Why Conceptual Architecture is Critical for Future-Proofing Interoperability

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Abstract

The work of the M490 team in Europe and the SGAC has been at a level that many people struggle with. The common question is "how does this help me deploy a meter?"

Architecture is not about deploying a meter, but creating the right environment to deploy it into. Many utilities in the 1990 and early 2000s chose to deploy drive by metering - since that would reduce their meter reader counts and give them a reduction in O&M. The ones that deployed 2 way systems may be working to upgrade those systems, but they are having an easier time. One of the key differences was the architectural thinking and the involvement of the whole business in the original project definition.

Looking back what did we learn about future proofing the systems via architecture? What did we learn about what is key about interoperability? How did the two interact?. What does this tell us about the need when it comes to DA/SA/DSM/RI and other programs that are on the way for grid modernization?

1. BACKGROUND

In the mid-1980's it became possible to do remote meter reading, power line carrier, one way radio and short range drive by metering all came to the market. Many utilities looked at the products and made decisions to start down the path to installation of one of these technologies.

Of the three, drive by metering was the lowest cost and the easiest to implement, on a pure meter reading efficiency basis the business case heavy favored drive by metering, yet some companies still installed power line carrier or one way radio based systems.

By the mid-1990s drive by metering was the choice for most companies, and almost every company was talking about installing drive by metering, yet against this trend some utilities continued to install power line carrier and one way radio. In this time period the first of the two way radio systems began to come to market.

By 2001 the discussion began to focus not on the prior technologies, now labeled as a group as "AMR – automated meter reading" but on "AMI – automated meter infrastructure". The start of this globally was surprisingly the installation of a power line carrier system by ENEL in Italy. Vendors began to push hard on two way radio based metering that forms the basis of most AMI.

Surprisingly the companies that had pioneered drive by metering are now struggling to make the move to AMI. The ones who spent more money on power line carrier and one way radio systems

actually have proven to have an easier path to replacing their systems with AMI systems.

2. BUSINESS AND ARCHITECTURE

The companies that undertook the more expensive AMR installations typically did not focus on the pure meter reading aspect, instead they focused on a broader set of business requirements.

They typically included operations use cases; customer services use cases; and other use cases that supported other aspects of their business.

That wider view of the use of AMR ended up with tools that did vegetation management, non-technical losses, asset loading, demand levels, load factors and other tools that assisted the business overall to be more efficient and provide better services to the end customer.

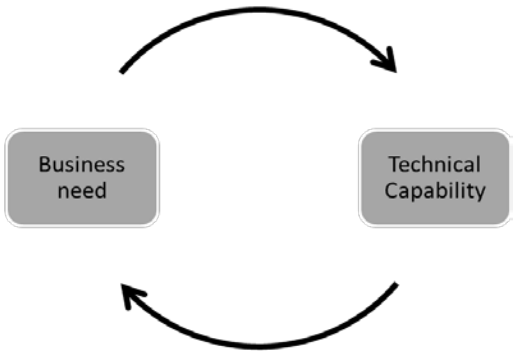
This difference qualified the value of the higher implementation investment.

One would think that since so much more of the value was captured by the initial installation that the idea of replacing the assets installed early would actually be harder than for those utilities that had not captured those values yet.

The interesting answer was that, no this was not true, the companies that had done the deepest integration of AMR into their organization, actually had the easier path to AMI than the ones who had used AMR to purely replace meter reading.

In reviewing the ways various utilities dealt with this issue, the reasons became clear and patterns began to form on the differences between those utilities that did pure meter reading replacement and those that did deeper integration. That pattern showed a better understanding of the value of the data and how it could impact the organizational processes. That understanding was informed in every case by a conceptual business architecture that broke the business down into services and looked at how to support those business services with data and tools. In the pure meter reading cases, the implementation was simple enough that no architecture was required and the system purely replaced the actual data entry in the organization, no other business changes were required.

The architecture was the key difference, it looked at the cost and value of each business service, the quality of the service delivered and how the equation between quality of service, cost and benefits could be improved. This also in some cases lead to the creation of new business services that could be supported by the information and technology deployed. The model for this process is shown in the simple illustration below:



Because of the implementation of this cycle, companies that chose to move forward with deeper integration of AMR, ended up with an architecture that was familiar with and accepting of higher capability equipment being deployed.

The process of taking advantage of new capabilities of new hardware in the field was built into the way the organization thought about new technology. In contrast many utilities that chose the meter reading only replacement had not gone through this transition and had not come to accept that there was more that could change and more value driven from the implementation of AMI.

These statements do not hold for every utility, in some cases, the organization came to the understanding that integration of new technology

offered new business functionality beyond what they needed and that the increasing technical capability would drive additional business value from projects that were unrelated to their AMR implementation.

In general the better the conceptual architecture and more developed the understanding of what the business services were, the easier it was to integrate new technical capability into the company. In general those companies that have come to business services with a library of use cases or conceptual business services, have been quicker to adopt new capabilities than companies that have not done this step.

3. THE NIST CONCEPTUAL ARCHITECTURE

In order to jump start the idea of a conceptual business services, in 2010, NIST approved a project by the Smart Grid Architecture Committee to look at what the overall conceptual architecture for grid modernization might look like. More than 700 use cases were reviewed as part of this effort, more than 100 people participated in this effort resulting in approximately 7,000 low level business requirements and 200 business services. The team continued beyond the NIST charter and went back and filled in the existing industry business services to provide a complete business services model for the industry.

This set of business services is now in use in 11 countries and more than 70 utilities around the globe. More than 100 companies that are designing software and hardware for grid modernization are taking advantage of these business services.

4. M490

At the same time that NIST chartered the SGAC effort, the European Union chartered the M490 project. The M490 team like NIST created a framework, and then started down the path of developing business services. The M490 team has now agreed to use as input the work done by the SGAC, that does not mean they will end up with the same catalog of conceptual services, or even end up with a similar catalog, but it does mean that their deliverables will at least be informed by the work that the SGAC did.

5. WHY CARE?

These two architectures offer a massive jump start to an architecture project. Because the SGAC conceptual architecture is built around the 7 NIST domains the NIST Conceptual Framework, it is possible to discuss between 20 and 50 business services with a senior executive that owns a domain and agree on what their list of services is and which ones they want to focus change on. The services also have the ability to be linked based on a set of very simple diagrams to each other to form very high level business processes, again jump starting discussions on the business side about how to improve the business and where the data comes from and where it goes.

Typically getting to this point with a green field architecture can take months and offer very little to keep people interested in the prospect and project during that time. It takes a strong leader to keep the project running. With the jump start from the M490 or the NIST work, it is possible to get to useful business discussions in days, not months.

Use of architecture can help unlock the value of the grid modernization effort and make the business case work, while also allowing the company to quickly determine what is and what is not important from a change standpoint. It also once setup allows a company to run the path from new equipment capability to business value and from business need to equipment specification change. This clear set of paths makes justification to regulators and customers much easier to do and much more believable.

Biography

Doug Houseman is a 30 year veteran of the utility and consulting industries. He is a retired Naval Officer who has worked on 6 continents on issues related to electricity, water, and gas. He is recognized as an industry leader in demand management and smart energy.