Case Study

Service Oriented Architecture at the DOI's National Park Service
Why EA involvement is critical for successful SOA rollout

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Abstract

As Enterprise Architects we pride ourselves in our ability to see the big picture and provide valuable top-down guidance. Sometimes, however, EA practitioners need to be in the trenches, championing an effort that will ultimately change the tide of an organization to embrace a new paradigm. Service orientation is just such a paradigm, and by its nature involves many levels of the organization, thus making effective change management SOA's Achilles' heel. This case study documents the efforts of the National Park Service EA team as it sowed the seeds for and ultimately rallied the organization around SOA and sound EA principles.

Background

The Department of the Interior is an agency with eight bureaus that performs a vast array of functions, in fact more than any other civilian government agency. Of the 39 Federal Enterprise Architecture (FEA) Business Reference Model (BRM) line of business functions, DOI performs 33. The National Park Service is the largest bureau within the DOI and performs many of those, with a large number of services to citizens. The following graph identifies the Services to Citizens that National Park Service performs along with the number of systems supporting those efforts.

Systems Supporting NPS Services to Citizens

All Others 40%

Natural Resources 60%
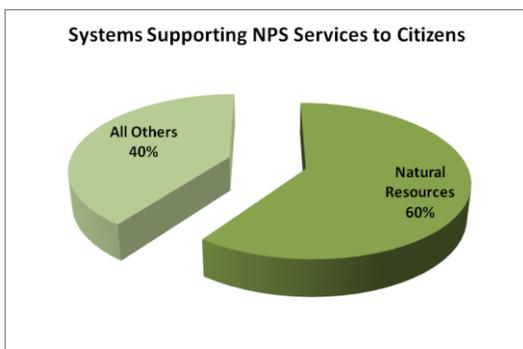
In addition it is geographically diverse and has a reputation for being highly decentralized. The 388 parks and sites have their core missions, of which Natural Resource management is now primary, but also report to a regional structure and the central Washington office. They interact with state and local governments and other geographically dispersed entities such as the natural resource inventory and monitoring "Networks", Research Learning Centers, universities, advocacy groups, the public, and other bureaus, such as US Geological Survey (USGS) for research support. The Parks must deal with the coordination and interaction with these various stakeholders, managing their day-to-day operations, and provide timely and accurate reporting for compliance, budgeting, and achievement status purposes. Accomplishing all these tasks is becoming more difficult due to an eroding budget baseline.

The classic problem

Like many federal agencies, NPS coordinates many data and information gathering activities and faces common challenges around data capture, storage, dissemination, sharing, awareness, synthesis, and use for scientific, operational, and strategic purposes. For example, the natural resource inventory and monitoring activities involve coordinating with researchers to devise protocols and approaches based on new or existing research and data, rely on field personnel to gather the information, natural resource experts to synthesize data, and managers to use this information for planning, possibly mitigation activities, and sharing with maintenance crews, scientists, the public, and oversight entities to name a few. The information being collected and managed is voluminous, distributed, and relatively complex.

The classic complaints persisted:

"I don't know what information is out there"

"The systems are too hard to use"

"When employees retire, the information goes with them, since no one knows what was on their machines"

"The information is not in a format or synthesized for me to use for my purposes"

"We don't have the time or resources to enter all this data in a system for others to use"

… As well as many others that seasoned Enterprise Architects have heard before.

Build it and they won't come

The natural resource management organization within the Washington office was aware of these issues. They began to implement a primarily technical solution to the obvious data management issues. New systems were developed to house this critical information. Three web-based systems in particular exemplified the issues. One system was created to house bibliographic information such as research papers, grey literature, and other journals and links. Another system was created to house species inventory information which

described which natural species existed within the parks. A third was capable of storing raw data and in particular geospatial information. Each if these systems had their own funding, a system manager who often acted as the analyst managing requirements, a development team which generally consisted of one or two developers, and their own identified user base.

To the seasoned Enterprise Architect reader, even with the minimal amount of information I have provided, the results are painfully easy to predict and scale to more ambitious projects as well. Three new stove-pipes were born. Users did not flock to the systems. Users complained about ease-of use, questionable data quality and value, the time and resource commitments necessary to keep the systems fed with information, the lack of data relationships across systems, and the ever-classic multiple login fatigue - assuming they knew these systems existed at all.

In an organization that lives and breathes on information, stovepipes have more issues that meet the eye. There are all the classic issues around interoperability, maintainability, usability, and flexibility. But a particularly insidious side effect is that information, when compartmentalized and placed in separate systems of record, loses its value because the relationships between the data become weaker or disappear altogether. This was happening here. Users had to be the ones gluing things together again using multiple systems, multiple logins, lots of time, and good old detective work. Understanding everything about one species became a monumental task worthy of Sherlock Holmes: In which park is it located? What bibliographic references are there? How is it geographically dispersed? Who else can help me? What research has been performed? What are the impacts on other species, park management, or even maintenance crews?

SOA to the rescue?

The good news in this story is the dedication of the team that drove the initial modernization described above. They had the best of intentions, talent, drive, and most importantly, executive support. The bad news is that they went down this significant path without true Enterprise Architecture guidance. The predictable came next: a contractor working for the team suggested that Service Oriented Architecture would be *the* solution to their problems. Get their technical team to switch to SOA and everything would be solved. It was after all touted in almost every technical journal and even EA journals and conferences. In fact, a policy was devised instructing all new systems development to adhere to SOA principles. Seasoned architects would likely agree that if this approach was taken at the purely technical level that the results would not be any better. This would have had the unfortunate consequence of SOA being labeled as just another failed technical approach. In reality SOA has great potential for success if approached correctly.

Luckily, the Natural Resources team has been in close collaboration with the NPS Enterprise Architects on another effort – a modernization blueprint for Natural Resource Management using DOI's Methodology for Business Transformation (MBT). At NPS, the EA team views itself primarily as a resource and support function for the mission areas. The team assists business areas wherever EA is beneficial, and in supporting modernization using the MBT. At the time the SOA idea surfaced, the teams were already collaborating on the modernization blueprint.

The timing was not perfect. The modernization blueprint effort was in its early stages – having just completed its first core team workshop and having just initiated stakeholder interviews. The natural resources group had an immediate need to placate users and had funding allocated. It was clear, however, that opportunities would be missed, and more mistakes made if the EA team did not find a way to drive this effort to a successful conclusion in close coordination with the natural resources team. This is the reality of Enterprise Architecture. As much as we as architects tout the ideal scenario, timing is not something we can always control. If the will and funding for an initiative exists, and the EA team is not ahead of the curve, the

architects need to be innovative, flexible, and resourceful.

How EA saved SOA

The NPS EA team knew that education, guidance, and policy alone could not make this effort successful. Without a true leader who understood architecture, analysis, organizational structure, the systems development lifecycle (SDLC), change management, and had true leadership skills, the effort would fail. The EA team helped devise the selection criteria, search for, and identify the new team leader who would transition the Natural Resources world into SOA and collaborate closely with the EA team.

In addition, the EA team knew that an SOA approach would only thrive if the underlying organization infrastructure and skill sets could support it. While still searching for the ideal team lead, the EA team interviewed managers, system managers, and the entire development and operations team for the existing systems. This was real in-the-trenches work that required a broad understanding of organizational and technical principles. What did we uncover? We found organizational, budgetary, and technical stovepipes. A technical team that was actively told not to collaborate, which was viewed as one effort funding another, and a broad range of skills and maturity levels. There was no SDLC process or use of the tenets which could make-or-break SOA, such as revision control, effective collaboration, and most importantly an enterprise vision and approach to driving requirements. Our new team lead would have his hands full on many levels, not the least of which was change management.

The new team lead was quickly brought into the fold of the modernization blueprint, and was involved in stakeholder interviews and analysis in order to help drive the critical SOA decisions such as the identification of services and their requirements. Quickly-devised workshops were created at a key conference on information management for natural resources in order to solicit requirements using prototype services and applications in rooms quickly filled with machines running web browsers. As mentioned before, the timing was not perfect, so improvisation and flexibility were paramount.

While continuing to move the ball forward, our new SOA team lead and the EA team knew that the change management aspects would be the primary challenge. The implementation teams had to be fundamentally changed to be groups of shared resources, despite system managers' previous objections. A real SDLC had to be implemented and enforced, and the results needed to meet stakeholder needs and support the enterprise. With executive support, a strong new team leader, and EA involvement, organizational changes were made and the transformation is considered a success.

Another decision that was critical to success was to focus on the basics. The SOA technical landscape is filled with interesting and complex solutions, such as sophisticated service discovery, service "orchestration" where fine-grained services call each other to complete a task following a specific workflow, standardized articulation of security and governance in the services themselves to name a few. These powerful abilities must be weighed carefully with the business needs. First and foremost, the organization must correctly address the questions of which services are necessary, and what they do to support the real business. Sophisticated service discovery and a UDDI repository, for example, are not necessary until there is a critical mass of services to manage.

What are the tangible results?

The boundaries came down. Services were created that took into account how the users did their jobs. The MBT business process analysis came to bear. And most importantly, users had information connected and related in a way that helped their day-to-day activities. Real services were born, and new portals were created to bring it all together. The applications provided a holistic view of the information provided by the services and it aligned well with the needs of the everyday users. Initial feedback from user focus groups was very positive. The user community was

reinvigorated, and much trust has been restored. The challenge now is to continue the effective use of service orientation and apply the lessons learned to the entire department. The effort was started with the specific intention of helping shape the departmental SOA strategy, and was initiated with input from DOI's EA office.

Do these lessons apply elsewhere?

This SOA rollout effort was not enterprise wide. It was a pilot effort to gather valuable lessons learned for department-wide SOA adoption, and in particular integration with the bureau and department EA programs. It is, however, addressing immediate needs and highly representative of the challenges facing most organizations that struggle with information management. The initial landscape contained a plethora of organically grown stove-piped systems that did not meet the real business process needs, an immature SDLC, unfortunate organizational structures and governance, narrowly focused requirements, unhappy users, and lots of data that had yet to reach its full potential.

It is clear to the bureau and department enterprise architects that the implemented approach to solving these issues is also highly representative of most federal agencies. Some of the keys to success are performing adequate and broad business analysis, deep involvement of the EA team, executive buy-in to implement organizational change, maturation of the full software development lifecycle and the participants' skills, and tackling the basics before venturing into the more complex technical approaches to SOA.

About the Author

Mr. Charuhas is a Partner at Phase One Consulting Group and Senior Enterprise Architect. Mr. Charuhas has supported several agency Enterprise Architecture initiatives and is currently supporting the DOI's National Park Service with their EA program maturation and business modernization efforts. Mr. Charuhas holds a masters degree in Computer Science from Harvard University and has taken a keen interest in bridging the gap between enterprise and solutions architectures while leveraging SOA. Mr. Charuhas can be reached at tcharuhas@phaseonecg.com.