VIEW POINT



TRANSFORMING UTILITY WORKFLOWS USING GIS

Abstract

Operational excellence in utilities demands the empowerment of field and office staff with better collaboration mechanisms. This paper explores how location technologies and mobile GIS applications can help bring about the required transformation.



Operating in legacy mode

For the utilities industry, complex physical assets and high-risk operations involve a great dependence on the field force for mapping infrastructure and performing asset inspections. For telecom, electric, gas, and water services especially, asset health monitoring is critical to prevent network failures. This needs highquality field data with an effective field workflow equipped with digital applications.

However, many utilities today still collect asset data through scans of field staff-supplied hand-drawings on printed schemas or maps, which then need to be migrated into enterprise information systems through several time-consuming procedures.





The need for change

With utilities involving both first and last mile connectivity, ensuring allround customer satisfaction is of prime importance and needs a sound business model. Addressing vulnerabilities that cause outages, reducing delays in field operations, and efficient scheduling of field staff needs effective means of deploying map services right from the field. Though the industry has been adopting sophisticated mapping technologies and transitioning from legacy to new enterprise systems, accessing and sharing geographic data continues to be a challenge, due to the factors detailed below.

Legacy datasets	Improper schedule	Aging workforce	Late adoption	Customer satisfaction
Physical paperwork, raw hand-drawn formats, reading and interpreting scanned forms and images requires human interventions	intensive manual interventions to schedule field assignments, identify the right field agents, and dispatch at the right time. Last mile connectivity is lost	Centralized operations provides dependency on ageing workforce thus impacting productivity and efficiencies	Utilities are late adopters of new technologies and practices due to the involvement of both IT and physical asset infrastructure in the overall landscape	Non-delivery of quick service requests Faulty network assignment thus reducing customer experience

For such organizations, equipping the field force with location-aware applications feeding into the organizational system of records will bring about streamlined data management, reduced errors, and enhanced productivity. This authoritative data hosted as a service, will further empower field and office staff with communication and reporting through real-time data feeds. Also, with Al and mobile work management solutions, utility companies can further improve operations through ensuring that maintenance staff are in the right place at the right time and with the right information to act promptly.

Thus, digital transformation using location

technology is a present mandate across public utilities to enable greater visibility of network assets and thereby savings on capital costs and labor field force. However, this drive towards digital transformation requires the right investments in technologies, people, and processes.

Moving towards digital workflows

Though utilities have begun digitizing their legacy asset data, a considerable volume of raw hand-drawn data supplied by engineers on the field remains to be converted into digital formats. In most utilities today, the daily workflow starts with office staff printing survey maps and inspection forms for use by crews to perform their field operations. The field crews then visit the project site, locate the marked assets, perform the needed inspections and collect data in form of redlines or marked features. This field data then makes its way to the office where GIS teams transcribe it to a desktop GIS or AutoCAD platform.



The typical paper-based workflow illustrated above suffers from several drawbacks such as illegible inspection forms, uncredited asset photos, lost paper forms, and so on. Hence, especially in the context of an influx of digital natives into the field workforce, the critical need is for enhanced digitalization. Using online GIS applications and GIS based mobile apps will efficiently integrate raw data coming in from the field into enterprise asset management systems, increase data collection accuracy, and reduce outdated information. The real-time synchronization of collected map data will enable paperless, digital workflows for enhanced field efficiency through improved collaboration and communication of data. Thus, for example, field work for outage-based assessments can be easily scheduled and dispatched, with map data from updated enterprise systems delivering relevant location/asset information to field technicians in the vicinity through their mobile applications.



Field workflow transformation initiatives are often hindered by data migration challenges. However, these can be addressed using GIS packages integrated with OCR technology and based on machine learning (ML) and artificial intelligence (AI). Such systems can capture the delta updates on paper maps, converting them back as map datasets in the enterprise GIS. This digital data migration approach eliminates the tedious manual processes of redlining the updates and converting the instructions, geometry data in a GIS/CAD environment.



Making the shift

While considering a quick turnaround approach for implementing digital workflows, deployment architecture plays a key role either in building a custom business model or in using a platform centric approach. Many industry vendors and service providers have started offering platform solutions and services thus enabling faster time to market.

However, building and deploying an enterprise GIS solution – both for digital work orders and as a replacement for traditional data migration activities has been found to be the best practice. Also, current trends point to migrating voluminous field data in an as-built format to the GIS environment. In the illustration below, the components enabling digital work orders can be either plug-n-play, or a complete reengineering of existing or standard enterprise systems.



The standard industry workflow-enabling implementation is as follows:

- Building a utility network using the Enterprise Geodatabase Model and ensuring the business capability in the network database.
- With a services-based architecture (SOA), the published utility network

layer will be used to manage, analyze, and work with the new utility network.

- Either a focused solution or common design of business workflows can be built for different user groups – administrators, schedulers, planners, field agents, markets
- 4. The web maps can be accessed

through any device and the utility network data can be collected/ modified from the field, the SOA enabling effective planning and monitoring of field resources.

 Quality checks on data can be performed with pre-configured validations tools.

Incorporating value-added solutions

The field operation or work order conversion involves many IT and hardware entities that builds the entire product solution. During the transition, several value-adds can be bolted onto each architecture component. The ones listed below can be loosely- or tightly-integrated with the core components:

 Sensor data: Today, utilities are becoming more aligned to digital methodologies and placing sensors in the field. Over time these sensors have become part of the larger geospatial picture, with sensor-collected data used in spatial analytics for insights and improved decision-making. Sensors in the field generate real-time data with positional intelligence enabling the workforce to access the shared data via smart phones and tablets to address asset maintenance and monitor asset health, with anomalies mapped using Web GIS technology

 AR/VR model: In recent times, AR based solutions are being deployed along with the mapping technology to improve the restoration and repair processes associated with overhead/underground utilities. This has enhanced field force operations manifold, helping manage tickets with a quick turnaround time and with a high quality of field repairs.

Customized mobile applications:
 These provide workers with a real-time knowledge of field scenarios through map-centric workflows, enabling them to collect data, mark-up maps, capture location tracks, complete assignments, and navigate to assets. The applications help save space on mobile devices through eliminating the need to duplicate data, such as base maps, across multiple applications.

Looking ahead

Market surveys indicate that the global work order management systems market size will grow from USD 414.1 million in 2018 to USD 694.6 million by 2023, at a CAGR of 10.9% during the forecast period. A large part of this growth will come from utilities, as shifting to digital workflows has undeniable benefits through better field-office collaboration on large datasets within a single editable environment. The integrated flow will be seamless for the field worker resulting in higher productivity and better performance. It will also provide easier, centralized access to data through the enterprise/cloud geospatial environment for clients, subcontractors, and decision-makers.

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