

**PROJECT: MOBILE DATA COLLECTION AND
ROBOTIC PROCESS AUTOMATION**

IDAHO DEPARTMENT OF WATER RESOURCES

Category: Business Process Innovations



State of Idaho

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Contact: Greg Mathias
Greg.Mathias@IDWR.Idaho.gov

EXECUTIVE SUMMARY

In 2017, the Idaho Department of Water Resources (IDWR) began a project to investigate more efficient and innovative methods to collect data while in the field. Once started, it was quickly realized that, in addition to collecting the data, a new method to enter the data into IDWR's existing systems had to be investigated, as well. The Mobile Data Collection and Robotic Process Automation solution that was ultimately decided upon is comprised of Esri's Survey123, to collect the data, and UIPath, a Robotic Process Automation (RPA)¹ tool, to automate the entry of the collected data.

Before the implementation of this solution, field staff carried pens, paper, maps, cameras, and GPS units into the field to record and document measurements. The collected data was written down, using pen and paper, while in the field and then taken into the office where it was manually entered into IDWR's existing custom developed applications.

With the successful implementation of the Mobile Data Collection and Robotic Process Automation solution to measure and record groundwater use for irrigation and other water uses, IDWR is now able to automate the collection of required field information with a web mapping application running on the mobile device that directs field staff to the locations that need to be inspected. Surveys developed in Survey123 are launched directly from the map showing the locations that need to be visited and collected data is then stored on the device, uploaded to the cloud, and subsequently, automatically entered into its applications via the RPA tool.

This solution has become an integral part of how IT services are woven into every step of in-field data collection. Building on existing IT services, GIS Services are leveraged to collect data and RPA is used to move the data from the Esri cloud into IDWR's custom developed applications. The successful use of Survey123 and UIPath demonstrates how the automated flow of data from the field into IDWR's applications can be accomplished and is a model to automate other field data collection workflows at IDWR.

IDWR has promoted the Mobile Data Collection and Robotic Process Automation solution to internal employees by demonstrating its capabilities in "Brown Bag" lunch sessions, to All Employee Staff meetings, as informal user groups during "Survey123 Workshops," and to external watermasters through individual water district meetings. During the "Survey123 Workshops," several users are given an opportunity to share their successes and innovative improvements they have discovered to a group of like-minded users. All IDWR employees are invited to attend, along with Esri employees, allowing the Esri employees to observe, firsthand, how their tool is being used, provide updates on new features, and receive feedback from IDWR employees on potential enhancements to their product for future releases.

Based partially on their participation at one of these workshops where they learned of IDWR's Mobile Data Collection and Robotic Process Automation solution, Esri awarded a 2019 Special Achievement in GIS Award to IDWR. In its official notification to IDWR, Esri stated, "This award is given to user sites around the world to recognize outstanding work with GIS technology. Your organization stood out from more than 100,000 others."

The cost to implement Survey123 was extremely low. Survey123 is included in IDWR's suite of Esri products and most IDWR employees already own a mobile phone or have access to an IDWR phone or tablet. These factors result in a high return on investment for IDWR. In addition to obtaining more accurate, consistent, and complete data, the benefits include a significant reduction in the time spent collecting and entering it.

To put the time savings into perspective, for 2018's groundwater measurement *error free* data entry, alone (actual data collection time not considered), IDWR was able to reduce, conservatively, approximately 130 hours (8,000 minutes, 16+ man days) by an order of magnitude to approximately 11 hours (660 minutes, 1.25 man days).

¹ **Robotic Process Automation tool:** In the context of the Mobile Data Collection and Robotic Process Automation project, RPA was used to automate the unattended entry of data collected in the field into existing applications, with no modifications required of the existing applications. The robot is programmed to log into the applications, read the collected data from the source and enter the data, field by field, line by line, into the applications.

This solution is benefitting both the department and the constituents that IDWR serves. Based on the successful implementation of this solution, IDWR will continue to expand its use to additional in-field data collection processes.

Combining the use of Survey123 with UIPath has proven to be an innovative use of technology to increase the efficiency of collecting and entering critical data to benefit all the citizens of Idaho and enabling IDWR to more effectively manage Idaho's water resources.

EXEMPLAR

The use of information technology has been, and will continue to be, not just the foundation on which its services rely, but is critical to the success of the Idaho Department of Water Resources (IDWR) in accomplishing its mission, "To serve the citizens of Idaho by ensuring that water is conserved and available to sustain Idaho's economy, ecosystems, and resulting quality of life." It can do so by adhering to its vision, "To achieve excellence in water management through *innovation, efficiency, planning, and communication.*"

In collaboration with IDWR's business units, the IT Services Bureau (made up of GIS Analysts and Programmers, Application Programmers, DBAs, as well as Network and Server Support personnel) continually works to identify opportunities to better utilize IT technology to make existing and future processes more accurate and efficient. The Mobile Data Collection and Robotic Process Automation project is an excellent example of a collaborative effort between the ITS Bureau and IDWR's business units.

Over the years, IDWR has continued to increase its use of technology, including Geographic Information Systems (GIS), custom in-house developed applications, SQL databases, Global Positioning Systems (GPS), digital cameras, and a document management system to assist in approving or denying proposals to appropriate or change existing water rights, archive water right records, recommend and record adjudicated water rights, and oversee the delivery of water in times of shortage. To promote the sustainable development of water resources, the department gathers information and data regarding the water supplies of the state and utilizes IT technology to store, analyze, and report the collected data.

As part of its data gathering responsibilities, IDWR performs thousands of field inspections annually and was investigating ways to leverage mobile technology to increase efficiency, consistency, and accuracy of data collected in the field while eliminating the need to manually enter data multiple times.

One of the major data-gathering efforts at IDWR is recording the amount of ground water pumped out of wells for irrigation and other uses. The volume of water is obtained by reading installed flowmeters on pipes close to the wellhead, where the water is pumped out of the well. A picture of a flowmeter is shown on the right.

Previously, field staff carried pens, paper, maps, cameras, and GPS units into the field to record measurements. The flowmeter data for each well was written down, using pen and paper, while in the field. The completed forms were then taken into the office where they were manually entered into IDWR's custom developed applications.

With recent advances in technology, IDWR investigated a more efficient and innovative way to collect the required data. Survey123, a product offered by GIS software vendor Esri, was identified and used to develop surveys used in the field to collect data. Surveys were developed, tested, and implemented and have proven to be innovative and invaluable solutions for mobile in-field data collection at IDWR.



Flow meters record the amount of water diverted from a well or pump station

The use of Survey123 to collect the data and UIPath, a Robotic Process Automation* (RPA) tool, to enter the data, have become integral and have transformed the way IDWR collects and enters data into existing applications. These two tools



Survey123, a product from ESRI, makes it easy to configure a survey to collect information on a smart phone or tablet.

comprise the Mobile Data Collection and Robotic Process Automation solution and allows IDWR to quickly develop and deploy surveys that can be used on mobile devices (smart phones and tablets) to collect and enter more consistent (by use of drop-down menu items and adaptive menus) and accurate data. An example of a survey is shown on the left.

The recent implementation of these two tools has become an integral part of how IT services are woven into every step of in-field data collection. Building on existing IT services, GIS Services are leveraged to collect data and robotic process automation is used to move the data from the Esri cloud into IDWR's custom developed applications. The successful use of Survey123 and robotic process automation demonstrates how the automated flow of data from the field into IDWR's applications can be accomplished and is a model to automate other field data collection workflows at IDWR.

IDWR has vastly improved its data collection and entry processes and is now able to automate the collection of required information starting with a web mapping application that directs field staff to the location of the flowmeters that need to be inspected. Surveys are launched directly from the map and data collected by Survey123 is stored on the device, uploaded to the cloud, and subsequently automatically entered into its applications.

CONCEPT

Each year, IDWR performs thousands of field inspections and wanted to use mobile devices to record data collected in the field and automate the entry of the collected data into IDWR's existing in-house developed applications. Before implementing the Mobile Data Collection and Robotic Process Automation solution, field staff carried pens, paper, maps, cameras, and GPS units into the field to record measurements. Collected data was written down, using pen and paper, while in the field. The completed forms were then taken into the office where they were manually entered into IDWR's custom developed applications.

Selecting the appropriate technology would save time, both when gathering the data in the field and by automating its entry into existing applications. In addition, consistency and accuracy of the data collected would be improved with an appropriate tool.

IDWR had been investigating the development and implementation of mobile data collection processes for field staff to use to collect data while in the field. Due to a seemingly infinite queue of application development and modification requests, coupled with finite development resources, IDWR searched for a "faster to market" option to enhance field staff efficiencies and experiences.

When Esri introduced Survey123 as a product, IDWR's field staff immediately recognized the potential benefits of its use. Because Survey123 is relatively easy to implement and use (without the need for IT assistance), it spurred a "grassroots" effort and field staff immediately began building (non-standard) surveys to fit their needs.

The ease of data collection quickly caught the eye of business unit managers who recognized its potential to increase the efficiency of their field staff, as well.

Although field staff were able to develop surveys to collect the desired data, there was no way to get that data into IDWR's custom applications. Several field staff employees developed similar, yet non-standard, surveys to collect the same data for the same inspection efforts in different regions of the state. They initially had to manually enter the data collected in the field.

IDWR's IT Services Bureau quickly recognized an opportunity for standardization and added functionality. The IT Services Bureau is made up of GIS Analysts and Programmers, Application Programmers, DBAs, as well as Network and Server Support personnel. The GIS staff, which supports use of Esri products including Survey123, worked with field staff to create standardized surveys – with maps, branching logic based on initial questions within the survey, drop down menus, multiple choice selections, and the option to look up and compare a current field observation against data currently stored within IDWR applications.

To consume the collected data and store it directly into the associated tables and databases, IT Services was initially planning to develop Microsoft SQL Server Integration Services (SSIS) processes. It was soon realized that the applications, as they are written, perform calculations on the data as the data is entered. A new approach had to be identified without duplicating the calculations included in the applications or rewrite the applications with accessible services.

IT Services investigated robotic process automation tools which could be programmed to mimic a human reading a CSV file and enter the CSV data into the selected application. After evaluating several RPA tools, UIPath was selected for its ease of use, online tutorials, and overall functionality. Using an RPA solution reinforced the importance of standardized surveys, based on the data being collected, to insure seamless data entry from the survey into IDWR's internal applications using the selected RPA tool. The GIS Section, working with the business units, has been tasked with developing standard surveys to be used within the department.

With the selection of Survey123 for the data collection and UIPath for the RPA tool, IDWR's Mobile Data Collection and Robotic Process Automation solution was set.

Although the implementation of the Mobile Data Collection and Robotic Process Automation solution for processing groundwater use data is an added improvement to a workflow that has been used at IDWR for years, its demonstrated success has set the stage for other field data collection efforts within the agency to use the same technology going forward.

The initial investment to start this project was extremely low. Survey123 is included for free in most Esri license agreements. To evaluate the solution, IDWR utilized a free community edition of UIPath, the RPA software used. Additionally, existing IDWR or personal cell phones along with existing IDWR tablets were used for the mobile data collection. No additional hardware was required. The initial survey development and standardization along with the selection of RPA software and programming took about 2 months of staff time.

IDWR is responsible for the oversight of its internal data collection. The success of the project was measured by the number of traditional pen-and-paper field inspections replaced by surveys along with the time saved, and the accuracy and consistency of data entry achieved by using RPA instead of manual data entry.

Access to specific surveys is restricted to authorized groups of IDWR employees using their individually assigned Esri ArcGIS Online credentials, reducing security concerns in its implementation. Esri is FedRAMP compliant.

To evaluate the effectiveness of the solution, IDWR utilized a prototype project management approach, with an iterative process to fine tune the Survey123 surveys and the UIPath workflow to collect and enter the field-data associated with groundwater use.

IDWR has promoted the Mobile Data Collection and Robotic Process Automation solution to internal employees by demonstrating its capabilities in "Brown Bag" lunch sessions, to All Employee Staff meetings, and to external watermasters through individual water district meetings. In addition, "Survey123 Workshops" are conducted on a semi-annual basis. During these workshops, four or five Survey123 users are given an opportunity to share their successes and new knowledge gained and innovative improvements they have discovered, to an informal user group of like-minded users. All IDWR employees are invited to attend, along with Esri employees. This allows the Esri employees to observe, firsthand, how their tool is being used, provide updates on new features, and receive feedback from IDWR employees on potential enhancements to their product for future releases.

SIGNIFICANCE

The initial scope of the Mobile Data Collection and Robotic Process Automation project was to identify a solution IDWR could implement to assist in the collection and subsequent data entry of measurements collected in the field for groundwater used for irrigation and other uses. The tools identified as the solution included Esri's Survey123, for in-field mobile data collection, and UIPath's Robotic Process Automation (RPA) application, for automated data entry. While the solution has already benefited several areas of IDWR, it has the potential to benefit field staff of all IDWR business units by reducing the time required to complete data collection during inspections, eliminating manual data entry, and ensuring consistency and accuracy of the data collected and entered. In addition, it benefits the consumers of this data, both internal IDWR employees and external customers, by providing a timelier turnaround time between when measurements are taken and when the data is available for review and analysis. It also benefits the taxpayer by providing a more efficient process to collect better, more complete data in a shorter amount of time, freeing up employees to perform higher value work.

Although a total rewrite of existing applications with a service-oriented architecture is the ideal solution, because of time and development resource constraints, IDWR searched for a "faster to market" option to enhance field staff efficiencies and experiences for in-field data collection and subsequent data entry into existing applications. Survey123 and UIPath were selected and have proven to be an innovative solution which required no modifications to existing applications and afforded IDWR the ability to increase efficiency of in-field data collection and data entry in a short amount of time.

The widespread acceptance of the Mobile Data Collection and Robotic Process Automation solution among IDWR employees and the time savings gained from its use is evidence of its successful implementation. The grassroots adoption of Survey123 coupled with subsequent standardization of data collection surveys by IT Services and the implementation of UIPath for data entry into existing applications has proven to be very popular with IDWR's business units. It has increased job satisfaction and efficiency of the field staff who have used it.

The implementation of the Mobile Data Collection and Robotic Process Automation solution directly supports several goals and objectives of IDWR as listed in IDWR's 2019-2022 Strategic Plan. Specifically, Water Rights' Goal 2: Objective 3, "Develop GIS-based method to partially automate and expedite water use compliance investigations across water districts or specific discrete areas of the state" and Management Support's Goal 4: Objective 8, "Promote and increase the use of Survey 123, other field tools, and Robot Process Automation tools or application resident functions to collect data and incorporate into existing systems."

In addition, its implementation also supports two strategic goals of the Governor's Office of IT Services to "Improve delivery and accessibility of government services and information" and "Seek improvement in all aspects of information technologies and services."

IMPACT

IDWR began using Survey123 in 2017 for a variety of data collections in the field that, up to that point, were done with pen and paper followed by manual entry into IDWR's applications. Since then, the use of Survey123 and UIPath Robotic Process Automation tool, IDWR's Mobile Data Collection and Robotic Process Automation solution, has increased significantly. In 2018 alone, IDWR field staff have completed over 8,000 surveys. Using the solution has saved IDWR time and money while delivering higher quality data in a shorter period of time, benefiting internal users, the citizens of Idaho, and other stakeholders that access this data through our publicly available systems.

More importantly, Survey123 and its success described in this submission, has changed IDWR's internal environment from "how can we implement mobile data collection in the future" to "where else can we use surveys to make things better?" IDWR went from being apprehensive about making a change from pen and paper to digital, to embracing it and looking for new opportunities.

Because the cost to implement Survey123 was so low – Survey123 is free and most IDWR employees already own a mobile phone or have access to an IDWR tablet – the return on investment was, and continues to be, huge. In addition to

obtaining more accurate, consistent, and complete data, the benefits include a significant reduction in the time spent collecting and entering it. As just one example, for the annual groundwater measurement process, a field crew of five was able to collect all necessary data in two and a half days, rather than the four days it took in previous years before using the Survey123 – a savings not only in time, but also in hotel and per diem costs. Add to this the fact that it only takes about five seconds to automatically enter each record into IDWR’s water measurement information system using RPA rather than more than a minute to manually enter it (along with potential typing errors), and it is easy to see how Survey123 has been a useful tool with a significant return on a minimal investment.

To put the time savings into perspective, for last year’s groundwater measurement *error free* data entry, alone (actual data collection time not considered), IDWR was able to reduce, conservatively, approximately 130 hours (8,000 minutes, 16+ man days) by an order of magnitude to approximately 11 hours (660 minutes, 1.25 man days).

This solution is benefitting both the department and the constituents that IDWR serves. Based on the successful implementation of this solution, IDWR will continue to expand its use to additional in-field data collection processes.

For its implementation of the Mobile Data Collection and Robotic Process Automation solution, IDWR was awarded a 2019 Special Achievement in GIS Award by Esri. In 2018, 187 SAGs were awarded, worldwide. Eighty-seven SAGs were awarded to foreign countries with 100 awarded to U.S.-based organizations. In its official notification to IDWR, Esri stated, “This award is given to user sites around the world to recognize outstanding work with GIS technology. Your organization stood out from more than 100,000 others.” Coupling the use of Survey123 with UIPath proved to be an innovative use of technology to increase the efficiency of collecting and entering critical data to benefit all the citizens of Idaho and enabling IDWR to more effectively manage Idaho’s water resources.