

Effects of Using WebTV Graphics on the Accuracy of Self-Reports

Jane S. Peters, Research Into Action, Inc.

ABSTRACT

In 1993, the Energy Center of Wisconsin¹ began conducting a periodic assessment of appliance sales. This effort has involved a telephone survey with random samples of consumers to track appliance purchases. Key to the success of the survey is that consumers understand what appliances and technologies are being asked about. Certainly it is reasonable to expect a consumer to know which appliance is their refrigerator, but do they know whether they have compact fluorescent lamps or a horizontal axis washing machine?

To test the reliability of responses, the 2001 Appliance Sales Tracking Survey conducted a pilot of the survey using a WebTV based methodology. Consumers were asked about and then shown graphics of some less common technologies such as different types of compact fluorescent lamps, different configurations for front loading and top loading washing machines, torchiere lamps, and the location of model numbers for refrigerators. They were also asked about and then shown a graphic of the ENERGY STAR[®] label.

The results of this study point to ways to improve telephone data collection for appliance sales tracking, identified the direction of bias that may occur from telephone surveys, and also demonstrates the strengths and weaknesses of WebTV as an alternative for collecting appliances sales data.

Introduction

Whenever consumers are asked about the appliances and energy using equipment in their homes, researchers wonder how much of what the consumers say is factual. This is always a concern when estimates of savings and market share are being determined based on the questions, and especially so when the desire is to observe whether there are changes over time.

One way to deal with this problem is to always ask the same questions. Then whatever bias occurs will be consistent. Yet, at some point it is generally desirable to attempt to estimate the level of bias. Is it large or small?

The Energy Center of Wisconsin (the Center) has conducted a telephone Appliance Sales Tracking (AST) survey of Wisconsin residents every two years since 1993. The purpose of the survey is to track the purchases of appliances and to obtain information from purchasers to estimate the efficiency of the appliance stock being purchased.² Respondents are asked whether they have purchased any of five targeted appliances in the past 12 months. Purchasers are then queried about the appliances they have purchased, up to a total of three appliances. Respondents purchasing fewer than three appliances, including those who have not purchased any, are asked a series of questions on lighting purchases. All respondents are

¹ At that time the Wisconsin Center for Demand-Side Research.

² A random digit dial (RDD) sample based telephone survey to track appliance sales was selected in 1993 as the most efficient means for collecting information on actual in-state purchases. Data collected from other sources were either more costly or could not be directly attributed to in-state purchase and use.

asked demographic questions. The survey has been administered to 3,000 households each time in order to identify approximately 200 household purchasers of the targeted five appliances—refrigerators, water heaters, forced air furnaces, central air conditioners, and clothes washers.

In the 1999 survey, the Center included questions about the ENERGY STAR[®] label. Because the label is primarily marketed as a graphic rather than an auditory label the Center was concerned that the telephone survey would not fully capture label awareness. A study of ENERGY STAR[®] label awareness by the Consortium for Energy Efficiency (CEE) in 2000 (Cadmus Group & Xenergy 2001) identified the option of using a WebTV tool for survey implementation and using a graphic of the ENERGY STAR[®] label.³ The results for ENERGY STAR[®] label awareness in the CEE study did differ, with the WebTV survey finding a higher level of awareness than the telephone survey method. In requesting bids for the 2001 AST, the Center asked for proposals to explore the use of WebTV as an optional delivery mechanism.

Research Into Action, Inc. and Opinion Dynamics Inc., proposed to conduct the AST using the telephone and RDD sampling. We also offered to conduct a pilot using WebTV and to use the Knowledge Network's WebTV capability to both fine-tune the questions for the telephone AST and to potentially provide a means to estimate the percent of false negative and false positive responses to the telephone survey.

Method

We developed a WebTV survey to test a variety of issues. These issues included the ability of a graphic to change responses to questions about the ENERGY STAR[®] label, torchieres, compact fluorescent lamps, and resource efficient washing machines. We also tested respondent willingness to obtain model serial numbers for the refrigerators and input the information into the WebTV.

We conducted a pretest of the survey with 20 people, made some modifications to the survey and then administered the survey to 437 Knowledge Network members residing in Wisconsin during the summer of 2001. In most of the examples we asked the respondent to answer a question without a graphic and to then answer it with a graphic. This was done to permit a comparison of response to the verbal telephone survey version (approximated by the questions without graphics) and the WebTV version of the question with a graphic.⁴

³ WebTV tools are dedicated devices for accessing the Internet and doing e-mail. Knowledge Networks uses random digit dialing to recruit network members who agree to participate in surveys. Members are then provided with a WebTV tool and asked to participate as panel members in a specific number of surveys each year. A benefit of using WebTV is the more rapid response time by respondents, since all can respond at the same time.

⁴ The WebTV sample of 437 is small relative to the telephone random digit dialed (RDD) sample of 3,000 used for the full-scale 2001 AST. A large sample is required to reach sufficient recent purchasers of appliances to provide statistically reliable results. The WebTV population base is currently insufficient to achieve the same number of completions that can be obtained with a telephone survey.

Results

The Survey and Use of Graphics

We observed no specific difficulty with any questions that have been previously used in the RDD AST telephone survey. Of the 437 respondents, 78% (336) said the graphics helped while the remaining respondents said they did not help.

A little less than 60% of respondents (197) provided a comment on the use of graphics. Respondents who did not like the graphics were more likely to comment than those who said the graphics helped. A vocal minority of these 197 respondents said that they did not like the redundancy of being asked a question twice, without and then with graphics. Sixty of the 197 respondents who provided comments specifically said “no” they did not find the graphics helpful, though about 10 of those also said the graphics were “fine” or “good.” Over half of the 197 said that the graphics were either useful to them, or would have been if they were not already familiar with the topic. Among the comments received on specific graphics, the graphics for the ENERGY STAR[®] Label and the CFLs were more likely than other graphics to be identified as useful.

ENERGY STAR[®] Label

As mentioned, the graphics for the ENERGY STAR[®] label were among those that commenting respondents found most useful. At least one respondent specifically noted that the graphic led to a change in his or her answer. The graphic question alone in comparison to the single question asking about recognition of the brand “ENERGY STAR[®]” provides the following estimate of false positives and negatives for the 368 who responded to the initial verbal question (see Table 1).

Table 1. Estimate of False Positives and Negatives for ENERGY STAR[®] Recognition

Category	Respondents	Percent
False positive identification of Energy Star [®] label from verbal question	13	4%
False negative identification of Energy Star [®] label from verbal question	62	17%
Response to verbal question unchanged by graphic	293	79%
Total responses	368	100%

The verbal question simply asking awareness of the ENERGY STAR[®] label generates a substantial number of false negative as well as some false positive responses. Consequently, the telephone survey was designed to refine the estimates of ENERGY STAR[®] recognition through a series of questions. First, respondents are asked if they have “ever seen or heard of the ENERGY STAR[®] label...” If they have not or do not recall, they are asked the prompted awareness question: “Sometimes the ENERGY STAR[®] appears on the Yellow Energy Guide label and sometimes it is on a label or sticker by itself. Thinking again, have you seen the ENERGY STAR[®] label?”

The WebTV results indicated that this additional question about where to look for the label produced only a small increase in the number of people who said they had seen or heard of ENERGY STAR. A small number of people, 13 (5%) of the 240 who did not recognize the verbal statement “ENERGY STAR® label,” did believe they had seen it when information on where to find the label was given. This awareness was confirmed for nine of these 13 respondents (69%) who subsequently reported recognizing the ENERGY STAR® logo in the graphic question.

Also among the 240 people who had responded “no” to the verbal recognition question were 46 (19%) false negative responses. These are responses of “no” or “don’t know” to the verbal question and yet a response of “yes” to the ENERGY STAR® logo in the graphic question.

These analyses indicate that the graphical display of the ENERGY STAR® label improved response more than the prompted question about where to look for the label. Because respondents benefited from seeing the label, we determined that a verbal description of the ENERGY STAR® label should be included in any telephone survey, rather than just a description of where the label might be found. The resulting AST telephone survey, which was implemented in the fall of 2001, first assessed respondents’ unprompted or unaided recognition of the ENERGY STAR® label and then asked two prompted or aided recognition questions. The unaided question followed questions asking awareness of and, for those aware, the meaning of the Energy Guide label. The unaided ENERGY STAR® question was: “Have you seen or heard of any other labels or logos about energy on appliances or on other products for your home?”

This question was followed, for those who answered “no” or “don’t know,” with the first aided question “Have you ever seen or heard of the ENERGY STAR® label, which is on some new appliances, electronic equipment, and home products?” Again, there was an additional aided question for those who answered “no” or “don’t know:” “The ENERGY STAR® label is on some new appliances, electronic equipment, and home products. It is a semi-circle with the word “energy” and a star on it. Often the background is a blue and green globe. Do you recall having seen or heard of the ENERGY STAR® label?” This final question built on our findings from the WebTV survey that respondents benefited from being able to “see” (in this case, in the mind’s eye) the logo.

All respondents who reported seeing or hearing about the ENERGY STAR® label, whether in response to an unaided or aided question, were asked what messages came to mind when they saw the label.

We found that 22% of respondents had unaided awareness of the ENERGY STAR® label and had an adequate understanding of its meaning. Another 18% of respondents said that they had seen or heard of the label, yet their response to what the label means conveyed an inadequate understanding. These two groups constitute a total of 40% who claim some recognition of the ENERGY STAR® label with 60% indicating no awareness of the label (Research Into Action & Opinion Dynamics 2002).

This compares with an awareness estimate generated without graphics of 23%, and with the graphics in the WebTV survey of 43%, without assessing the adequacy of respondents understanding of the meaning of ENERGY STAR®. This suggests that the additional questions used in the telephone AST survey were, in fact, able to achieve comparable assessment of awareness to the graphic used in the WebTV pilot.

Clothes Washers

The telephone survey questions about newly purchased clothes washers led by asking respondents whether the washer was a top or front-loading machine. For the WebTV survey, we added a question about whether the washer was a particular model: Staber 2000, an EcoSmart, a Gold[®] High Efficiency, a Calypso[™], or a Resource Saver[®], all known to us to be top loading resource efficient clothes washers (RECW). We also asked respondents to provide a brand and model name or number of their washer. There were 33 recent purchases of clothes washers; three of these did not answer any of the questions about their new washing machine as they responded to questions about their new refrigerator instead.

The WebTV questions designed to differentiate different types of top loading machines did not seem to improve the accuracy of responses. Answers to the graphics of different agitator configurations showed no clear pattern compared with answers to the verbal question. Five respondents who indicated that they had one of the five RECW top loading machines subsequently; upon viewing the graphic, indicated their unit was a regular washing machine (false positive responses). Two people reporting top-loading machines indicated they did not have any of the type listed as RECW top loaders, but later chose the graphic of a Calypso[™] (false negative responses). None of these seven respondents provided a brand or model name, so we could not resolve the discrepancies in their responses.

The question about front-loading machines appeared to generate more accurate responses than the questions about top-loading machines. Five of the respondents indicated they had purchased a front-loading machine. Three provided the name “Maytag Neptune[®]” in the brand and model name questions. They also all selected the graphic for a front-loading machine. The other two respondents indicating they had front-loading machines also picked the graphic of a front-loading machine. All responses are described in Table 2.

Table 2. Effect of Graphics on Clothes Washers Responses

Question Responses	Top Loading		Front Loading	Total
	Regular	RECW		
Stated location for loading clothes washer	25		5	30
	Regular	RECW		
Responses about top loaders	17 (1 refused)	5	NA	
Responses to graphic of regular washer	18	5	0	23
Responses to graphic of Calypso [™]	2	0	0	2
Responses to graphic of front loader	0	0	5	5
Total	20	5	5	30

We do not believe that the questions were effective for differentiating top-loading clothes washer types. Furthermore, because we had a limited number of respondents that provided the brand and model number, we could not fully confirm the effectiveness of the graphics. Since RECWs can have a variety of loading and agitation configurations and do not

have readily accessible nameplate information, using a survey to assess the types of clothes washers purchased is difficult, even with graphics.

Refrigerator

We asked respondents to get their refrigerator model number from the inside of the freezer compartment and put it into the survey. The responses to the refrigerator model number were poor. The 35 respondents who had recently purchased a refrigerator and an additional 221 respondents were shown the refrigerator questions. Apparently, many of the respondents skipped through the pages without responding. Twenty-four of the 256 queried respondents (or 9%) provided a model number; 29 indicated they could not find a model number and six gave a reason for not taking the time to look. The remaining respondents skipped the model number question.⁵

The WebTV approach obtained a poor response on model numbers for refrigerators, much lower than the 42% of respondents to the 2001 telephone AST who accurately reported this information. There is no way to persuade a panel recruited for WebTV that they really should complete the information, as they always have the choice to answer or not to answer by just terminating participation all together. The results of this effort suggest that a telephone survey, with a persuasive interviewer is more likely to get model numbers and brand names than a WebTV survey.

Compact Fluorescent Lamps (CFLs)

CFLs were the other graphic most frequently noted by respondents as helpful. However, detailed analysis of the CFL responses suggests that the impact of the graphic is smaller than for the ENERGY STAR[®] label.

Over 80% of the respondents had heard of CFLs prior to the survey. Sixty-one reported purchasing CFLs in the past 12 months and 116 report having installed CFLs inside or outside their home. All who purchased in the past 12 months reported they currently have CFLs installed inside or outside their home.

We asked the 116 respondents who said they had installed CFLs how many they had installed. Two respondents answered, “zero.” When asked to indicate the number of bulbs by type using the graphic, these two respondents indicated they had some “other” type of CFL. Similarly, five of the 116 respondents said the number of bulbs they had of each of four types shown in the graphics was “zero,” yet they indicated they had some “other” type of CFL. Assuming the accuracy of their response of “other” type of CFL, these respondents generated no false positive answers.

There were 40 people who initially said they did not have CFLs who changed their response when viewing the graphic. We conclude that 89% made a correct determination of whether they had CFLs from the verbal description; the question elicited 11% false negatives (see Table 3). This result suggests that there may be an underreporting of CFLs among the population on the order of ten percent.

⁵ WebTV survey implementers have discovered that respondents who are required to enter information that may be difficult to generate (such as having to walk to a refrigerator to get a model number) will often to terminate early rather than make the effort to fill in the information. As a result, WebTV implementers prefer to permit respondents to skip questions.

Table 3. False Negatives and Positives for CFLs Generally

Category	Respondents	Percent
False positive identification of CFL	0	0%
False negative identification of CFL	40	11%
Response unchanged by graphic	316	89%
Total Responding	356	100%
Refused, or did not answer	81	---

The WebTV survey included a question about “pin-based” CFLs. Twenty respondents indicated they have pin-based CFLs. However, half of these respondents (10) changed their answer when the graphic was shown. Two of the 95 people who reported having CFLs installed but who did not think they had a pin-based CFL indicated, upon seeing the graphic, they did have one. Thus, the graphic of a pin-based CFL provided a small degree of assistance to respondents. However, almost 90% of the responses remained unchanged by the graphic, as shown in Table 4. We estimate that the overestimate of pin-based CFLs with a verbal question alone is about 6-8%.

Table 4. False Negatives and Positives for Determination of Pin-Based CFL

Category	Respondents	Percent
False positive identification of pin-based CFL	10	9%
False negative identification of pin-based CFL	2	2%
Response unchanged by graphic	104	89%
Total Responses	116	100%

Lighting Fixtures

The graphics for lighting fixtures helped a few respondents confirm whether they have a torchiere. Notably, some of the negative comments about the use of graphics specifically singled out the torchiere question as not needing a graphic. As shown in Table 5, 94% of the responses were unchanged by the graphic. We conclude that the verbal description works satisfactorily with only about a 3-5% overestimation of the presence of a torchiere.

Table 5. False Negatives and Positives for Torchiere Identification

Category	Respondents	Percent
False positive identification of Torchiere	14	5%
False negative identification of Torchiere	4	1%
Response unchanged by graphic	265	94%
Total Responses	283	100%

Seventy of the 135 respondents with a torchiere floor lamp indicated they had a fixture with a halogen lamp. When shown the graphic, 12 of the 70 respondents did not check a halogen (9% false positives). For the 65 who did not think they had a halogen lamp, 4 determined that they did in fact have a halogen lamp once they saw the graphics (3% false negatives). Those with false positives typically indicated they actually had a circline or a pin-based CFL rather than a halogen. Table 6 shows that 88% of the responses were unchanged by the graphic for halogen lamps in torchieres. This implies about a 6% over reporting of halogens.

Table 6. False Negatives and Positives for Determination of Halogens in Torchieres

Category	Respondents	Percent
False positive identification of Halogens	12	9%
False negative identification of Halogens	4	3%
Response unchanged by graphic	119	88%
Total Responses	135	100%

Identifying pin-based CFL in torchieres was more difficult for respondents than identifying pin-based CFLs in other applications (as discussed in Table 4). As with the pin-based CFLs alone (Table 4) respondents were more likely to make false positive than false negative identifications of pin-based CFLs in torchieres (see Table 7). The confusion primarily seems to arise because both halogen and circline lamps can be pin-based. The graphic is important for pin-based lamps in torchieres; only 53% of the responses were unchanged by the graphic. We estimate that there could be as much as a 40% over reporting of pin-based lamps in torchieres when only a verbal question is used.

Table 7. False Negatives and Positives for Determination of Pin-Based CFLs in Torchieres

Category	Respondents	Percent
False positive identification of pin-based CFL	22	43%
False negative identification of pin-based CFL	2	4%
Response unchanged by graphic	27	53%
Total Responses	51	100%

Conclusions

The graphics clearly helped respondents discern whether they had seen the ENERGY STAR[®] label and whether they had seen or purchased specific types of CFLs. We conclude, however, that though the graphics helped with CFL identification, CFLs are relatively well known by consumers, as are torchieres. The graphic depictions of these items did not change the responses by more than 10%. What was difficult for respondents were the questions that asked them to make subtle distinctions between types of lamps such as between pin-based

CFLs and halogens, which are also typically pin-based. Given the difficulty of looking inside a torchiere once it is assembled, this is probably to be expected.

The graphics for the ENERGY STAR® label had a more noticeable effect, and one that suggests graphic based surveys are preferable when measuring awareness of the ENERGY STAR® label, which is mainly used as a graphic and rarely as a verbal or auditory brand. Nonetheless, by including a verbal description of the ENERGY STAR® label when the 2001 AST phone survey was implemented, we successfully prompted recognition of the label. As a result the 2001 AST found comparable rates of ENERGY STAR® label awareness to those found by the WebTV pilot using a graphic and by the 2000 ENERGY STAR® awareness survey fielded for CEE (Cadmus Group & Xenergy 2001).

The use of a graphic provided less assistance when we asked respondents to discern the differences between types of top loading clothes washing machines. Because neither model numbers nor brand names are consistently noted on clothes washing machines, there is little information readily available to provide clues to consumers about the product they have. We had hoped that a graphic of the agitator could prompt respondents to correctly identify the washer they had purchased. The graphics were not effective.

At the outset of this pilot we had hoped to be able to develop adjustment factors to use when phone surveys are conducted to obtain information on appliance purchases. For each of the items reported here we sought to determine whether a phone survey was likely to be over or under estimating the actual purchase behavior. The following table displays our estimate of the percent of under or over estimation that occurs using just a verbal phone-based question. Another alternative to using adjustment factors is to use better verbal descriptions, as we found by modifying the ENERGY STAR® label awareness question in the 2001 AST.

Table 8. Estimates of Adjustments Needed for Use of Verbal (Phone-Based) Questions

Item	Adjustment	Percent
ENERGY STAR® Label (recognition of label name)	Understated awareness	12-14%
CFLs	Overstated purchases	10-12%
Pin-based CFLs in use	Overstated purchases	6-8%
Torchieres	Overstated purchases	3-5%
Halogen lamp torchieres	Overstated purchases	5-7%
Pin-based CFL torchieres	Overstated purchases	38-40%

In conclusion, we found the pilot WebTV survey very useful for identifying where the verbal phone-based questions did not provide enough information for respondents to respond accurately. For these questions, we were able to modify the wording before fielding the phone survey. We strongly believe that graphics can improve the ability of respondents to recognize products for which they may not know the name, or to recognize labels such as the ENERGY STAR® label, which is mainly used as a visual not an auditory brand.

Yet, at the same time graphics can be difficult to make clear enough to overcome some recognition problems, such as with different types of agitators in top loading washing machines. Furthermore, WebTV pilots such as we used here with different types of question wording can become tedious and boring for the respondents, this puts the WebTV survey

provider in a difficult position. They like to keep their panel happy, a disgruntled panel could put their efforts at risk. Thus, while very useful, WebTV pilots should be used judiciously.

Similarly, the WebTV approach cannot persuade a reluctant respondent to get information they do not willingly want to provide. Thus, WebTV respondents were unwilling to go from their computer to their refrigerator to find and write down the model number from inside the freezer. Phone interviewers can persuade and cajole respondents to do this. A WebTV or computer based approach is dependent on respondent cooperation. Persuasive techniques such as incentives might help push the respondents to respond and probably should be considered if this approach is attempted for full-scale implementation, not just pilot level.

Finally, for surveys such as the AST, where large numbers of respondents must be sought in order to identify sufficient purchasers of different appliances, the WebTV approach will only work when the panels are orders of magnitude larger than they are in 2001. At that time, it may be possible to develop clear graphics, have good incentives and thus achieve response to surveys in record time.

References

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