Practical Considerations for the Implementation of a World Information Library (WIL) - 17112

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ABSTRACT

The U.S. Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) is a deep geologic repository for the permanent disposal of defense-generated transuranic waste. Title 40 Code of Federal Regulations (CFR) Part 194.43, Passive institutional controls, requires that measures be employed, "…to preserve knowledge about the location, design, and contents of the [WIPP] disposal system." These measures include the, "Placement of records in the archives and land record systems of local, State, and Federal governments, as well as international archives, that would likely be consulted by individuals in search of unexploited resources." One possibility for allowing individuals to quickly and easily access information on the location, design, and contents of a disposal system and its relation to unexploited resources is the development of an electronic geographic information system (GIS) that would be used to interpret spatial data. In 2016, R. Patterson proposed such a system, known as the "World Information Library (WIL)." Information in this database system would be designed to be publicly accessible through a simple web-based user interface that would focus on spatial databases with categories such as; waste repositories, resources, historical sites, wildlife, infrastructure, medicine, agriculture, and technology. The conceptual WIL would be a compilation of searchable libraries and databases.

A category in the WIL would consist of spatial databases created for the purpose of preserving knowledge and providing a means of communicating location information in a GIS-based Land Use Information System (LUIS) user interface. The successful implementation of the WIL would require the robust use of project controls, an effective Quality Assurance program, and the development of international standards in collaboration with industry experts. The purpose of this paper is to identify and discuss known practices and industry standards that could be utilized for the implementation of a WIL as was introduced by Patterson et al. in

"A Conceptual World Information Library (WIL) and Land Use Information System (LUIS)." [1]

INTRODUCTION

The U.S. Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) is a deep geologic repository for the permanent disposal of defense-generated transuranic waste. Title 40 Code of Federal Regulations (CFR) Part 194.43, Passive institutional controls, require that measures be employed, "…to preserve knowledge about the location, design, and contents of the [WIPP] disposal system." These measures include the, "Placement of records in the archives and land record systems of local, State, and Federal governments, as well as international archives, that would likely be consulted by individuals in search of unexploited resources." One possibility for allowing individuals to quickly and easily access information on the location, design, and contents of a disposal system and its relation to unexploited resources is the development of an electronic geographic information system (GIS) that would be used to interpret spatial data. In 2016, R. Patterson proposed such a system, known as the "World Information Library (WIL)." Information in this database system would be designed to be publicly accessible through a simple web-based user interface that would focus on spatial databases with categories such as; waste repositories, resources, historical sites, wildlife, infrastructure, medicine, agriculture, and technology. The conceptual WIL would be a compilation of searchable libraries and databases. Depending on its content, a category in the WIL would consist of spatial databases created for the purpose of preserving knowledge and providing a means of communicating location information in a GIS-based Land Use Information System (LUIS) user interface. The successful implementation of the WIL would require the robust use of project controls, an effective Quality Assurance program, and the development of international standards in collaboration with industry experts. The purpose of this paper is to identify and discuss known practices and industry standards that can be used towards the implementation of a WIL as was introduced by Patterson et al. in "A Conceptual World Information Library (WIL) and Land Use Information System (LUIS)." [1]

PROJECT CONTROLS AND INFRASTRUCTURE

The goal of the WIL is to provide a means, through technology, to maintain and integrate spatial databases to be used as a resource to communicate with the future. For this concept to function effectively there is a need to develop sufficient infrastructure to support the WIL. The infrastructure would be composed of both physical (buildingings/facilities/hardware) and digital (software/data) design and is likely to change depending on the breadth of information that is to be maintained and the level of security required to protect that information. For example, low-risk

small-scale projects benefit from utilizing prepackaged software and hardware in combination with cloud-based services. Prepackaged software/hardware services reduce the time and costs needed for application development and allow project teams to dedicate more time to execution and operation phases like inputting information into spatial databases and implementing continuous improvement activities. A large-scale international project that involves multiple categories and high risk would benefit most from customized software, localized servers, and multiple physical facilities. Customized software and project controls require a process framework of application development and management. In the xxx, Sound Guidance for Application Management and Application Development, Meijer et al. [2] compares two types of process framework, ASL®[1] and ITIL®[2]. Both frameworks use similar lifecycle stages as depicted in Figure 1 below.

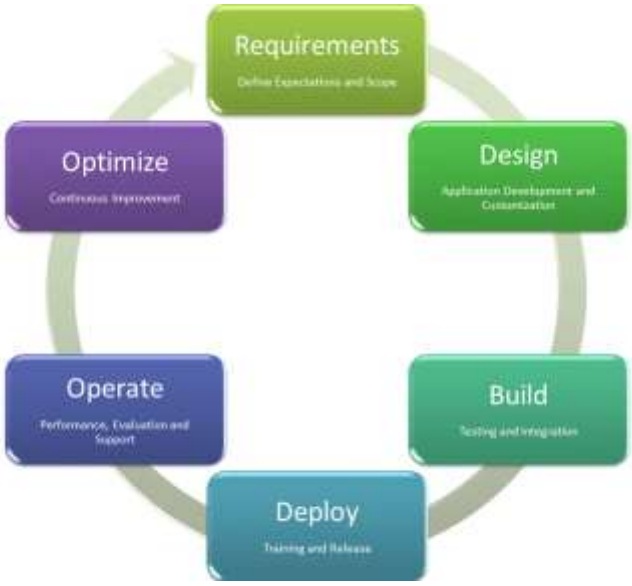

Figure 1. Lifecycle Stages

The lifecycle stages shown above are designed to provide an increase in the quality and productivity of an information technology (IT) department inside an organization or project. Not surprisingly, they also closely mimic other well-known process improvement methodologies such as Six Sigma®[3] and Plan-Do-Check-Act. From an IT and project management perspective, the implementation of a WIL would benefit greatly from using a combination of industry-proven process frameworks and methodologies.

[1] ASL is a registered trademark of ASL BiSL Foundation.
[2] ITIL is a registered trademark of AXELOS Limited.
[3] Six Sigma is a registered trademark of Motorola Inc.

QUALITY ASSURANCE

Every organization and/or project that has a continuous improvement goal should establish a quality assurance (QA) program. A QA program is designed to eliminate or reduce the number of mistakes made or defects produced when developing a product. A large international project, such as the implementation of a WIL, would benefit from an integrated QA program. There are numerous ways in which to implement quality assurance practices, however, because the WIL would need to be funded by multiple countries, a program built from international standards would be the best choice.

The International Organization for Standardization (ISO) is an organization that utilizes world experts to develop international standards for many purposes. The ISO 9000 standards focus on requirements and tools related to Quality Management. The ISO standards for quality management are based on the following seven quality management principles; customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making, and relationship management[3]. While each of these seven principles are equally important, several techniques in particular that could be used in the development and management of a WIL are process approach, improvement, and evidence-based decision making. These techniques could be utilized to develop a flowchart for the data acquisition process.

A WIL would have the potential to receive data from many sources and while most of those sources would likely be from reputable parties, there will always be a possibility that data could be received from a non-reputable source. To screen out that possibility and ensure that a quality assurance approach is taken, a data acquisition flowchart can be developed, maintained, and utilized as shown in Figure 2 below.

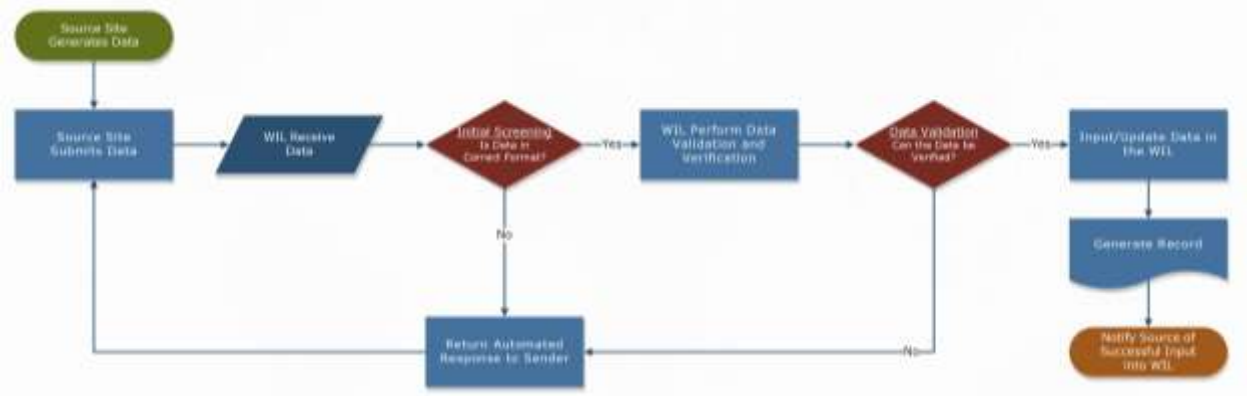

Figure 2. Data Acquisition and Input Flowchart

INDUSTRY PRACTICES

It is important to consider current industry practices when faced with the challenge of developing an international program that will utilize GIS and Information Libraries with the capability of outputting data to a Land Use Information System. The Infrastructure for Spatial Information in Europe (INSPIRE) is a directive within the European Union that was initiated in 2007 as a way for the European public sector to share environmental spatial data. In preparation for INSPIRE, numerous fact-findings and public consultations were conducted in which five obstacles were identified. Those obstacles are summarized below:

1. Spatial data is often missing or incomplete
2. Metadata is often incomplete
3. Data is not in similar projections
4. Spatial data files are often isolated and not compatible with each other
5. Various barriers (cultural, institutional, financial and legal) exist that make it difficult to share and re-use current spatial data.[4]

In response, INSPIRE developed Implementing Rules that require spatial data infrastructure compatibility and usability associated with metadata, data specifications, network services, data and service sharing, spatial data services, and monitoring and reporting. Since a WIL will use spatial data in a similar fashion, the project can and should use the expert decisions and lessons learned determined from the implementation of INSPIRE.

CONCLUSION

A large-scale project such as developing and maintaining a World Information Library will require the use of project controls, a quality assurance program, and international standards to support industry practices. The infrastructure will most likely include several physical locations in supporting countries. The custom designed software will benefit most from being developed and maintained using a process framework with lifecycle stages such as ASL® and/or ITIL® in combination with other well-known process improvement methodologies like Plan-Do-Check-Act. The ISO provides international standards for quality management that can be incorporated into a quality assurance program that has the option to be certified by the ISO platform. When looking into industry practices, consider the INSPIRE directive which is the culmination of GIS spatial databases used by member countries of the European Union to share environmental information. INSPIRE and other similar projects have performed fact-findings, developed guidelines, and generated lessons learned. The practices that have been discussed form the building blocks for the successful implementation of a World Information Library.

REFERENCES

1. R.L. Patterson, M.M. Toothman, J.W. Callicoat, and T. Klein, "A Conceptual World Information Library (WIL) and Land Use Information System (LUIS)," WM2016 Conference, Phoenix, Arizona, March 6-10, 2016 (2016).
2. M. Meijer, M. Smalley, and S. Taylor, "ITIL® 2011 and ASL® 2, Sound Guidance for Application Management and Application Development," AXELOS Global Best Practice, ASL BISL Foundation (2016).
3. International Organization for Standardization (ISO), *Quality Management Principles*, Geneva, Switzerland (2015).
4. INSPIRE