Smart Ways to Implement Smart Meters: Using Analytics for Actionable Insights and Optimal Rollout
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Smart meters and smart grids provide utility companies with remarkable capabilities and opportunities to exploit Big Data analytics for gaining valuable insights into the business. The use of smart meters benefits all stakeholders – utility providers, consumers, and the environment. However, a significant challenge in leveraging this technology is the inability to tap into the large volume of data generated to attract and retain customers. Effective utilization of the data can help predict energy demand with a greater degree of accuracy, and hence reduce the overall cost burden for both utilities and consumers.

This paper examines the issues that can arise in the process cycle – from installation to actual use of smart meters by end customers. It suggests analytical solutions that can be adopted by utilities to overcome these challenges and reap long-term business benefits from deploying smart meters.
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1. Introduction

Smart meters are electronic measurement devices used to operate and regulate consumers’ utility systems and communicate consumption data to the utility company as well as the consumer for billing purposes. Over the last few years, utility companies have used such meters to provide accurate energy consumption and billing data to their consumers. Installing smart meters offers several benefits for both sets of stakeholders, including accurate billing, improved control over energy consumption, and potential savings in energy.

The major benefits that each of these stakeholders can derive are listed in Figure 1.

![Figure 1: Benefits accruing to various stakeholders from smart meter deployment](image)

2. Concerns in deploying and using smart meters effectively

The benefits of smart metering are not limited to accurate billing. It presents an opportunity for utilities to mine large volumes of real time data available in smart meters and gather new insights to drive business benefits. For example, organizations can roll out customized offerings to their customers based on their behavior and usage patterns, and thereby improve customer satisfaction.
Despite these benefits, utilities face significant challenges both in deploying as well as in using smart meters. It is important for utilities to recognize these challenges and develop concrete plans to overcome them. The concerns for utilities include those identified in Figure 2.

These challenges and concerns need to be effectively addressed in order to maximize return on investment and optimize business outcomes. In the following sections, we have outlined different ways in which these concerns can be met.

3. Designing a rollout plan for maximum business impact

Analytics are not only required after the implementation of smart meters but can also be of great help in the pre-implementation phase. The right combination of analytics in these two phases can help increase overall revenue and also enhance market penetration, customer acceptance, customer loyalty, and brand reputation.

Analytics can be applied in two stages for the implementation of smart meters:

- **Stage one:** Statistical and analytical tools can be used to identify the right set of geographies to be targeted first. These geographies can be picked based on sampling techniques and various other criteria such as stratified (region, number of appliances, and household size), disproportionate (over-sampled groups with higher variance), and random (equal chance of selection) sampling.

- **Stage two:** Once the geographical locations have been identified, analytics can help identify a select group of customers to be targeted within the specified location. The select group of customers may include those who contribute the most to revenue or the ones who are most likely to churn. By targeting such customers, the utility can increase returns and enhance customer retention.
4. Leveraging actionable insights: Mining vast data to derive insights for better business outcomes

Smart metering can provide useful and actionable insights to revitalize a business. Considerable volumes of data are now easily available with the implementation of smart meters, presenting a huge opportunity for utility companies to enhance end-customer service as well as improve business outcomes. Smart meter analytics can provide details on energy use and consumption to help consumers reduce their bills, and enable utilities to lower costs and improve efficiencies.

Enterprises are just beginning to identify the potential of analytics that smart meter data is capable of producing. Insights such as variations in volume of use relative to the time of use, appliances impacting consumption, etc., open up a wide range of new opportunities and uses.

Some of the analytical opportunities available to businesses due to the adoption of smart meters include:

- **Enhanced customer segmentation:** Smart metering enables segmentation based on various parameters like attributes of customers, consumption patterns, etc. One of the key goals of smart grids is to allow consumers to participate in the decision regarding their usage of the utility, depending on their priorities such as saving money or contributing to the environment, etc.\[1\] To help with this, organizations can provide consumers with variable pricing plans based on the time of usage and thus reduce demand during peak times.

- **Customer insights:** Smart metering provides instant analysis of customers’ energy consumption data at all levels of granularity and dimension as well as usage patterns. Customer insights help the utility company with capacity planning and enable it to offer differential pricing for different customers, or at various times of the day or the year (based on high and low loads). Analytics can also help organizations plan campaign activities targeted at specific customers, which in turn yield a better return on investment.

- **Energy know-how:** Peer comparison of customer data can be carried out based on statistical predictions and root cause analysis of variance in consumption and causal analysis of loads. Ultimately, smart meters can help the end-consumer effectively use utility services by managing the flow in real time, even remotely. Businesses can realize long-term benefits as a result of improved energy efficiency through real-time information on energy usage and reduced energy loss as well as increased revenues through cross and up-selling avenues.

5. Reducing the cost imbalance using smart meters

Cost imbalances for the utility are largely caused by a mismatch between demand and supply, which affects the per-unit cost of production and distribution. In the long run, both surplus and shortage are harmful for the business. This means the utility should strive to meet the desired requirement optimally. It is possible to do so by accurately forecasting demand through the use of predictive analytics based on data that is gathered using smart meters.

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Utility companies, until now, have so far been using basic demand forecasting techniques such as time series, causal models, linear trend line, etc. However, these techniques are inadequate to cope with the growing complexity of demand fluctuations and the availability of extremely large volumes of data in the wake of smart meters. New forms of forecasting techniques employing predictive analysis use trends to develop decision trees and provide complex predictions.

Application of predictive analytics helps utilities:
- Process large volumes of data faster
- Identify factors that lead to changes in load
- Analyze the impact of each factor
- Understand the impact of weather on demand and supply

As the benefits of a predictive analytics model kick in, other forms of analysis (such as reactive or decision based analytics) can be used to refine the results of predictive analysis to drive better decision-making.

6. Conclusion

The utility industry is facing a paradigm shift in transitioning from traditional to smart meters. While many companies deploying smart meters might be tempted to focus purely on fixing issues and ensuring right delivery to their customers, there is a huge opportunity for businesses to use analytics from the very outset. Use of analytics can help solve some of the issues faced by utility companies by enabling a more granular view of information in real time.

Smart metering without the support of analytics provides only limited benefits. When combined with data analysis, smart metering can offer a wide range of benefits across the value chain that includes utility suppliers and distributors, as well as consumers. It can help all the stakeholders better equip themselves to address the challenges arising out of smart meter implementation. The bottom line is that smarter insights from smart meters can help utilities increase efficiency, reduce costs, and provide better services to customers.
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