for training. Since we were in the position of needing to train our own (Build-your-own staff concept), we sought training specific to our automation system and software applications. This presented problems especially during times of travel restrictions (City budget requirements). On a couple of occasions we partnered with our integrators/service providers to bring in trainers for one or two week training. We invited other utilities in the area and charged an affordable fee to offset cost of trainer and food. This also gave us opportunity to share ideas and resources between utilities.

7. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Developing candidates with the qualifications needed for effective use of digital tools**

We have found it was necessary to develop our own. There was minimum criteria for a candidate, but plant specific skill just had to be taught.

8. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Artificial intelligence**

We didn't delve into this too much. Chose the real thing!

9. Your ideas, observations, experiences, challenges, lessons learned, and/or questions about **Cyber-security**

This was a struggle.

10. Your thoughts, observations, experiences, challenges, lessons learned, and/or questions **in any other area** you would like to see addressed in the White Paper

Lessons learned:

1. Team investigation of systems: Assemble a team that will be the core team from investigation through selection. Make sure it includes staff that will be the end user of the system.
2. Bring operations/process control specialists into the mix of identifying needs and what they need in terms of reports and reviewing potential products/technical support against needs/wishes/wants. (I have a dream!)
3. Go to many vendor demos.
4. Partner with local utilities who are using same/similar software/systems/etc. What are they doing, how are they doing it, what data are they collecting, how is it being used, what are they measuring, how does the information tie into strategic planning, the list goes on...
5. Invent your own training programs for Automated systems, process control, SCADA the whole deal! Some systems such as Profibus networks do not offer training in the US. Partner with service providers and bring the trainer to you. Offer the training out to other utilities in the area.
6. Identify partnerships that will benefit your program: neighboring utilities; educational institutions; service providers; regional committees; So on...

B. Glossary

Please identify any terms that you think it would be useful to include in the glossary,

HMI – Human Machine Interface

SCADA – Supervisory Control and Data Acquisition

EAM – Enterprise Asset Management

RFP - Request for Proposals

ODBC – Open Data Base Configuration

PLC – Programmable Logic Controller

which will be one of the attachments to the White Paper. If you have a definition of the term to suggest, please feel free to provide that as well. However, it will also be helpful if you identify terms that you have seen used in relation to digital tools that are unclear to you.

C. Resource Suggestions

If you have benefited from articles, reports, presentations or books that have increased your understanding of effective use of digital tools, you are invited to share them with the group and/or provide reference information on them here.