Data Analytics (Or Data Overload) and the Utility

Introduction

Utilities have made significant investments in Advanced Metering Infrastructure (AMI) and smart grid infrastructure over the past few years. These investments have produced significant benefits for both the utilities and their customers. Many of these utilities have started to focus on new opportunities that leverage their foundational AMI and smart grid investments. Referred to as "DAY2", these DAY2 opportunities have the potential to provide significant incremental benefits to both utility and customer alike. One such DAY2 opportunity is the implementation of data analytics. AMI and smart grid investments have produced volumes of new data. Data alone, however, does not provide value to a utility or its customers; however, the information gleaned from this data does. Data analytics provides the opportunity to transform data into information that benefits both the utility and its customers.

What are data analytics and how can they help?

Utilities are gathering terabytes of data from multiple systems within their enterprise. These data sources include both traditional (AMI, census, customer information systems, distribution planning applications, and distribution management systems) and the non-traditional (customer communications preference management, social networking, and portal clicks). Opportunities exist to intelligently apply tools, analyses, and logic to this disparate, asynchronous data and glean transformational information about a utility and its customers.

Data analytics can be used to improve customer satisfaction with the utility. Key to this is understanding what customer experience needs improving. Nearly every utility assesses customer satisfaction via industry standard measures such as JD Power and Market Strategies International (aka MSI). Customer satisfaction is determined based on customer responses to an extensive list of questions about utility interactions – including cost/rates, reliability, and utility interaction. Data analytics help utilities gain a better understanding of the key drivers of each customer response and the unique contribution to customer satisfaction and, perhaps more importantly, dissatisfaction.

- A customer dissatisfied with service reliability might actually have experienced very limited interruptions but had a poor communications experience during the interruption. Analyzing actual reliability information from an outage management system, customer participation in outage communications programs, and comments captured by a customer service representative could identify the need for new outage communications strategy or tools.
- A customer that perceives utility costs to be too high might not have programs available that enable them to decrease expenditures. Analyzing assessor data about the age of a home or existence of a pool, usage patterns from interval electric usage data, and thermostat operation data may allow utilities to offer programs and services to specific customer populations.

A clear understanding of the specific drivers of overall customer satisfaction (or dissatisfaction), enhanced by the use of data analytics, should guide the types of programs, processes, and services that can be implemented to improve customer satisfaction. Clearly, there are many influencers of customer satisfaction, so utilities need to focus on those that are most influential.

Data analytics can be used to improve the way a utility operates. Increasing operational efficiency can reduce a utility's cost to operate and maintain (O&M) its system.

- A utility might use data analytics to identify energy usage patterns and meter alarms and events (such as theft of service or diversion) that correlate to future occurrences of meter failures. This correlation may help target and prioritize proactive field investigations that address potential causes of failure before they happen.
- Improved asset utilization also results in an improvement in the way a utility operates both financially and reliably. A utility might use data analytics to identify a correlation among usage patterns and age of distribution assets (e.g. transformers) to determine the most likely candidates for failure. Replacing transformers before failure or delaying transformer upgrades until load growth requires such an upgrade optimizes the utilization of transformer assets.
- A utility might use data analytics to improve a strategic measurement such as SAIFI. Correlating high and low voltage patterns, momentary occurrences, and tree-trimming cycles can identify the likely occurrence of an outage before it happens, thus eliminating a reliability event that would otherwise negatively impact SAIFI.

How do you get there?

Before determining what data analytics to implement, a utility must understand its strategic drivers and ask itself what it's trying to accomplish with data analytics. Does customer satisfaction need improving? Can operational efficiencies be increased? Is there a need to introduce a new program? The answers to these questions drive the focus of data analytics.

In addition to strategic drivers, utilities have a host of practical drivers. Utilities have limited personnel and financial resources and need to utilize these resources as efficiently as possible. Utilities must, therefore, prove the prudency of data analytics investments to ensure cost recovery via future rate cases. And utility organizations have a limited tolerance for change – properly managing that change helps ensure adoption and maximizes the value that the organization can achieve.

The contribution of both strategic drivers and practical drivers should be considered in developing a roadmap to implement data analytics. A roadmap for the realization of data analytics benefits should be developed at the start of data analytics' efforts. The roadmap strategically lays out both the near term and long term data analytics opportunities. Near term opportunities are necessary to show quick wins and convince the utility that continued investment in analytics offers an appropriate return on investment. Long term opportunities ensure the sustainability of investment in data analytics.

A strategic roadmap is tactically delivered

Data analytics can't be executed without capturing the appropriate data. But people often make assumptions about what a data element means – and those assumptions are sometimes ill-defined or defined in a manner that has different meanings for different folks. Without a clear and accurate definition of each data element, the appropriate data cannot be captured. And without the appropriate data, data analyses cannot provide value.

Data requirements differ depending on the question being answered by data analytics. An analysis requiring understanding of customer energy usage habits, for example, requires attributes that help define historical energy usage. Some attributes are found in existing applications (e.g. historical interval

usage data) while others must be acquired from new, external systems (e.g. census data indicating number and age of folks living at a premise).

Data storage infrastructure and tools to access that data must be implemented. Infrastructure includes that to store and manage data. Infrastructure also includes the tools and applications to conduct the analyses necessary to unlock the information. The infrastructure must be flexible enough to bolt-on the incremental applications necessary for new/modified analyses (e.g. a third-party application to identify likely volt-VAR optimization candidate feeders). Utilities must answer the pragmatic "make vs buy" and "hosted" vs "cloud-based" solution questions.

Purchasing large scale data analytics applications and infrastructure and implementing a data model doesn't automatically net any value. Vendors often pitch "big data" and data repositories that will enable a business to conduct analysis, but with the methodology of "build it and the business will come". Significant investment is being focused on infrastructure and data conversion, yet investment is lagging in understanding how to unlock the value of the data and put the results to pragmatic use. Before making significant investment in data analytics, utilities should have an area of focus – be it grid optimization, advanced asset management and capital spend prioritization, workforce improvement, customer satisfaction improvement, or some other intent – and structure the data analytics and investment to address that focus.

Data analytics requires a collaborative implementation by the business and information technology teams. Once implemented, utilities should establish an organization that not only maintains data and existing analytics but allows for the identification, vetting, implementation, and control of new data analytics opportunities. An information technology versus business discussion to determine who provides the overall governance associated with data analytics is a healthy and necessary conversation for success. While some consider IT the keepers of all things data, infrastructure, and applications, others consider the business the keeper of the customer and the ultimate beneficiary of the data analyses.

Once you identify the opportunities, how do you determine the analyses to conduct?

Once the physical and organizational infrastructure is in place, the analyses can begin. The development of any analysis should follow the scientific method:

- What is the problem?
- What hypothesis do you have for the answer to the problem?
- What data is necessary to prove the hypothesis?
- What calculation, manipulation or extrapolation of the data proves or disproves the hypothesis?

The hypothesis will not always be proven right. However, failure to prove a hypothesis, and the understanding of why this is so, often provides as much value as proof of a hypothesis.

So, does data analytics require a data scientist?

Yes. But we need to redefine the "data scientist". With the advent of so many different tools and applications on top of so many different data warehouses, the "old school" definition of a data scientist (e.g. one who crunches raw data from a SAS output or their own homegrown Access/Excel repositories and tools and creates and runs their own regression analyses) is defunct. Instead the redefined "data scientist" must be a utility-knowledgeable, customer-knowledgeable, logical thinker who can quickly become adept at manipulating and executing multiple tools and applications that live on top of data repositories and fulfill specific analyses. This "data scientist" must be able to interpret the analyses and *sell their interpretations* to the rest of the utility in order to create actionable activities that benefit both the utility and customer alike.

This data scientist exists in a limited number of folks at each utility – and include folks that may not even know they're data scientists yet. Alternatively, data scientists can be "grown" within a utility, but this takes a conscious effort on the part of the utility to identify potential candidates and expose them to key lines of business, e.g. field collections, metering, billing, customer services, distribution operations, et al. Utilities need an industry-knowledgeable, subject matter expert to ferret out the data scientist and help him/her execute. Except in limited cases, this begs for an application and tool agnostic third party, the data scientist, to sift through the chaff and help the utility mine the opportunities within the data.

Illustrating an Analysis

Many utilities offer budget billing or equal payment programs. These programs allow customers to pay the same amount each month – typically the average of their monthly bills over the past year. In some months, the amount a customer pays is less than the value of the actual consumption; in other months, the amount a customers pay is more. Periodically, a true up between the amount paid and the actual amount incurred occurs. Utilities like this program because it minimizes the "sticker shock" of a high bill that often occurs after a seasonal change. Customers like this program because they're able to forecast (budget) their expenditures over the year. Applying the scientific method:

- Utilities can use data analytics to identify other customers who are likely to sign up for this program (the problem).
- Utilities can identify a "typical" program customer (the hypothesis). Various attributes (the data) are used to define this typical program customer (e.g. usage profiles, collections activity, geographic location, age of customer) and these attributes create a profile which utilities can use to identify non program participants that are likely to become participants if marketed to.
- Utilities can target program literature to these customers with the expectation of a higher rate of success at signing new customers up (proving or disproving the hypothesis).

Conclusion

Data analytics has the potential to substantially change the utility paradigm. Data analytics is expected to be at the heart of IT integration and play a key role in the operation of future power delivery systems. And some utilities are using data analytics to feed the next generation of utility workers. It used to be

that only lines and wires with visual inspections, outages, and other incidents drove the process to manage the infrastructure. The next generation of utility work is adding data to help make the decisions – data such as pole type, average age, past asset model failure analysis, and other data elements – that drive asset management. Data enables the transition from a legacy physical decision making process into a process that is refined and supported by the use of analytics.

About VASS Solutions

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