Emphasizing the Best Options for Energy Savings: Overcoming Choice Overload in a Commercial Energy Assessment Program

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ABSTRACT

People frequently make no decision at all when they are faced with many potential choices. This phenomenon – referred to as choice overload - may explain why customers that receive an energy assessment often implement none of the recommended savings measures. If so, focusing customer attention on a few of their best options for saving energy should lead to increased measure implementation and increased savings.

Franklin Energy Services teamed with Xcel Energy to conduct a randomized field trial that tested a strategy for overcoming choice overload. All customers requesting assessments from Xcel Energy were randomly assigned into two groups. Customers in Group 1 received a cover letter that listed their best options for saving energy from among the recommendations in the accompanying energy assessment. Customers in Group 2 received a cover letter that did not mention any options for saving energy, and only referred them to the accompanying assessment. The energy assessment reports for both groups followed an identical format including a custom list of energy saving recommendations. Installed measures and first year savings were tracked through incentive applications received by Xcel Energy. Group 1 - the treatment group - which had received the best options cover letter, installed more measures and achieved an 80% higher mean electric savings than Group 2 - the control group – although the results lack statistical significance.

This paper presents the theory behind the design, lessons learned during the trial, savings results, and additional research ideas.

Introduction

Academic research into decision making has determined that how information is presented to people influences the decisions that they make. Changing how information is presented is known as message framing, (Hammond, Keeney, and Raiffa 2006). More specifically, in a phenomenon known as choice overload, people will often make no choice at all when presented with a long list of options for moving forward – effectively choosing to stay with the status quo, (Tversky and Shafir 1992). These findings may have implications for utility efficiency programs that present customers with large numbers of options for improving energy efficiency in their buildings or facilities, and suggest that a strategy of emphasizing a small number of options may result in increased adoption of recommended energy efficiency measures and greater savings.

This study did not limit choices, as customers received assessment reports with a full set of efficiency recommendations. Instead, it tested a strategy of emphasizing the best options from among all of the recommended efficiency measures, and compared results against a group of customers who received assessments that did not emphasize any of the recommended efficiency measures.

The goal was to determine if emphasizing the best options among a suite of energy efficiency recommendations would result in greater overall savings than presenting a suite of recommendations without stressing any best options.

One prior study was found that related directly to this concept. A 2011 retrospective looked at savings that followed energy assessments, and found that the number of options presented in energy efficiency reports did not impact the adoption rate for projects, but the order in which the recommendations are presented did impact adoption rates, (Muthulingam et al 2011). In their conclusions, Muthulingam et al. suggest that the most important efficiency recommendations be listed first, as they will be more likely to be adopted. Although the current study design was developed without prior knowledge of these two findings, the design aligns with both. This study did not limit the number of recommendations, and it did put the best recommendations up front in the cover letters of the treatment group.

Methodology

Question of Interest

The main question of interest was, "Does emphasizing the best options for energy savings lead to achieving more savings?" The answer was determined to rest with the mean savings achieved by each of the two groups. Customers in Group 1– the treatment group - each received a report cover letter emphasizing their best options for energy savings. Customers in Group 2 – the control group – each received a report cover letter than did not mention any specific energy saving options. A difference in mean savings between the two groups would be attributed to a treatment effect (emphasizing the best options for energy savings leads to higher achieved savings).

Onsite Energy Assessment Protocol

This study was overlaid onto the existing Xcel Energy Onsite Assessment offering for Commercial customers in Minnesota. As such, it followed the existing processes and procedures in place for the assessments and resulting reports. The Onsite Assessment offers customers three levels of energy assessments. In order of most basic to most in depth, those assessment levels are: Walkthrough, ASHRAE Level 1, and Engineering.

The basic process followed is:

1) Incoming requests for assessments are forwarded to Franklin Energy.
2) The request is assigned to an Energy Advisor or Energy Engineer – hereafter referred to as EA.
3) The EA contacts the customer and arranges for a site visit.
4) On site data is gathered.
5) An assessment report is delivered to the customer (via mail or in person)
6) The EA contacts the customer and asks for a follow-up meeting to go through the report in detail
7) The follow-up meeting is held (or not, as the customer determines).

Best Options Study Protocol

The following SRS study design was overlaid on top of the Onsite Energy Assessment protocol:

1) Walkthrough and ASHRAE Level 1 assessments conducted by Franklin Energy were included in the study. (Engineering level assessments and assessments done by entities other than Franklin Energy were not included in the study).
2) Incoming requests for energy assessments were randomized into two treatment groups, alternately assigning them to Group 1 or Group 2 in the order the requests arrived.
3) Treatment Group 1 received cover letters with their written energy assessments that stressed a single "best option" for energy savings.
4) Treatment Group 2 received cover letters with their written energy assessments that did not stress any particular options.
5) The content of the written reports for both Group 1 and Group 2 followed the current format used for Xcel Energy's Onsite Energy Assessments.
6) The best option was defined as an electricity saving measure meeting the following criteria:
    a) Incentives for the measure are available from Xcel Energy;
    b) Simple payback for the measure, including incentives, must be less than 5 years;
    c) The measure has the shortest simple payback of all recommended measures, and is estimated to save 3% or more in annual electricity costs;
    d) If no recommended measure has estimated savings of 3% or more, then the best option is the measure with the shortest simple payback; and
    e) If no recommended measure meets criteria a through d, then that assessment will not be included in the study.
7) During any follow up visits by the EA, the best options were again stressed to customers in treatment Group 1, but no such emphasis was stressed for Group 2.
8) The EA helped the customer to move forward with acquiring any and all measures in which they showed interest.
9) The study continued for one calendar year, with the expectation of conducting 80 energy assessments during that time (N=80).
10) Energy savings estimates made in the written reports were considered into the analysis conducted for adopting recommended measures.
11) Differences in energy savings between the two treatment groups was analyzed for statistical significance, using the student's t-test.
12) Significant differences in savings were attributed to a treatment effect.
13) The independent variable is "stressing a single best option" or "not stressing a single best option." The dependent variable is the total energy savings of each group. A secondary dependent variable is the number of recommendations installed by each group.

Additional criteria

1) Projects that recommend a single type of change for multiple devices are considered to be one measure, based on the calculations resulting from the recommended number of devices changed. Example 1: "Install occupancy sensors in 20 private offices" is

considered to be one measure. Example 2: "Replace ten 200W incandescent bulbs with 50W CFL bulbs" is considered to be one measure.

2) Energy savings were tracked based on information from incentive applications received by Xcel Energy.

Execution

Random assignment of assessments into the two groups ran from February 15, 2012, until February 28, 2013. Savings were tracked for incentives received by Xcel Energy from February 15, 2012 until April 30, 2013.

The project coordinator and EAs were trained to follow the protocol and treat customers in both groups the same, except for the independent variable. All customers were given the same level of service, with the only variable being the emphasis on the best options for Group 1, and no such emphasis for Group 2.

Data Collection

Throughout the study, Franklin Energy staff stored all documents related to the assessments in a password secured cloud based storage site. Access to the site was limited to personnel associated with the program.

Xcel Energy provided Franklin with information on incentive applications received for all customer premise numbers that were included in the study. Xcel provided: the account number, the program, a generic description of the measure installed, kW reduction, kWh savings, rebate amount, creation date for the opportunity, and close date.

Data Analysis

Measures were considered for inclusion in the analysis if they were installed after the delivery date of the assessment report, but before April 30, 2013.

The criterion for achieved savings was "incentive application received by Xcel Energy." Xcel Energy codes incentive applications based on the progress of the project and the application. Those codes are:

- Prospecting
- Identification
- Definition – a formal vendor proposal for the project exists
- Pre-Approval – project savings have been verified by Xcel based on proposal
- Measure Implementation – project in process of being implemented
- Measure Validation – project most likely complete, but verification information being gathered, savings amounts have been verified by Xcel through TRM or custom analysis
- Rebating/Crediting – project completed, but rebate has not been paid
- Final Application Review – project completed and rebate paid
- Closed – Won

Projects coded Measure Validation, Rebating/Crediting, Final Application Review, and Closed-Won were determined to meet the criterion of "incentive application received by Xcel Energy" and were included in the analysis.

A review of each cover letter and assessment report identified fifteen customers that had not received a cover letter with their assessment report. These customers were excluded from the

analysis. One additional assessment was located that had not been included in the original count of 101 assessments. The net result of removing 15 assessments and including one additional assessment was that 87 assessments were included in the analysis. Several customers had received the wrong cover letter; several Group 2 customers received a "best option" recommendation and one Group 1 customer received no "best option" recommendation. Since the cover letter was the only differentiation between the groups, these customers and assessments were simply placed into the correct group for analysis.

MS Excel was used for statistical analysis. Descriptive statistics were developed for the mean savings per group (=AVERAGE) and the standard deviation (=STDEV.P) in savings per group. The t-test (=T.TEST) was used to test for statistically significant differences in the mean savings of the two groups.

Differences from Original Research Design

The original design called for a single best option to be called out in the cover letters. In the field, this proved to be more complicated than in the design room. Of the 47 customers in Group 1 – which received cover letters emphasizing their best options for energy savings – 36 received a letter emphasizing a single best option, 5 received a letter emphasizing two best options, and 6 received a letter emphasizing three best options. Of the 11 cover letters emphasizing more than 1 best option, one letter emphasized a best option for each of the customer's three buildings, one letter emphasized two related energy savings measures best installed together, and nine letters emphasized 2 or 3 options that the EA identified as the best savings opportunities for the customer based on the EA's experience and an earlier protocol unrelated to this study. While the letters emphasizing more than one best option did not follow the protocol, they still emphasized the best options for energy savings, versus mentioning no best options for energy savings. Therefore, these customers and any associated savings were included in the analysis.

Treatment of Outliers

One customer achieved first year savings of 474,009 kWh, while the mean savings of the other 86 customers was 2,858 kWh. To determine if this outlier was solely responsible for differences in the mean savings between the groups, analyses were conducted both with and without this outlier.

Results

Table I. Initial Number of Assessments by Type

Group	ASHRAE 1	Walkthrough	Total
1	28	22	50
2	14	37	51
Total	42	59	101

Customers receiving two types of assessments, ASHRAE Level 1 assessments and Walkthrough assessments, were included in the study.

Table II. Final Assessments for Analysis

Group	Assessments Included in Analysis
1	47
2	40
Total	87

For a number of reasons, 14 of the original 101 assesments were not included in the analysis.

Table III. Results of Initial Analysis of Group 1 and Group 2

	Group 1 (N=47)	Group 2 (N=40)
Mean Savings	15,047	1,972
Standard Deviation Savings	69,703	9,108
Group 1 v Group 2 p=0.21 (t-test)		

Group 1 achieved mean first-year savings of over 15,000 kWh, while Group 2 achieved mean first-year savings of just under 2,000 kWh.

Table IV. Results of Analysis of Group 1a (very high savings outlier removed) and Group 2

	Group 1a (N=46)	Group 2 (N=40)
Mean Savings	3,629	1,972
Std Deviation Savings	16,893	9,108
Group 1a v Group 2 p=0.29 (t-test)		

Group 1a achieved mean first-year savings of over 3,600 kWh, while Group 2 achieved mean first-year savings of just under 2,000 kWh.

Table V. Summary of Results

	Group 1 (N=47)	Group 2 (N=40)	Group 1a (N=46)
Efficiency Measures Installed	17	9	16
Total kWh Savings	726,850	97,925	252,841
Mean Savings	15,047	1,972	3,629
Std Deviation Savings	69,703	9,108	16,893
Group 1a omits outlier with very large savings (474,009 kWh)			
Group 1 v Group 2 p=0.21 (t-test)			
Group 1a v Group 2 p=0.29 (t-test)			

Group 1 installed 17 efficiency measures and achieved a total first-year savings of 726,850 kWh. Group 2 installed 9 efficiency measures and achieved a total first-year savings of 97,925 kWh. Group 1a installed 16 measures, and achieved first-year savings of 252,841. Standard deviations in savings were quite high for all three groups.

Table VI. Number of Installed Energy Saving Measures

	ASHRAE 1	Walkthrough	Totals
Group 1	1	16	17
Group 2	5	2	7
Total	6	18	24

Group 1 customers receiving ASHRAE Level 1 assessments installed 1 measure. Group 2 customers receiving ASHRAE Level 1 assessments installed 5 measures. Group 1 customers receiving Walkthrough assessments installed 16 measures. Group 2 customers receiving Walkthrough assessments installed 2 measures.

Table VII. Installed Measures and kWh Savings by Assessment Type

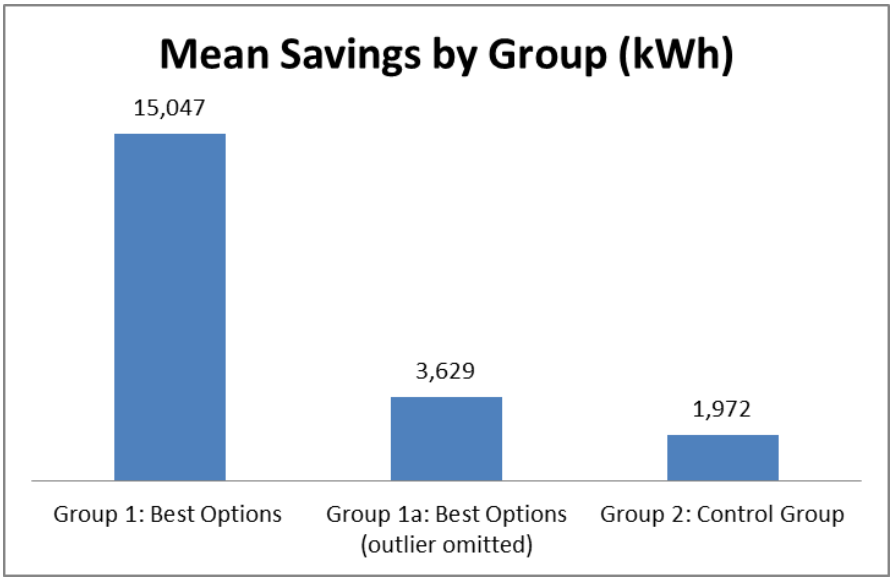
Type	# Assessments	# Measures	kWh Savings
ASHRAE 1	42	6	69,723
Walkthrough	59	18	716,373

The forty-two customers receiving ASHRAE Level 1 assessments installed 6 measures, and achieved 69,723 kWh in first-years savings. The fifty-nine (59) customers receiving Walkthrough assessments installed 18 measures, and achieved 716,373 kWh in first-year savings.

Discussion

In both comparisons, with and without the high savings outlier in Group 1, the mean savings for Group 1 appears to be considerably higher than for Group 2. As shown in Table III, the mean savings of 15,047 kWh for Group 1[1] is more than seven times the mean savings of 1,972 kWh for Group 2. As shown in Table IV, the mean savings of 3,629 kWh for Group 1a (outlier removed) is 84% higher than the mean savings of 1,972 kWh for Group 2. While the evidence trends towards a higher level of mean savings for Group 1 - the group that received cover letters emphasizing the best options for achieving energy savings - the lack of statistical significance diminishes the strength of any conclusion.

Figure 1. Mean Energy Savings (1st year kWh)



Split of Assessment Types in the Two Groups

The study design called for a random distribution of customers into the two groups without regard for the type of assessment requested (Walkthrough or ASHRAE Level 1), which created a potential confound. The random distribution design resulted in an uneven split of assessment types between the two groups: Group 1 had 28 ASHRAE Level 1 assessments and 22 Walkthroughs, while Group 2 had 14 ASHRAE Level 1 assessments and 37 walkthroughs. This split had the potential to skew the results by type of assessment. Anecdotal evidence from the DSM field suggests that a more expensive assessment means a higher commitment to energy

[1] All savings are for 1st year kWh.

savings, and thus more resulting measures and savings following an assessment. However, the results of this study show no support for that finding. The ASHRAE Level 1 assessments cost the customers more, yet there is no evidence that customers receiving ASHRAE Level 1 assessments installed more measures than those receiving Walkthrough assessments.

Interactions with the Xcel Energy Solar Rewards Program

While this study focused on energy efficiency, the study noted some interactions with the Xcel Energy Solar Rewards program. Xcel Energy requires an Onsite Assessment for customers to be eligible for Solar Rewards incentives. This requirement almost certainly causes some customers to request assessments for reasons related solely to receiving Solar Rewards incentives. Anecdotal evidence supporting this occurrence was found during the study period. An unspecified number of customers told the EAs that the reason for the Onsite Assessment was because it was a requirement to be eligible for Solar Rewards incentives. Since the study did not focus on Solar Rewards, this information was not recorded, nor were customers asked why they were interested in an assessment. The Onsite Assessment application has since been modified to ask this question, so Xcel Energy will gain a better understanding of why the customers are interested in an assessment.

Of the 102 assessments that were included in the study - including the ones removed from the analysis of efficiency savings - 17 customers installed a total 23 solar measures during the study period. (The solar measures were not included in the analysis of energy efficiency measures). Of those 17 customers, 9 requested solar incentives, but no energy efficiency incentives. This could be interpreted as the 9 customers only getting an assessment to qualify for a solar incentive. The other 8 customers requested incentives for both solar and efficiency measures. If the 8 customers initially requested an assessment for purposes of qualifying for a solar incentive, they may have been "cross-sold" on at least one efficiency measure. Conversely, it does not seem likely that customers originally interested solely in efficiency were "cross-sold" to a solar measure, since the EAs do not advocate solar measures, nor include solar measures as recommendations in the energy assessment reports. Therefore, it appears that the Solar Rewards program may have been serving as a feeder into Energy Efficiency programs. In the case of people requesting an assessment for the sole purpose of Solar Rewards eligibility, and that did not install any EE measures, Solar Rewards could be classified as a drain on resources for the EE programs. The Xcel Energy Onsite Assessment intake form has since been changed to ask customers for their reason(s) for wanting an assessment, which should help clearly define future interactions between the programs.

If some customers were receiving assessments for the sole purpose of eligibility for the Solar Rewards program, there may have been an impact on the number of efficiency measures installed during the study period. However, there would not necessarily have been any variation in those impacts across the two study groups, and therefore should not have been any impacts on the study findings.

Conclusions and Recommendations

While the results are somewhat inconclusive due to the lack of statistical significance, the costs of emphasizing the best options when delivering an energy assessment report are so low that it makes sense to do so. The strategy appears to be a no regrets approach, with an upside available at little cost, and no down side.

The recommendation is for utilities to consider the impacts of message framing when presenting recommendations resulting from an energy assessment. Give the customers information on all energy saving opportunities, but emphasize the best options for saving energy at the front of the report. The criteria used to determine the best opportunities for saving energy can be set by the individual program, but might include:

1) Return on investment (often expressed in terms of simple payback period)

2) Savings per year (setting a minimum threshold in absolute or relative terms, e.g. minimum kWh, or minimum % of annual kWh consumption)
3) Other non-energy related benefits

While this study was done in a commercial program, the results appear to be applicable in residential programs that offer energy assessments. The unknown underlying behavioral or decision making mechanism should work in multiple settings when energy assessments are done.

If utilities choose to start employing these recommendations, pilot programs with experimental set-ups and controls are in order. Even though the results of the study are promising, the results lack statistical significance, and additional testing is warranted. The study design appears to be sound, and could form a strong basis for pilot programming. The lack of statistical significance is likely related to the small sample size.

An additional recommendation is for energy efficiency pilot programs to apply other concepts from social science research to achieving savings. There is enormous promise for energy savings driven by applying concepts from the social sciences, and many of those concepts have never been tried in the energy efficiency program field. Those searching for new behavioral program ideas may want to review "Paving the Way for a Richer Mix of Residential Behavior Programs" by Ignelzi et al., (2013). This white paper contains a treasure trove of theories and concepts that can be applied to achieve savings, as well as a set of behavioral intervention strategies for applying those concepts.

References

Hammond, J., R. Keeney, and H. Raiffa. 2006. The hidden traps in decision making. *Harvard Business Review, 84*(1), 118-126.

Ignelzi, P., J. Peters, K. Randazzo, A. Dougherty, L. Dethman, and L. Lutzenhiser. 2013. "Paving the Way for a Richer Mix of Residential Behavior Programs." Prepared for the California Investor-Owned Utilities: Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, and Southern California Gas. San Francisco, CA. http://www.calmac.org/publications/Residential_Behavior_White_Paper_5-31-13_FINAL.pdf

Muthulingam, S., C. Corbett, S. Benartzi, and B. Oppenheim. 2011. Investment in energy efficiency by small and medium-sized firms: An empirical analysis of the adoption of process improvement recommendations. *UCLA Anderson School of Business - Decisions, Operations & Technology Management Working Papers*, http://www.anderson.ucla.edu/faculty/decisions-operations-and-technology-management/working-papers.

Tversky, A., and E. Shafir. 1992. Choice under conflict: The dynamics of deferred decision. *Psychological Science, 3*(6), 358-361.

Xcel Energy Turn Key Services, accessed June 2013, http://www.xcelenergy.com/Save_Money_&_Energy/For_Your_Business/Energy_Audits_&_Studies/Turn_Key_Services_-_MN