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Customer Perception and Reality: Unraveling the Energy Customer Equation

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ABSTRACT

Energy companies that operate in a highly regulated environment and are constrained in pricing flexibility must employ a multitude of approaches to maintain high levels of customer satisfaction. Many investor-owned utilities are just starting to embrace a customer-centric business model to improve the customer experience and hold the line on costs while operating in an inflationary business setting. Faced with these challenges, it is natural for utility executives to ask: "What drives customer satisfaction, and what is the optimum balance between influencing customer perceptions and improving actual process performance in order to be viewed as a top-tier performer by our customers?" J.D. Power, for example, cites power quality and reliability as the top influencer of overall customer satisfaction. But studies have also shown that customer perceptions of reliability do not always match actual reliability experience. This apparent gap between actual and perceived performance raises a conundrum: Should the utility focus its efforts and resources on improving actual reliability performance or would it be better to concentrate on influencing customer perceptions of reliability? How can this conundrum be unraveled with an analytically driven approach? In this paper, we explore how the design of experiment techniques can be employed to help understand the relationship between process performance and customer perception, thereby leading to important insights into the energy customer equation and higher customer satisfaction!

INTRODUCTION

In order to survive in a competitive business environment it is crucial for companies to be customer-centric; one expression of this centricity is having a clear understanding of how well the products and services they provide meet customer expectations. Such understanding simply can't be acquired unless customers' perceptions of products and services are measured, analyzed, and acted upon in a timely fashion.

Companies who don't put the customer first tend to lose market share and experience degraded financial performance. For an example one need look no further than the experience of US Airways before they were purchased by American West in 2005. This company outsourced many of its customer service functions to third parties in order to decrease its customer service budget. The result was mishandling customer complaints and other reductions in customer service which eventually caused customers to use alternative service providers. No amount of cost-cutting could make up for the loss in revenue when customers became angry and fled, which in turn forced US Airways to file for bankruptcy.

The predominant approach to acquiring and understanding customers' views of a company's products and services is to administer a probability survey. Satisfaction surveys are very valuable for measuring customer perceptions of a company's products and services. First, the overall customer sentiment about a company can readily be determined by posing general questions related to satisfaction, where responses are solicited on an ordinal scale. Second, it is common practice to gain insight into the "drivers" of overall satisfaction by asking questions which are naturally related to the overall sentiment and commonly understood to influence a customer's overall perception of a company. With sufficient understanding of these drivers it is usually the case that a company can identify actions to improve product and service attributes important to customers with a goal of improving overall satisfaction.

A necessary condition underpinning strategies for improving satisfaction is that actual process performance has a strong causal relationship with perceived performance. That is, by altering the attributes of a delivered product or service to better meet customer expectations it is assumed the customer's perception closely reflects the improved form of the product or service being offered.

Often times the mapping of product and service attributes from “real” to “perception” space is strong and straightforward, but on occasion the mapping breaks down for reasons less understood. This paper explores such an occasion with regard to utility customer satisfaction and its relationship to service reliability, leveraging a “naturally occurring laboratory” for the investigation.

Modeling Customer Satisfaction

Modeling customer satisfaction in a useful analytical format is an important first step to identifying actions which can improve customer satisfaction. A model which associates overall satisfaction to its various drivers is necessary in order to identify and establish the relative importance of these drivers. With this knowledge guidance on where best to focus satisfaction improvement activities can emerge.

The process of modeling customer satisfaction for this paper started with three available datasets: (1) a customer satisfaction survey containing approximately thirteen hundred survey responses, (2) customer interruption data extracted from utility records, and (3) billing-related information. Each record in these datasets had a unique identifier so that the records could be joined by customer, thus allowing survey responses to be associated with outage and billing attributes at the customer level.

The survey dataset consisted of 560 variables which characterized survey design parameters and customer responses. The outage dataset provided a two-year historical record of actual outage counts and outage durations for all customers who participated in the surveys. This data was further divided into classes of brief and extended outages, where brief outages were defined as those with durations of less than five minutes. The billing dataset contained variables which helped characterize bill payment performance. Examples of these variables included length of time since last payment and account age.

An initial assay of the survey data quickly established that 12 response levels for overall satisfaction yielded a skewed distribution with some categories being highly populated and others containing a low number of counts. Responses were collapsed into three levels of customer satisfaction to address this problem, which concurrently provided for the possibility that a different set of drivers might be necessary to explain each of the three categories: highly satisfied customers, moderately satisfied customers and dissatisfied customers.

Figure 1 illustrates the breakdown of customers’ responses into the three categories. Note that only three respondents answered “Don’t Know” when asked their opinions of overall satisfaction; this category was eliminated from further consideration because it could not have a significant impact on the overall results of the study.

Figure 1: Customer Satisfaction Breakdown

(Source: 2013 Ameren Missouri Residential Customer Satisfaction Survey Conducted by Independent Contractor)

Predictors for Customer Satisfaction by Grouping

Models of highly satisfied, moderately satisfied, and dissatisfied customer groups were created using SAS® Enterprise Miner to determine the key variables associated with satisfaction in each group.

The process flow in Figure 2 shows the model selection process using model competition techniques to predict customer satisfaction for the highly satisfied customer group. The winning model for this group was a forward regression model with a valid misclassification rate of 0.1065. The model selected for the moderately satisfied customers was a modified decision tree with a valid misclassification rate of 0.1543 and the model for dissatisfied customers was a modified decision tree with a valid misclassification rate of 0.0438.

Final selections were based on the valid misclassification rates for each model entered in the competition. Importance rankings from the winning models for the top six variables are listed in Fig. 3.

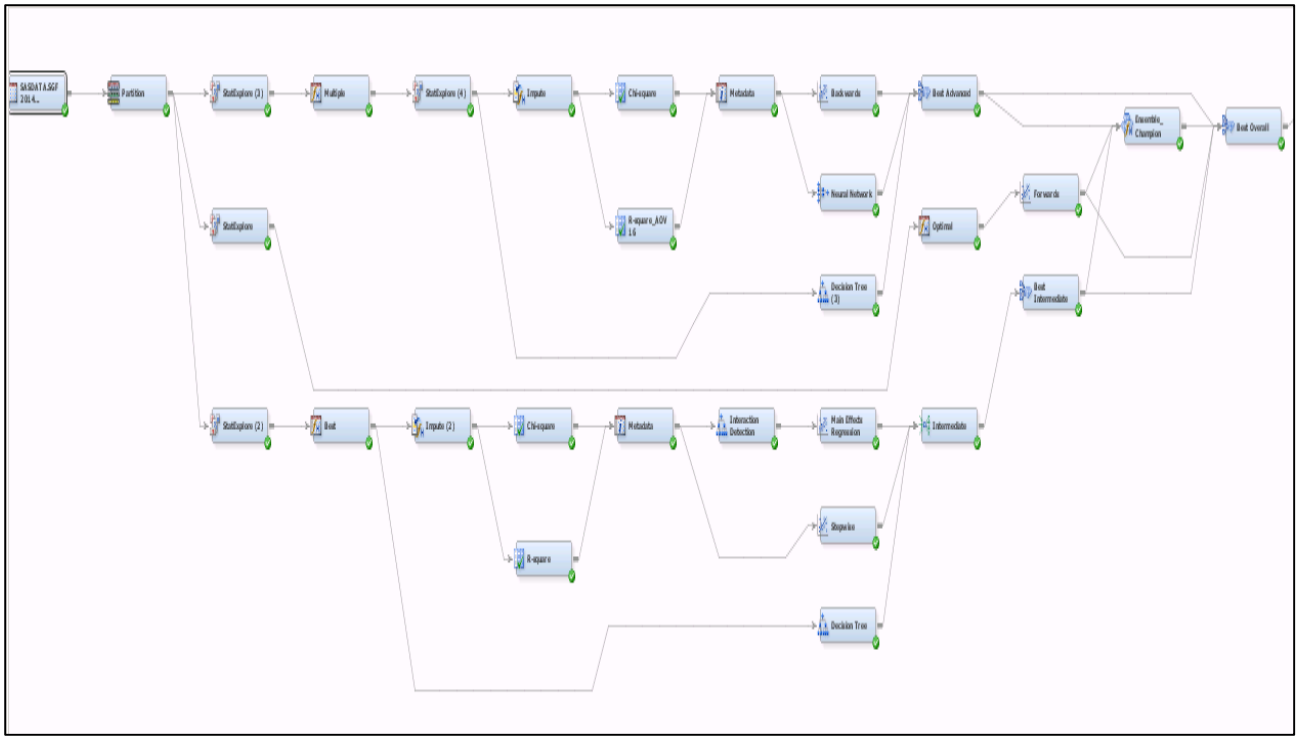

Figure 2: Illustration of Prediction Model for Highly Satisfied Customers

(Source: SAS® Enterprise Miner with SAS®Text Mining)

Satisfaction	Variable Importance Ranking
Highly Satisfied	1. Improvement opportunity identified
	2. Reliable electric service
	3. Useful communications
	4. Earned satisfaction through reliability, responsiveness
	5. Reasonable electric rates
	6. Invests in service reliability
Moderately Satisfied	1. Keep rates reasonable
	2. Easy to do business with
	3. Reliable electric service
	4. Shows concern
	5. Restore power after outages
	6. Offers programs to help use energy efficiently
Not Satisfied	1. Months current account open
	2. Transparent conducting business - billing
	3. Reliable Electric Service
	4. Improve Advertising – lack of communications, rates
	5. Keep number of outages to a minimum
	6. Support local community organization and charities

Figure 3: Customer Satisfaction Predictors by Grouping: Importance of Top Six Variables

(Source: SAS® Enterprise Miner and SAS® Text Miner)

Modeling Customer Perception versus Reality

A key finding of the modeling process was that customers' perceptions of reliability are a significant input to the models developed for all three customer groups. It is natural, then, to assume that by improving reliability an attendant increase in overall satisfaction would result.

There is a problem with this assumption; a person's perception of reality can be quite different than reality itself. This is especially true when the perception originates from one party and reality is measured by another. The difference between reliability perception and reliability experience has been known for quite some time but only recently was investigated to the extent that actionable information could be derived.

At this point a short digression is necessary. Under ideal circumstances it would be desirable to develop a designed experiment for the purpose of establishing the relationship between reliability perception and actual experience. To perform such an experiment one would randomly divide customers into two groups; a control group which establishes a benchmark, and a treatment group which would be subjected to the experimental condition whose effects are being investigated. Upon applying the experimental condition to the treatment group its response would be compared to that of the control group in order to determine if a statistically significant difference exists in the outcomes.

In the real world of utility operations this type of experiment cannot be performed for a number of reasons. Most prominent among these is that the experiment would require turning off power to customers in the treatment group. This is clearly not an acceptable approach as it would subject customers to inconvenience at best and life-threatening danger at worst.

There is an alternative, however, and it rests in the concept of a "natural" laboratory.

Electrical distribution networks are extensive, serving, for example, over 1.1 million residential customers in Ameren Missouri's service territory. Due to the large geographic area covered and the diversity of system design within this territory customer outages occur on a regular basis. These outages are not purposely induced, but are rather caused by stochastic factors such as wind and ice storms, lightning, animal intrusions, tree contact, age-related equipment failures, etc.

Because of the random nature of these events it is possible to view customers who experience outages as a naturally occurring "treatment" group, while those who experience no service interruptions can be thought of as a naturally occurring "control" group. Furthermore, since surveys are conducted by random sampling there is no preference in the sampling plan which would bias results by reliability experience.

This naturally occurring laboratory establishes a ready-made environment for investigating differences between perception and actual reliability since nuisance and other factors are controlled for in both groups and the treatment is randomly applied by naturally occurring events.

Adopting this paradigm of the survey and naturally-induced outages makes it straightforward to construct an analysis of customer-level data which provides insight into the relationship between perception and experience.

One depiction of this relationship can be realized with tree diagrams. Figures 4, 5 and 6 illustrate perceived versus actual number of extended outages for highly satisfied, moderately satisfied, and dissatisfied customer groups.

A distinguishing feature of the perception profiles of these groups is that, in general, customers in the lower two satisfaction groups appear to have reliability perceptions which are less accurate than those in the highly satisfied group. For example, 31% of moderately satisfied customers who experienced 0, 1, or 2 extended outages overestimated the actual number, while only 21% of highly satisfied customers overestimated the number. Further investigation into this difference may point to an opportunity for positively influencing reliability perceptions in the moderately satisfied group which could lead to an increase in overall satisfaction for this group.

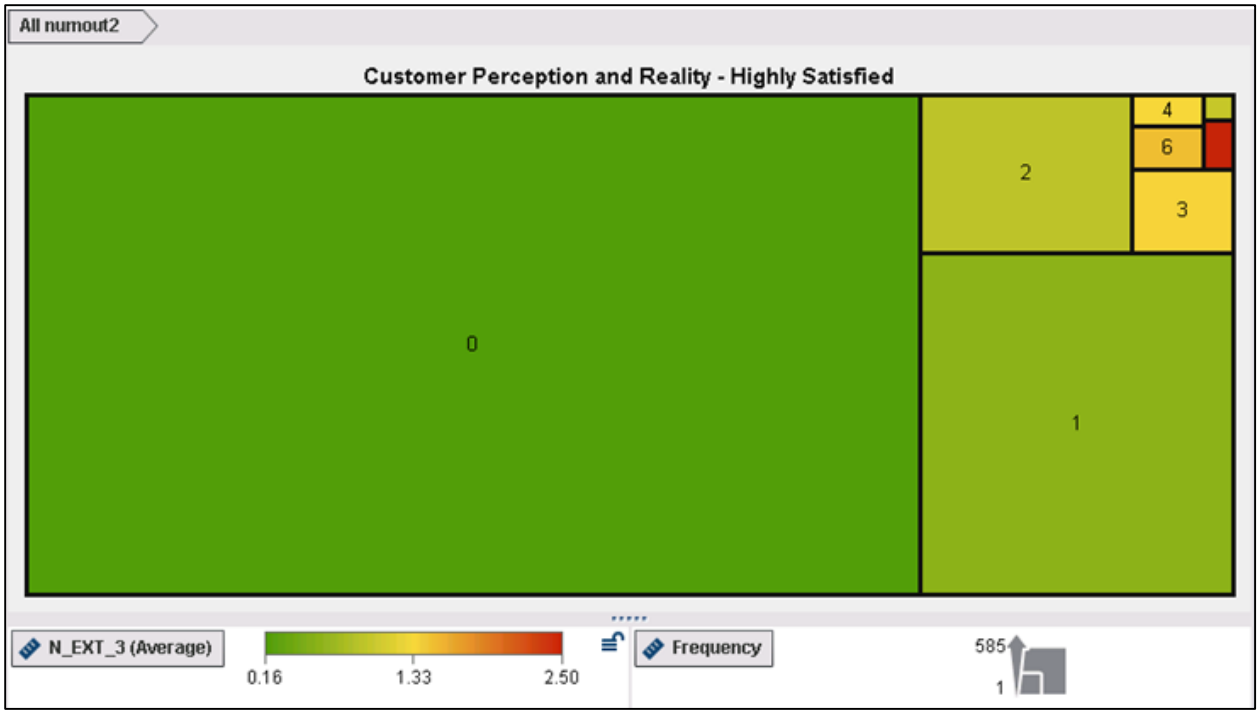

Figure 4: Customer Perception versus Reality on Reliability of Service – Highly Satisfied Customers

(Source: SAS® Enterprise Guide)

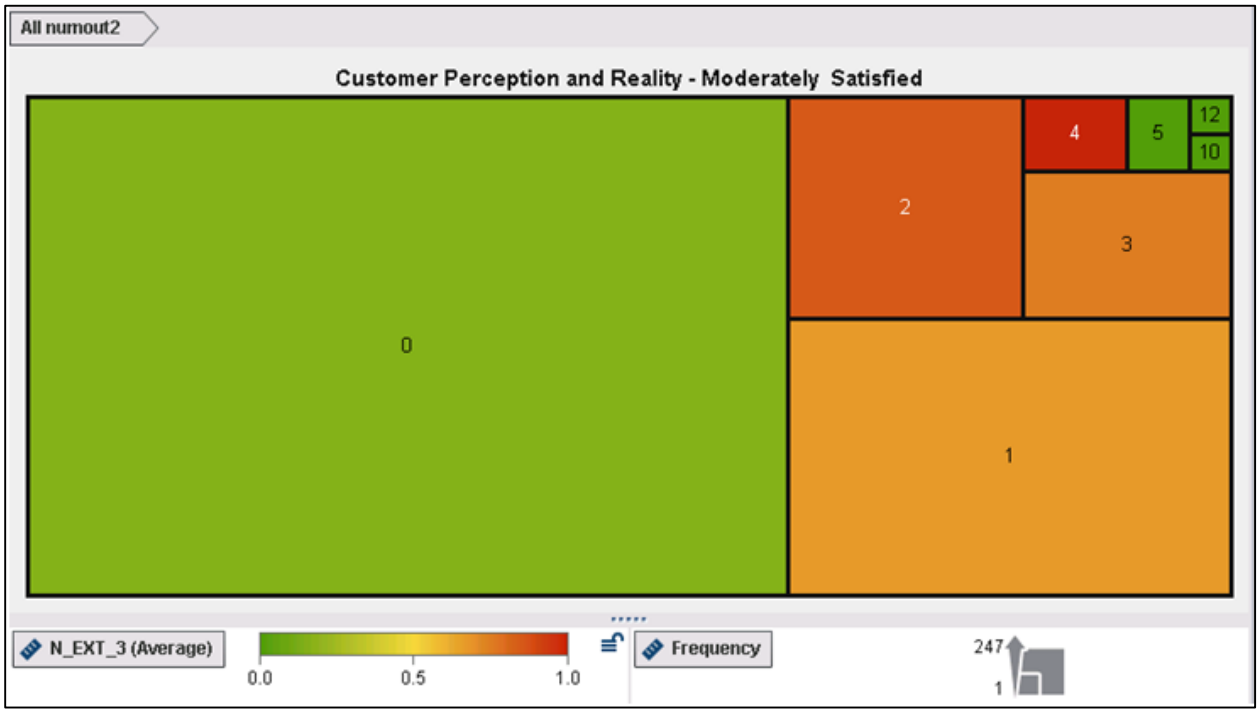

Figure 5: Customer Perception versus Reality on Reliability of Service – Moderately Satisfied Customers

(Source: SAS® Enterprise Guide)

While perception does not always align well with the actual number of outages experienced by customers, this does not mean that that actual reliability is unimportant to customers in forming perceptions. Rather, within the context of common customer experience there is not a strong correlation between perception as expressed on customer survey responses and the actual number of outages to which a customer is exposed.

There are a number of plausible explanations for this disassociation. For example, some outages occur during time periods when customers are not home. If the customer is not present to experience the outage and observe its duration then their perception would be likely influenced by the after-effects of the outage. For instance, the only indication that an outage occurred might be the need for the customer to reset clocks or other electronic devices at the premise.

In any case knowing that reliability perception is an important contributor to overall satisfaction provides the impetus to further investigate what drives this perception.

One technique for drilling down into reliability perception was provided by the SAS Enterprise Miner Decision Tree node. After creating a data source in Enterprise Miner, the decision tree target variable was set to the survey response for "satisfaction with reliability." The node was then executed with a maximum branch value of 2 utilizing the ProbChisq method of searching for and evaluating candidate splitting rules in the presence of a nominal target.

Decision tree results indicated "satisfaction with ability to restore power following an outage" and "working to keep outage durations to a minimum" were important sub-perceptions which contributed to customers' higher-level satisfaction with reliability. Both of these sub-perceptions are likely influenced by customer observations of utility crews performing field work, communications from family and friends, and media exposure. Message content focusing on these areas may therefore be effective for improving reliability perceptions in this group with a commensurate improvement in overall satisfaction.

Throughout this study it is important to keep in mind that actual outage counts were in direct competition with perceived outage counts when competing on a level playing field for entry into the models. In all cases the perception variables won the competitions.

RESULTS: GOING BEYOND THE OBVIOUS

Another approach to investigating the gap between customer satisfaction and reliability perception relies on the rich collection of unstructured data collected in open-ended survey questions. SAS® Visual Analytics Text Cloud yields an interesting summary of the comments impacting customer satisfaction. In the following text cloud depictions larger fonts correspond with a greater ability to predict satisfaction.

Figure 6 represents a text cloud for highly satisfied customers. One interpretation of the cloud is that this group holds positive sentiments of Ameren Missouri and places a great deal of importance on reliable electric service.

While this customer group does not represent a class to target for satisfaction improvement efforts, it is important to sustain their perceptions in order to prevent "backsliding." This could be accomplished in part with the help of messages reinforcing high reliability performance communicated through bill inserts, personal energy reports and other channels of communication.

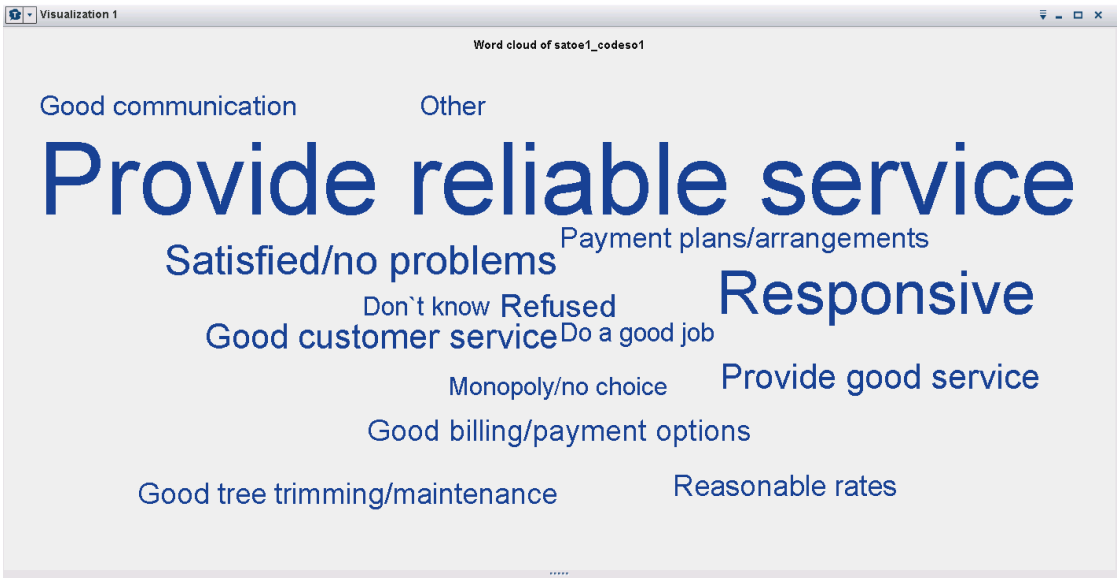

Figure 6: Text Cloud highlighting factors for Customer Satisfaction among Highly Satisfied Customers

(Source: SAS® Visual Analytics – Text Cloud)

In order to *improve* overall satisfaction it would be most effective to focus on the group of moderately satisfied customers where a more diverse set of responses come into play. One view of the text cloud in Figure 7 is that moderately satisfied customers tend to express negative sentiments and notice what's wrong. This is in contrast to the highly satisfied customers who tend to give good marks for what's right.

Concerns of the moderately satisfied group ranged from reliability to customer service issues. The greatest challenge in addressing this group would be to construct and deliver diverse message content which addresses the expressed sentiments. Opportunities for improving process performance, when identified, should also not be neglected for this group.

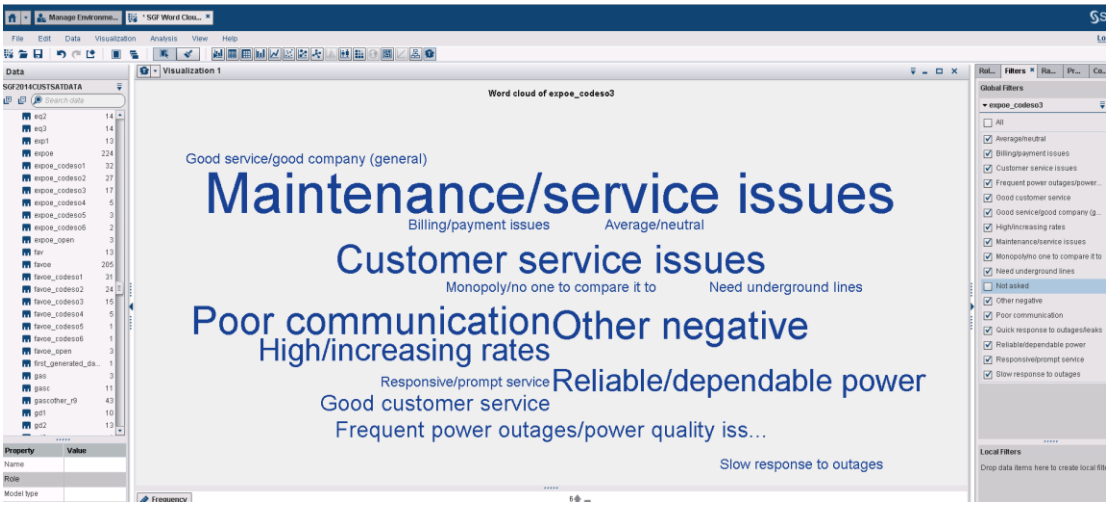

Figure 7: Text Cloud highlighting Customer Expectations for Moderately Satisfied Customers

(Source: SAS® Visual Analytics – Text Cloud)

Dissatisfied customers, who represented less than 5% of the survey respondents, predominantly expressed a need for more information (Figure 7). It was notable that this group contained a relatively high proportion of newer accounts, which may be an indication that satisfaction could increase as some of these customers gain additional service experience over time.

Figure 7: Text Cloud highlighting Customer Expectations for Dissatisfied Customers

(Source: SAS® Visual Analytics – Text Cloud)

CONCLUSION

In a campaign to improve customer satisfaction through reliability-related drivers what is the optimum balance between improving actual performance and improving perception? Ameren Missouri has already made large investments to create a robust and reliable electric distribution system. In fact, recent industry benchmarking places Ameren Missouri in the top quartile of participating nationwide utilities for system average interruption frequency. A beneficial investment in the future, then, will be to communicate this high level of performance to customers in a way that positively influences reliability perception. In other words…

Sustain the perception of highly satisfied customers -
Prevent "backsliding" of this group by reinforcing the perception of good reliability.

Improve the perception of moderately satisfied customers -
These customers can be positively influenced with diverse message content and multiple communication channels; if successful the results will be a significant increase in overall satisfaction.

Learn from the experience of dissatisfied customers -
While a small percentage of the total, dissatisfied customers may be experiencing less-than-satisfactory levels of service. Listen to what they say - their expressions may help identify problem areas in customer-facing processes.

A better understanding of what influences overall customer satisfaction makes it possible to focus available resources on performance and perception gaps which are most important to customers. Predictive and visual analytics tools enable this process by allowing, for example, the recognition of differences between reliability perception and real world experience. With this insight actions can be developed and executed to continue the quest for ever-higher levels of customer satisfaction.

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