Utility Enterprise Information Management Strategies

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Abstract

Grid modernization is a complex issue that requires a holistic approach, chief among them is the ability for utilities core operational systems to interoperate both internally and externally in real time such that adverse events can be better managed to avoid catastrophic consequences. In an increasingly compliance-driven and competitive utility industry, information is a vital enterprise resource and is critical to business achieving success. The new responsibilities to ensure transparency, governance, quality, market compliance and information fidelity can limit bottom-line success. This paper will discuss how two utilities, Oncor Electric Delivery and San Diego Gas & Electric (SDG&E), are addressing these challenges through their Enterprise Information Management (EIM) initiatives. EIM frameworks and strategies provide a clear roadmap for utilities to establish the necessary governance and technology solutions. EIM is not only complementary to Service-Oriented Architecture, but also required for the business to drive and enable the convergence of operational technology (OT) and information technology (IT), which are key parts for the ultimate realization of a Smart Grid.

This paper shares experience of how these utilities have embarked on the journey of EIM to better prepare the enterprise business and IT for the upcoming business transformation programs such as Enterprise Application Integration, Advanced Metering Infrastructure, Smart Grid, and Asset Management.

1. DEVELOPING AN EIM FRAMEWORK

1.1. Business Drivers

The energy and utility industry is going through a transformation as energy prices continue to rise and global warming is becoming a real concern for many. The Energy Policy Act of 2005 requires the industry to invest in technologies to deal with the increasing imbalance between demand and supply. Within utilities, we see that:

- The convergence of Operational Technology and Information Technology at utilities to enable Smart Grid and Intelligent Enterprise requires utilities to manage much more data and information and increasingly in real time;

- Operationally, utilities are also moving towards process-centric business which requires interoperability both internally and externally;

- Continued pressure to cut costs and increase revenue in an environment where both infrastructure and workforce are aging and costly to replace.

These are driving utilities to invest in technology and solutions that will enable a more agile business, and central to that investment is the ability to get more "intelligence and value" from the data that will be collected. When it comes to Smart Grid, getting the data is one thing, to be able to get "intelligent" about the data in real time requires a brand new architecture and strategy to deal with how utilities collect, use, and act upon data and information.

1.2. Strategy Development

To help the utility enterprise to commit to managing data and information as assets, a strategy and roadmap needs to be developed to facilitate strategic thinking amongst the key stakeholders and set paths for future pragmatic plans. The following diagram shows a ten step approach for the EIM strategy and roadmap development. A critical step of the strategy development is the definition of EIM Framework (step 4), which serves as the foundation for the prioritization and detail discussions of which parts of the Framework will be most critical to a specific utility enterprise. Finally a business case could be developed to ensure that EIM investments will bring positive and sustained benefits to both the business and to IT.
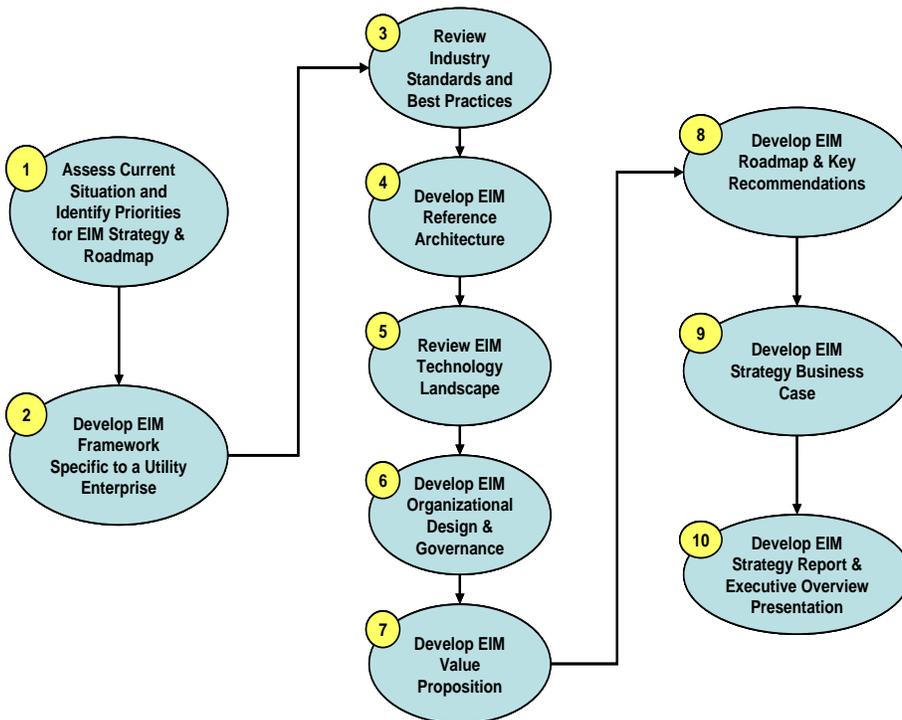
1.3. EIM Framework

As depicted in the following diagram, EIM is defined through a framework that encompasses 5 major components - vision and strategy, governance, core processes, organization, and infrastructure.
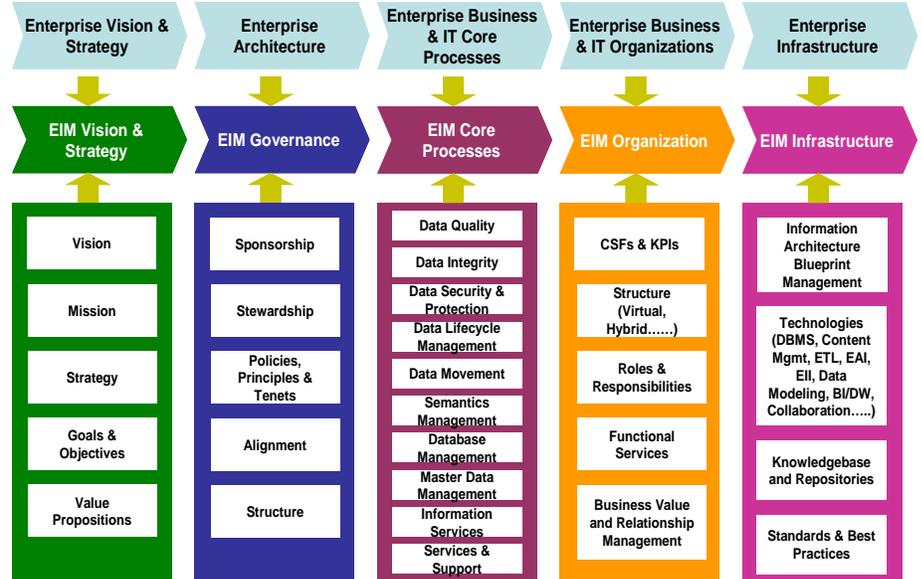
The value of the EIM Framework can only be delivered through a shared commitment of business and IT to recognize the need to manage data and information as corporate assets. The EIM Framework serves as the foundation for the subsequent discussions around EIM reference architecture, the impact of relevant industry standards to EIM, governance processes, EIM organizational models, value propositions, and EIM technology landscape. The framework prioritization process should focus around the critical needs of major business programs such as AMI, Smart Grid, etc. as well as what key recommendations we can develop to influence where and how these programs go in order to gain immediate value. The roadmap for EIM as a program could then be developed to show what the next steps of EIM could be, and where/when they would have the most impact to programs and enterprise IT activities in general.

2. EIM AT SDG&E

2.1. The Business Needs

Operational Excellence is a key mantra for many utility companies today. With this focus set utility companies are now targeting to become process-centric organization. At Sempra Energy utilities, which includes both San Diego Gas & Electric (SDG&E) and Southern California Gas (SoCalGas), OpEx 20/20's vision of 'One-hour-a-day' and 'One-work-order-a-day', will require the shift towards defining a dynamic, yet structured approach for linking and integrating various business processes spanning across the business units over heterogeneous-environment of information systems. Although optimization of complex business processes spanning numerous line of business (LOBs) offers greatest improvement opportunities, it also poses the most significant technical and organizational challenges.

Most utilities will develop business technology plans to these challenges concentrating on Process, People and Technology dimensions. However, most often these exercises fail to recognize the importance of looking at information dimension from enterprise perspective (cross-business units). (Manage information as an enterprise-wide shared strategic asset). Without this forefront view on strategic organization and management of information, the cost of implementing process-centric strategies will be prohibitive, particularly for large, complex heterogeneous environments; as information landscape will be highly fragmented and will contain significant redundancy even if we improve integration puzzle through SOA infrastructure. In addition to the desire of becoming a process-centric organization, utilities are also looking at business transformational initiatives in the areas of field workforce management, enterprise asset management, smart grid and smart metering to solve aging workforce, demand management, and reliability challenges. All these initiatives demand accurate, timely, and trustworthy data and information to drive real time decision making.

Recognizing these business drivers, SEU IT has invested in SOA integration technologies and established core competencies around them so that a solid technical foundation is put in place for more scalable, manageable, and repeatable integration across enterprise. Other initiatives such as Enterprise Architecture (EA) are also under the way in order to position IT as a business enabler rather than an inhibitor. Enterprise Information Management (EIM), as a mean to enable information architecture, fulfils a critical component of EA, and is also complementary to SOA for integration. While the current SOA investments enable systems to connect in a common way, the constructs of EIM would enable systems to talk to each other in a common business language with clarity and consistency, thus transforming data into information and business intelligence services. As the result, the combination for SOA and EIM sets up a solid foundation for business process management and services at the enterprise level, this is the eventual goal of IT.
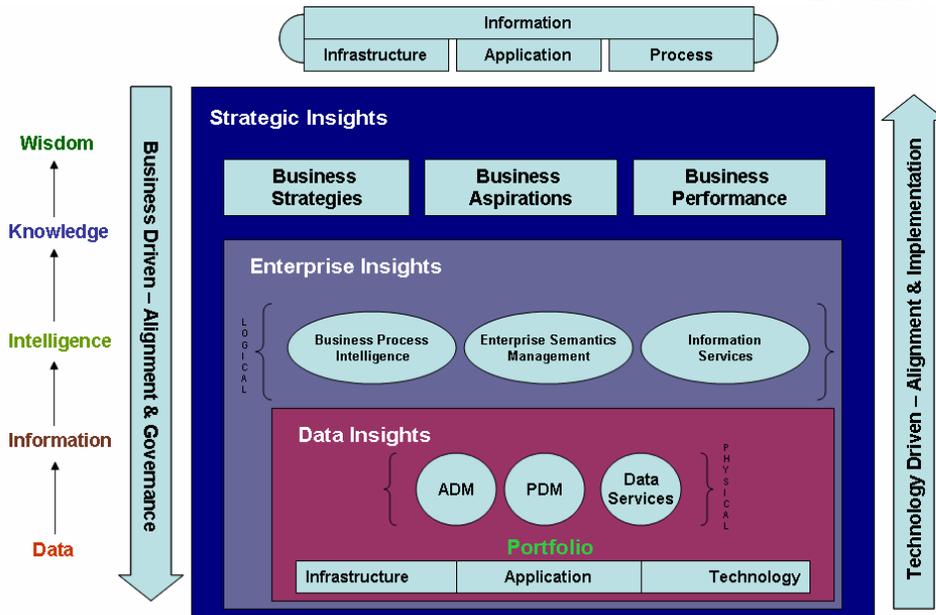
2.2. Establishing EIM Strategy and Roadmap

SDG&E embarked on a formal EIM strategy project, where many key pieces of the EIM Framework were discussed. In summary, the EIM strategy study identified the following key points:

- EIM is a shared responsibility of business and IT, especially when it comes to data and information ownership, stewardship, governance, and lifecycle value management.

- EIM disciplines and capabilities are critical to the success of business programs such as Smart Meter and OpEX 20/20. It is well suited for the business use cases such as Enterprise Asset Management. Without EIM investment, such business programs will not be able to fully realize its benefits.

- EIM is complementary to SOA for integration, and provides a mean to leverage SOA infrastructure to establish data, information and business intelligence services across business and application domains.

- EIM is also different than SOA in that it addresses information management needs (data quality etc.) across the domains of application, integration and business intelligence, as such, should be invested accordingly.

- A critical piece of EIM is the development and management of the Enterprise Semantic Model that represents what key SEU business information entities are across enterprise, as well as methodology and technologies to drive the consistent use of the model to enable data and information services.

- Industry standards are an important reference to EIM, and have to be evaluated to ensure its applicability and value to enterprise semantic model development. The goal should be to minimize the semantic conflict among applications and processes.

- EIM organization is a formal mechanism to develop EIM related core competencies, and enable the delivery of EIM value throughout IT and business. However, the organization should be established incrementally.

- Technologies are key to the success of EIM, but should be implemented with solid business case

and fit for purpose within enterprise architecture portfolio.

2.3. EIM Value Propositions

To understand what value EIM brings to the enterprise, one must consider how raw data can be turned into information, intelligence, knowledge, and wisdom. As information systems are becoming critical to the success of business, information management must be dealt holistically.

In summary, EIM

- Enables business to take ownership, responsibility and accountability for the improvement of data quality and information accuracy and consistency.
- Enables business to establish single version of truth for data over time.
- Improves business process and operational efficiency and effectiveness.
- Provides a strategy and technique to mitigate the risks as well as maximize the value of implementing commercial packaged applications.
- Reduces the number and effort of integration over time.
- Enables the control of unnecessary data duplication and proliferation.
- Enables a more flexible and scalable process integration.
- Improves the data quality, integrity, consistency, availability, and accessibility over time.

- Maximizes the return on investment of SOA technologies.
- Establishes a critical component of the Enterprise Architecture.
  - Provides guidance and services, and enables consistent implementation of SOA and information management across major programs.

2.4. SDG&E's EIM Plans

SDG&E has developed EIM strategy and business case, and is in the process of prioritizing and planning on how EIM can be best executed along with many others strategic initiatives. Such commitment shall enable SDG&E to ensure long term benefits of both business and technology investments. And as many have said, EIM is a journey and it will evolve as business and IT needs change.
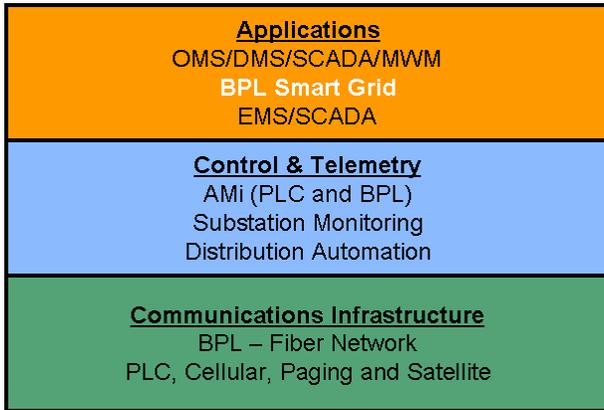
3. EIM AT ONCOR

Oncor Electric Delivery's new systems and legacy systems currently yield many sources of data with incompatible formats, making systematic organization, integration, and cleansing a big challenge. Accordingly, Information Management (IM) has established the following technology principles for true 'enterprise' integration - in which individual vendors must supply systems that function as component parts of a greater whole:

- Align Technologies to Business Objectives
- Adopt Utility Industry Technology Standards
- View Technology Investments from an Enterprise Level
- Adopt Reuse, Buy, Build Philosophy
- Treat Information as a Strategic Resource
- Promote Standardized Integration Architecture
- Select "Thin Client", Distributed Options When Available

3.1. The SmartGrid Program

SmartGrid is the first project to be planned to adhere to these principals. The essence of the SmartGrid vision is summarized in the following diagram.

| **Applications** |
| OMS/DMS/SCADA/MWM |
| **BPL Smart Grid** |
| EMS/SCADA |
| **Control & Telemetry** |
| AMi (PLC and BPL) |
| Substation Monitoring |
| Distribution Automation |
| **Communications Infrastructure** |
| BPL – Fiber Network |
| PLC, Cellular, Paging and Satellite |

SmartGrid functionality objectives include:

- Replace an aging mobile workforce management (MWM) system that is no longer supported by vendors
- Implement a fully integrated OMS/DMS/MWM/D-SCADA system suite replacing a "legacy" home-grown Outage Management System (OMS) and several unrelated small distribution control systems
- Leverage the "new" data available through AMIS into system operations activities
- Utilize "intelligent" field mounted equipment in true "smart grid" activities
- Provide near real-time data and control to distribution operations control centers
- Improve reliability to customers while controlling costs

To accomplish these functionality objectives, the following interoperability objectives are being followed:

- Utilize "completely off the shelf" (COTS) applications wherever possible and work with vendors to update/improve applications
- Implement utility standards such as those based on the Common Information Model (CIM) to allow improved interoperability between various applications
- Leverage the "new" technologies available for enterprise application integration (EAI) by using a state-of-the-art middleware suite for new application implementations

- Utilize service oriented architecture (SOA) concepts to keep access to vital information open and easily accessed by any application
- Provide near real-time data and value-added information to all market participants in Texas (customers, retail electric providers, ERCOT, and other participants) via Web Portals and specialized information transfers

As depicted in the following diagram, SmartGrid is establishing an Enterprise Service Bus (ESB) for inter-application integration. Information exchange among services is based on the IEC 61968 series of standards, which uses the industry standard CIM for a vocabulary. Oncor is using a model driven integration (MDI) methodology to extend the CIM as necessary to plug gaps between standards message schemas and its canonical message schemas.

3.2. Business Challenges

The challenges with integrating systems are many and begin with the way systems are procured. When a project procures applications, vendors are driven by the procurement process to meet user requirements at lowest cost. Each of the procured systems has its own unique mixture of platform technologies, databases, communication systems, data formats, and application program interfaces. While Oncor prefers products that support CIM-based interfaces, an even higher priority is for product vendors to supply application interfaces that remain relatively stable across product releases. In that fashion, once an application is interfaced to Oncor's enterprise application integration infrastructure, incorporation of future product upgrades will be easier, charges for custom interface development will be decreased, and the risk of errors will be reduced during installation and maintenance of each product release. Success will depend on how well the 'how to' gaps are

closed between Oncor's principles and the actual practices used to integrate applications into the enterprise. These gaps are closed as Oncor's business groups and Information Management, and all their supporting vendors, use EIM to address the key issues such as data definition; data quality; data integrity; data security; data compliance; data access and generation; data management; data integration for systems and process interoperability; data governance; and data for decision support.

3.3. Oncor's EIM Plans

Oncor has embarked on development of an EIM framework relevant to its circumstances. Establishing EIM should enable Oncor's service and application providers to all accomplish their individual functions in a manner that positively contributes to enterprise objectives. Establishment of this EIM framework is planned to be performed in steps, allowing Oncor and its providers to assess the results of each step and make course corrections before continuing on to subsequent steps. By leveraging MDI and the CIM, integration artifacts developed in the meantime should fit into the resulting EIM framework with minimal effort.

Acknowledgement

Biography

Kamal Parekh:

From past 11 years in Information technology, Mr. Parekh enjoys the role of researching, developing and applying business frameworks with embedded enterprise-IT value principles. Specialization includes business performance management, knowledge management, statistical business analysis and analytical applications, which encompasses operational and multi-dimensional large enterprise-wide data warehouse architectures. Currently, as a Business Intelligence architect/strategist with San Diego Gas & Electric (SDG&E) utility, plays key role in formulating and translating EIM vision into enterprise-wide program for managing information as a strategic corporate asset. Prior to SDG&E, worked with prominent consulting organizations providing enterprise-class technology services in IT strategy and enterprise planning, systems architecture, business process management, enterprise application integration, ERP/CRM/PLM implementations, IT portfolio management and change management practices to various fortune 100 clients across vertical industries.

Joe Zhou:

Mr. Zhou is a co-founder and CTO of Xtensible Solutions, which provides enterprise information management and integration solution and services to energy and utility industry. With about 20 years of industry experience and services for more than two dozen utilities worldwide, Mr. Zhou works with his clients to build sustainable information management and integration solutions that leverage industry standards and best practices in order to enable and improve business and systems interoperability.

Kelly McNair:

Mr. McNair has led the Information Management group within Oncor's Asset Management & Engineering department for over five years. He has 26 years of extensive operations and engineering experience at Oncor, including support to Oncor's distribution operations centers, as well as holding several engineering management positions. Mr. McNair has played a central role in Oncor's ongoing transformational technology activities by overseeing the development of the current governance process and the deployment of new applications within annual technology asset investment plans. He has a BSEE from Texas Tech University and is a Professional Engineer.

Greg Robinson:

Mr. Robinson is a co-founder and President/CEO of Xtensible Solutions, which provides enterprise information management and integration solution and services to energy and utility industry. He helps utilities plan and implement semantically coherent application integration infrastructures. Mr. Robinson is convener of IEC TC57 Working Group 14, which is extending the industry standard Common Information Model (CIM) for enterprise-wide messaging. This volunteer work has enabled him to help utilities leverage and drive these industry standards to their benefit while simultaneously aiding the standards development process. He has a BSEE from Georgia Tech and a MBA from the Florida Institute of Technology.