

GIS Project ROI and Benefits Report

2016 Template

Project Name: Statewide 3-D Stereo Model Acquisition

Department or Division: Utah Geological Survey

Project Manager/Sponsor: Kent Brown, Sr. GIS Analyst and Grant Willis, Program Manager, Mapping Program, UGS

Project Completion Date: 09/15/2012

Executive Summary: (Concisely state the problem and its impact on the organization then describe the solution and its impact on the organization)

Photogrammetric stereo models are used for geologic mapping in Utah. Bottlenecks arise where the time required for each project to setup the stereo models is lengthy and expensive, and limits access to the photogrammetry system. This solution is to have a ready-to-use statewide collection of 3-D stereo models, thereby eliminating the necessity for model setups for each project separately. A GIS database is integral to organizing and managing this collection.

Describe current workflow or limitation: (Be as detailed as needed)

3-D stereo model setups require that all aerial photos for a mapping project area, generally a 7.5' quadrangle, are scanned at high-resolution and then three photogrammetric software orientations are performed on them to eliminate errors and apply real-world geometry. Traditionally this process is time consuming and therefore expensive. For one mapping project this equates to about 40 hrs. of labor to complete. In addition, there are significant costs for purchase of aerial photography for each project—ranging from \$1200 to \$8000 depending on photo scale and scope of mapping area.

Describe proposed enhancement: (Be as detailed as needed)

In 2012, the UGS purchased 1:40,000-scale statewide stereo aerial photography of Utah from the 2009 NAIP program contractor (Surdex Corp.) for \$14,000 total, which included 3-dimensional aerial triangulation ground control data files for each stereo pair of photos. Nearly 13,000 stereo pairs cover Utah, and from each pair, a controlled 3-D stereo model was created using the photogrammetry software that the UGS has been using for geologic mapping since early 2001. After the initial creation of a GIS database to organize and index the 3-D stereo models, geologists can now use the photogrammetry workstation to view any part of Utah in 3-D stereo vision, and digitally create geologic map GIS databases for any part of the state without any time-consuming delays that were required prior to having this system in place. There are also very significant annual cost savings in being able to print our own aerial photos for field use—using Data Driven Pages in ArcGIS and an image mosaic dataset—instead of purchasing them from other sources, and even more significant is the estimated 25-40% reduction in field work a geologist needs to complete his mapping project. As an example: for the recent geologic mapping of the west half of the Loa 30'x60' quadrangle, field mapper Bob Biek estimates this new system has saved the UGS about \$4000 in aerial photo print costs and about five field trips per year, or 45 days of field work over the three-year project. So, with wages, lodging, vehicle, per diem, and photo print costs, this adds up to about \$29,925 savings to the UGS for this one mapping project. The true savings to the UGS is difficult to quantify using this simple spreadsheet.

Current Workflow Costs: (Enter values for hours, wage - see note below, and occurrence. Dollar values are calculated, no need to enter these values)

Hours to complete current workflow	120.0	Current workflow cost	\$21,121.00
Hourly wage rate*	33.30	Current annual cost	\$253,452.00
Annual occurrence of workflow	12		
Other workflow costs (consumables/travel exp., etc.)	\$17,125.00		

Enhanced Workflow Costs

Hours to complete workflow after enhancement	80.0	Enhanced workflow cost	\$14,050.00
Hourly wage rate*	35.00	Enhanced annual cost	\$168,600.00
Annual occurrence of workflow	12		
Other workflow costs (consumables/travel exp., etc.)	\$11,250.00		

Enhancement Production Costs and Savings

Hours to complete enhancement	150.0	Enhancement cost	\$18,500.00
Hourly wage rate*	30.00	Initial Annual Savings	\$66,352
Annual maintenance costs of enhancement, if any	\$0.00	Future Annual Savings	\$84,852
One-time enhancement costs	\$14,000.00		

Projected ROI

ROI=Savings minus Enhancement Cost divided by Enhancement Cost plus Enhanced Annual Cost	Initial Year ROI	26%
	Future Annual ROI	45%

Tangible Benefits to the Organization: (i.e., quality or quantity improvements, effects to throughput, cost avoidance, better decisions, etc.)

Benefit 1: A ready-to-use statewide collection of 3-D stereo models for use by geologists in mapping the geology of Utah, plus significantly lower travel and material costs annually per geologic mapper. This also means faster completion times for mapping projects.

Benefit 2: A detailed GIS data schema was developed for geologic data collection, GIS geodatabase creation, and geologic map symbolization, thus producing internal data standardization and efficiency.

Benefit 3: This enhanced workflow provides the tools for consistency in our digital geologic mapping of Utah and delivers a higher level of geographic precision that can contribute to better decision making; leading to fewer delays and higher throughput of the division's key information products.

Tangible Benefits to Others Outside the Organization: (i.e., other divisions, state agencies, stakeholders, public, etc.)

Benefit 1: The UGS license agreement with Surdex Corp. allows us to freely share our 3-D stereo model imagery and control data with any state, county, or local government agency, and any public or private university for research. The UGS has shared this statewide 3-D stereo model resource with Brigham Young University, Southern Utah University, and Utah State University. These universities will experience significant savings to their program expenses by having ready-to-use statewide 3-D stereo models for their student projects.

Benefit 2: This solution helps the UGS produce GIS databases of geologic maps with a higher level of accuracy and detail for our customers.

Benefit 3:

Meaningful Measures of Success: (Describe how can/will the project be measured - what is needed to implement regular measurement?)

Each year we will verify with our geologic mapping team members if our initial workflow and cost avoidance estimates remain accurate.

Measurement Observations: (Interval varies depending on project, typical may be 3-6 months, 1 yr., 2 yrs., and 3 yrs. after completion date. The purpose of these observations is to record measurements, validate ROI projections, and adjust workflows as necessary for continued improvement)

Date: January 27, 2015 Since the almost \$85,000 annual savings in this calculation exceed the \$14,000 total purchase price of statewide 3-D stereo photography, we feel that this was an obvious wise investment of state funds and will continue to pay out benefits for years to come. The recent field mapping of the Loa 30'x60' quadrangle and input from project's senior scientist confirmed that these workflow and cost avoidance estimates are appropriate.

Date: March, 2016 Due to the significant drop in oil/gas commodities, UGS is receiving less mineral lease revenue. This situation has put more pressure on our staff to be more cost effective in what they do. Now, more than ever, the cost avoidance benefits of these 3D stereo models and the streamlined workflow they enable are being leveraged. It is expected that more geologists will utilize this enhanced workflow than originally predicted, but for now we are conservatively retaining our original estimates.

Date:

Submitted by: Kent Brown, Sr. GIS Analyst, Utah Geological Survey

Date: January 27, 2015

Project Sponsor/Manager Confirmation by: Grant Willis, Program Manager, Mapping Program, UGS

Date: January 27, 2015

*Generalized wage rates are used for simplicity and consistency: Intern \$15/hr., General Clerical \$20/hr., GIS Analyst \$25/hr., GIS Manager \$30/hr., Division Professional \$35/hr.