A Utility Application Implementation Strategy Using the EPRI IntelliGrid(sm) Methodology and the GWAC Stack as a Model

John J. Simmins	Brian Green	Michael K. Tao
Electric Power Research Institute	Electric Power Research Institute	Boreas Group
942 Corridor Park Blvd.	942 Corridor Park Blvd.	730 South Elizabeth Street
Knoxville, TN 37932	Knoxville, TN 37932	Denver, CO 80209
jsimmins@epri.com	bgreen@epri.com	mtao@boreasgroup.us

Keywords: GridWise Architecture Council (GWAC) Stack, Information Technology, IntelliGrid, Project Management, Smart Grid

Abstract

Most IT projects fail one of the triple constraints of Project Management: Schedule, Cost or Scope. The typical IT project is either late, over budget, or the scope is reduced to fit into the schedule and cost constraints. Many projects fail all three constraints. Sadly, these projects fail for predictable and preventable reasons. The key to managing IT projects is to understand the project products and all the levels of complexity that need to be managed to deliver that these products. But how does an IT project manager ensure that all that needs to be planned has been identified?

This paper will outline a portion of the EPRI IntelliGrid methodology that utilizes Use Cases to define the business objectives of any IT project and the use of the GWAC Stack as a model for a utility IT project. The presentation will describe how to obtain a usable Use Case and how to decompose it into each of the layers of the GWAC Stack to create a project plan. Also described will be the documentation of how each of the critical cross-cutting issues of the GWAC Stack are created and applied to ensure a well scoped, successful project.

1. THE PROBLEM OF SCOPE

The majority of electric utility information technology projects fail to meet the triple constraints of scope, schedule, and budget. Too often, this failure is due to poor project planning and management, which are foreseeable and avoidable. Budget, scope, and deadline are each interdependent in a project's success or failure, but scope provides the best opportunity for preventative planning. Accurate and thorough scoping of the project is essential to success.

Traditional project planning does not include all the elements of a project that need to be addressed in a Smart Grid (or any utility IT) project. Because the technology and business processes of the Smart Grid span groups not only within the utility but often extend outside the utility, the complexities and interrelationships between phases and tasks are not established in the project plan. Also, the cross cutting issues inherent to Smart Grid technology, such as security, are often not identified until the project is underway.

Figure 1 – Triple constraint of project management.

A traditional project plan would progress through one or more phases, such as Evaluate – Design – Build – Test – Launch phases. This traditional "water fall" methodology (where one phase needs to be completed before subsequent phases start), while often sufficient to address generic project needs, does not adequately anticipate the complexities of Smart Grid technology implementation. This linear model only loops back on itself to solve unanticipated issues which become apparent in the subsequent phases. The process groups of initiating, planning, executing, monitoring and controlling, and closing (defined in the Project Management Book of Knowledge (PMBOK)[1]) are repeated in each phase. Often projects, especially those using leading edge technologies, are planned and executed by a progressive elaboration of the plan. This "rolling wave" type of planning is used when discovery and experimentation define subsequent activities.

Smart Grid inspired projects include too many interfaces and interoperability issues to be satisfactorily managed using traditional methods. Project managers often employ the tools and processes found in the PMBOK. But these tools and processes need a methodology that fits within the context of the Smart Grid. The IntelliGrid Methodology for project planning incorporates the powerful requirements gathering tools of IntelliGrid with the structure of the GridWise Architecture Council Stack.

2. USE OF INTELLIGRID AND THE GWAC STACK IN PROJECT PLANNING

2.1. GWAC Stack

When developing a model of a Smart Grid or any utility IT project, one needs to consider all the complexities (both technical and business) involved to be successful. It is insufficient to implement an elegant technology solution without consideration of the impact of that solution on the business or the statutory or regulatory environment in which the utility operates. Cross-cutting issues involving how the solution fits into the existing policies and procedures of the organization must all be taken into account. Fortunately, the GridWise Architecture Council (GWAC)[2] has developed a model, called the GWAC Stack. The GWAC stack, shown in Figure 1, is an eight-layer model that describes the levels of standards and technologies required to support end-to-end interoperability. The GWAC Stack also decomposes the complexity of a Smart Grid implementation in the back office into a manageable model which includes all aspects of the project that need to be managed to be successful.

2.2. IntelliGrid Methodology

EPRI's IntelliGrid methodology [3,4] provides tools and recommendations for standards and technologies when implementing systems such as advanced metering, distribution automation, and demand response. It also provides an independent, unbiased approach for testing technologies and vendor products. The IntelliGrid Methodology was developed by EPRI over a six year period and turned over to the International Electrotechnical Commission (IEC). EPRI has applied this methodology to help a number of utilities with specific roadmaps for Smart Grid development and deployment in addition to working with industry members of the IntelliGrid research program to continually advance the interoperability standards and methods for the industry.

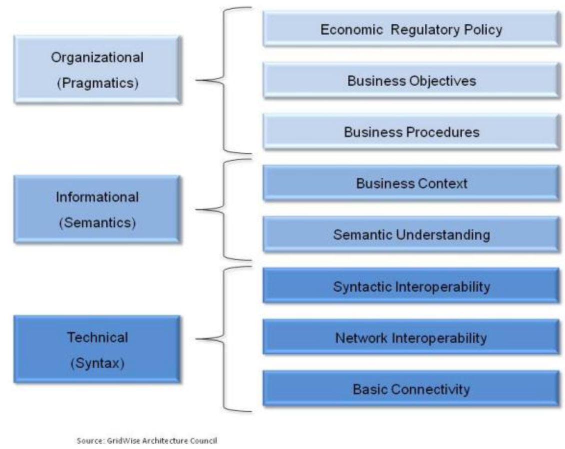

Figure 2: GWAC Stack illustrating the various topics that need to be addressed in a typical Smart Grid project.

While the IntelliGrid methodology was originally conceived to identify requirements for Smart Grid applications and points of interoperability, the business process detail obtained through the careful scripting of Use Cases is finding new uses in security risk identification, System Acceptance Testing (SAT), training, and project planning. The requirements obtained can be used to identify the elements of the Work Breakdown Structure (WBS). The Work Breakdown Structure (WBS) is a deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project goal.[5] As the Use Case is developed, the items that need to be built or purchased are identified. By completed the Use Cases for all the scenarios a project encompasses, a complete set of work items can be identified.

As the work needed to be executed to achieve the project goals takes shape, categorizing the work into the appropriate level of the GWAC Stack can help organize the work and thus ensuring that all the areas that need to be managed are covered and help see the interdependencies between layers.

Figure 3 shows a typical project plan with a project life cycle defined by the sub-phases Evaluate-Design-Build-Test-Launch. At each level of the GWAC stack, an evaluation phase takes place, followed by a design phase, etc. A successful Smart Grid project needs to address all the issues from basic hardware/physical connectivity through addressing the requirements from a regulatory or statutory perspective. The details of the work that needs to be done in the project plan are derived through use of the IntelliGrid methodology. It is important to note that this work must be accomplished regardless of the organization of the project. In other words, a project might just as well be organized with Evaluate-Design-Build-Test-Launch as the major phases with the layers of the GWAC Stack repeated in each phase as a series of sub-phases. How a project is organized is usually a factor of how costs or progress are reported.

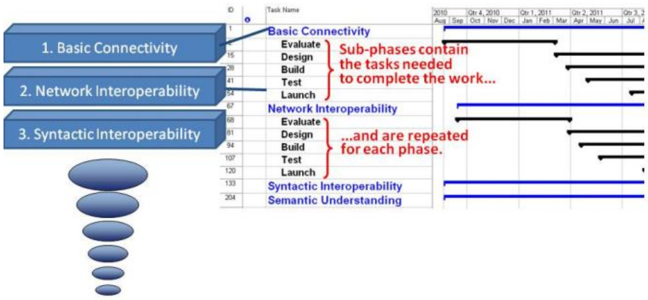

Figure 3: A typical project plan organized around the layers of the GWAC Stack. The detail is obtained by use of the IntelliGrid methodology.

3. CONCLUSION

Utility Smart Grid projects are complex and therefore often fail to meet budget, timeline and scope constraints. The application of traditional planning methodology overlooks the significant interoperability and cross cutting issues of modern Smart Grid technology implementations. The use of insufficient planning strategy is tantamount to a 'failure to plan is planning to fail.' The traditional project approach does not sufficiently identify the intricacies of project scope. This can lead to unused or reduced functionality which does not meet user requirements, much less, cost and time overruns as resources attempt to rectify initial mistakes.

The GWAC Stack is a model for defining a thorough project scope. By considering the eight-tiered stack when structuring project phases, utilities can improve management of IT projects and systematically derive project scope. In conjunction with the IntelliGrid methodology to create use case-derived requirements, the GWAC Stack provides a much-needed Smart Grid-specific project planning method. When thoroughly defined, essential requirements will reduce the number of projects subject to the common failure modes of violating one of the triple constraints of cost, schedule, and scope.

References

[1] *A Guide to the Project Management Body of Knowledge, Fourth Edition*, Project Management Institute, Newtown Square, PA.
[2] http://www.gridwiseac.org/
[3] *Guidelines for Mapping Requirements to Technologies*. EPRI, Palo Alto, CA: 2008. 1016889.
[4] *IntelliGrid Applications Guide: Metering and Consumer Systems*, EPRI, Palo Alto, CA: 2006.1013610
[5] Project Management Institute, *op. cit.*

Biography

John J. Simmins is Senior Project Manager for the Smart Grid Demonstration Projects at the Electric Power Research institute (EPRI). His current responsibilities focus on developing robust system architecture in the demonstration projects and bringing thought leadership in the area of integrating diverse applications such as Advanced Meter Infrastructure, Meter Data Management Systems, Distribution Management Systems, Customer Information Systems, Geospatial Information Systems and Outage Management Systems.

Dr. Simmins brings over 15 years of implementing highly integrated systems which span the latest technology to mature legacy systems. Dr. Simmins spent six years at Southern Maryland Electric Cooperative, first as consultant and then as Applications Manager. Prior to that, he had eight years consulting in project management, application integrations and supply chain automation. He also has six years of experience as a manager of research in the field of magnetic materials for millimeter and microwave communication. Dr. Simmins has over eighty publications on science, technology and project management. He is a member of IEEE, GITA and the Project Management Institute.

Brian Green is a Project Manager at the Electric Power Research Institute (EPRI). He is member of the Smart Grid Demonstration Project Team where he is involved in training member utilities in the IntelliGrid Use Case Process for their Smart Grid demonstration projects. This training includes guiding the project members in the development and refining of their use cases.

Green is also involved in the Green Substation Program which enables member utilities to develop greener, more efficient substations. This program aids utilities in their substation design process and allows them to save energy in their existing substations.

Green joined EPRI in early 2005. During his time at EPRI, he has worked extensively in the Transformer Life Assessment program, Basic Infrared Thermography training programs, 80Plus Computer Power Supply program, and the development of the Living Lab in EPRI's Knoxville office.

Before joining EPRI, Mr. Green spent ten years as a Substation Technician with East Kentucky Power Cooperative and Chugach Electric Association, and three years as a Communications Engineer for a major government contractor.

Mr. Green holds a Bachelor of Science degree in electronic engineering technology from DeVry Institute of Technology, Columbus, Ohio

Michael Tao is a management and technology strategy consultant with over 25 years of hands on experience in the utility industry. Mike has provided thought leadership to more than 40 private and public utilities. Mike has devoted his career to assisting utilities overcome interoperability issues in both field and office based systems. Mike's current client engagements include serving as the project manager and technical architect for several ARRA Investment Grant Projects. Prior to joining Boreas Group, Mike held numerous senior executive positions with utilities and consulting firms. Mr. Tao started his career as a system planning engineer for a major California utility and rose to the level of district manager. Mr. Tao has authored over fifty articles and presentations on integration and interoperability for T&D systems. He has a MBA in Finance and a BS in Electrical Engineering from Washington University. He is also a Registered Professional Engineer in the State of California.