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New mobile workflow optimization approaches are rewriting smart meter deployment best practices

By Shashi Gupta

Problems associated with poor installations of advanced meters have done tremendous damage to public perceptions about the utility industry. To those familiar with the challenges associated with advanced metering infrastructure (AMI) deployments, it comes as no surprise that significant quality and process issues, such as hot meter sockets and other safety and reliability problems, have come to the fore. AMI can present customer-facing issues too, including customer billing errors from improperly registered meters and poor handling of utility customers by an inexperienced, hybrid workforce. Lost meters and poor inventory tracking, schedule overruns and inefficiencies in a range of processes can drive up project costs.

Utility executives are demanding new processes, tools and strategies to confront these risks. To withstand regulatory and media scrutiny, AMI rollouts require fail-safe programs and processes that ensure automated process compliance and tracking. Utility executives know that when it comes to batch errors, hot sockets, and billing mix ups that "one such incident can stall the whole project." In an environment where every public mistake is magnified, best practices are beginning to emerge, and workflow optimization systems are playing a pivotal role in ensuring adherence to standards and structures providing documentable audit trails.

What Can Go Wrong? – Identifying AMI Deployment Risks

System-wide advanced metering infrastructure (AMI) deployments represent an unusually substantial resource commitment for a utility. A highly varied workforce that includes relatively inexperienced field personnel often carries out AMI rollouts. Problem areas generally relate to installation processes and personnel, rather than being specific to a particular meter manufacturer. AMI deployment problems include:

1. Hot meter sockets and associated fire hazards
2. Meter registration, batching, and pairing installation errors
3. Meter inventory errors (lost meters and/or inefficient tracking)
4. Inefficient processes (for workers, managers and/or administrators)
5. Safety, reliability, or customer-facing process deficiencies
6. Liabilities arising from a lack of audit/photo trail of standards-based activities

The New AMI Best Practices

Early smart meter deployments yielded some hard lessons, and that knowledge has become the basis for metering specific approaches that draw on business process management approaches, particularly mobile workflow optimization. Utilities today can apply these practices to avoid pitfalls and ensure success.

No.1 – Think Processes, not Features

To find the right approach, utility managers accustomed to evaluating software solutions on features and functionality will need to look at workflow optimization solutions in a holistic, process-centric way rather than in a fragmented 'module centric' fashion. Doing so will reveal the powerful common business process management principles as the source of dramatic improvements across different workflow scenarios. What are your productivity objectives? Workflow optimization can address a variety of challenges in AMI deployments, including:

- Ensuring proper work assignments are given and that new team members are assigned work based on their skill set as soon as they are badged
- Allowing the rapid update of assignable tasks after completion of new training.
- Managing the life cycle of a project's inventory
- Integrating bar-coding and GPS data into process steps (e.g. tracking meter movements from a pallet being opened, to boxes being moved, to individual meters being installed, with workers scanning their badges so status and location of each meter is traced)
- Guiding workers through each step in various workflows, using interactive questions or prompts, from the moment the meter is removed from the box
- Providing a single system rather than multi-system integration for time sheet and payroll system data tracking

In the early days of AMI deployment, there were no mobile workflow optimization solutions built specifically for this purpose. Those who recognized the role that business process management (BPM) could play had only generic tools that needed to be adapted on an ad hoc basis. Today's solutions incorporate the lessons of the past, building workflows that address the needs and challenges of AMI deployments. Whereas legacy enterprise software solutions often lack native ability to process photographic records, perform job assignment changes based on new certifications, or integrate time sheet and payroll system data, new AMI solutions achieve lasting productivity gains because they are infused with hard won knowledge and purpose built to avoid systemic inefficiencies, process bottlenecks, and common errors.

Mobile workflow optimization has taken long-standing principles of BPM out of factory and IT-centric environments and applied them in new ways for utility-related fieldwork. In addition to choosing an AMI-specific tool, a utility must take a great deal of care to collaborate with the solution provider in designing an optimized workflow for each step in the installation process. An IOU executive reflected on the impact this made in their deployment, "The upfront planning we did with the vendor is really paying dividends. The solution is a real-time system. I can look at the system right now and I can tell you how many meters are currently installed and I have a report that can tell you how many have been installed today."

No. 2 – Deploy 'Forced March' and 'Fault-Resistant' Workflows

Humans are fallible, yet the best workflows do not over – or under – automate a workflow. Optimal approaches find the perfect balance in the interaction of human and automated systems. 'Forced march' workflows help design out errors by rigorous identification of common errors in specific workflows and redesigning tasks that guide the user through the new process step by step. For example, a water utility had a problem with the work process of using a clip to connect a radio to a meter. Installation technicians found it difficult to determine whether the clip was fully inserted. The connector clip has two holes in it, which fully protrude only when the clip is firmly inserted and the radio is connected correctly. To ensure proper connection, a step was added to the workflow requiring the installer to insert toothpicks into the two holes, and then photograph them. The photograph not only provides evidentiary proof that the clip was installed correctly, but also serves as a verification record that gets stored for quality assurance record keeping. Steps in many of the other workflow processes similarly force the correct process to be accomplished and documented, thereby forming key elements of the forced march, which help to eliminate failures.

Similarly, fault-resistant workflow designs prevent workers from engaging in error-prone work processes. This is accomplished by analyzing the "fault trees" of a process and designing against them. One common problem in mass meter deployments is "batching." This occurs when -- instead of removing and replacing one meter at a time -- installers remove many meters at once. Often, when they go to put in the new meters, it becomes impossible to associate the correct old meter with the new meter. Consequently, bills go to the wrong customers, creating a serious public relations issue. Batching can be eliminated by requiring the technician to follow this 3-step process:

1. Take a photo of each meter prior to removal and installation
2. Log the legacy meter number into the system
3. Scan the new meter serial barcode

The workflow mandates that the steps be performed in strict sequence, forcing the technician to install each meter one at a time, and eliminating any possibility of a mix-up.

No. 3 – Collaborate with Experts to Hone Your Tools

An expert who understands both AMI challenges and workflow optimization can tailor your tools for a variety of purposes. Take on expert advice to learn about the tools that address the needs of a specific deployment. Here are a few to consider:

- Photographs of installations can provide valuable opportunities to document customer equipment issues and proactively engage customers for corrective steps while warning them of any hazardous conditions.
- Barcoding can play an important role, too. As parts move through the field, at each change in custody – from the warehouse manager to the installer or between installers in the field – equipment barcodes and worker badges allow managers in the office to identify precisely who has custody of each meter.
- Statistical sampling can identify 'error-prone' situations and single those out for analysis. For example, because newly trained workers, or workers thrown into unfamiliar situations, are among the most error-prone, the sampling process can focus on them. While the overall worker sampling would normally be 7 percent or lower, the sampling for a new worker involved in meter replacements can be set, in the first days, to 100 percent. The best sampling is a real-time shadowing that involves recording observations. As the worker gains experience, the sampling tails off until it reaches the average for all employees.
- Time-stamped GPS data can create an audit trail to track worker progress and improve worker productivity and accuracy.

- Other techniques can address cascading inventory issues by showing, for example, precisely when a pallet has been opened and exactly which units are on the pallet. Such tightly controlled asset management drastically reduces the likelihood of any meter being lost.

No. 4 – Build Positive Customer Engagement into the Process

Early AMI deployments encountered unexpected challenges in consumer engagement. Today's best practices recognize this and proactively incorporate outreach to keep customers informed and satisfied. Mobile workflow optimization guides important customer-facing activities during AMI deployment. An investor-owned utility manager said, "The solution is very process oriented. It is a series of built-in checks. Did you knock on the door? Did you leave a door hanger? So before you can go on to the next process, you have to complete the previous process, do the steps, and answer the questions. The technician cannot change the order of operations or skip steps." The workflow optimization solution ensures that utility communications processes are followed as planned.

Utilities deploying AMI today must confront a range of misperceptions and consumer fears around fires, RF exposure, high bills, and more. Mobile workflow optimization solutions address these stakeholder concerns through carefully documented deployment records, workflows and photographic audit trails that greatly reduce the risks associated with the rare occurrence of 'hot sockets.' One utility reported using its mobile workflow optimization solution to take photographic thermal readings of empty meter sockets during installation to ensure a site-specific audit trail of socket conditions. Through a variety of methods, mobile workflow optimization solutions reduce utility liability risks and the risks posed by potentially negative public relations exposure during AMI rollouts. Photos that show on-site conditions before and after work can go a long way to protect a utility from legal liabilities. One utility executive noted, "We have had some situations where the meter reading may be entered incorrectly. Our contractor performed a 'blind validation' of every meter reading captured in the field, using the photo of the legacy meter face, zooming in to read the digital display or the analog dials. This gave us 100 percent accurate meter readings and the photo evidence to back them up. So, if a customer contested their billing, we could verify the accuracy of the reading in our system right in the office, instead of going to the expense of another truck roll to actually look at the meter again."

A Promising Body of Knowledge

The lessons learned by early AMI rollouts have yielded detailed knowledge, which is now available in industry specific workflow optimization solutions. These are yielding successful AMI rollouts that avoid many of the most widely reported deployment pitfalls. In the process, these utilities have lowered risk, increased field productivity, and enhanced consumer engagement. Looking ahead, mobile workflow solutions hold potential to optimize other utility applications including rollouts of load management, home area networks, distributed generation, and T&D inspections. Forward-looking utility executives who have applied mobile workflow optimization solutions to AMI rollouts have laid a strong foundation to confront unknown challenges and exploit coming opportunities in the distributed energy future.



About the author

Shashi Gupta is an expert in mobile technology that offers the safest, most efficient, least-cost solutions for managing field workforces – by balancing the processing power of computers with the cognitive power of human minds. He is CEO of Apex CoVantage.