# Obtaining Purchase Probabilities via a Web Based Survey: Some Corrections!

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This paper reports the corrected findings of a study that compared two purchase probability scales in a Web based survey: a pull-down version of the Juster Scale, and a written version of the Verbal Probability Scale. Respondents were recruited via a newsletter sent to clients of a local Internet provider, and directed to a Web site for the survey, where they were randomly assigned to a treatment group. In one task, respondents were asked to use a version of the probability scale to indicate the likelihood of choosing each of five billing options. The two forms of the scale produced similar estimates, a finding consistent with previous research. In a second task, respondents were asked to give the probability of using two services. A different price was used with each of four treatment groups, for each form of the probability scale. For both services, the Juster Scale elicited much lower probability scores than did the Verbal Probability Scale, at each price. As the options and services were not actually implemented, it is not possible to say which form of the scale produced the most accurate estimates.

Keywords:  purchase probabilities, Juster Scale, Verbal Probability Scale, web survey

## Foreword

A research note published in the previous issue (Parackal & Brennan 1998) reported research that compared the results of using both the Juster Scale and a printed form of the Verbal Probability Scale, in a Web-based survey. The two scales produced very different results. These results surprised the authors, who expected to find a very close correspondence between the two scales, in light of previous findings (Brennan, Esslemont & Hini 1995).  As the data had been carefully checked to ensure the differences were not due to computational errors, the authors concluded that, for some unknown reason, the scales were not equivalent.

However, a subsequent re-examination has confirmed that there was indeed an error in the data, and uncovered the cause of the problem. The authors are very grateful to Malcolm Wright, of the Marketing Science Centre at the University of South Australia, whose re-analysis of the reported data, and perceptive suggestions, prompted further scrutiny.  It turns out that the script written to capture the Web-based responses reversed the required order in which numerical codes were assigned to the Juster Scale scale items. This error, and subsequently misleading results, is regretted.  The corrected paper is now presented in full.

## Introduction

The unique characteristics of the World Wide Web, and the rapidly increasing importance of the Web for both communication and commerce, provide unique opportunities for Web based survey research.  However, while a great deal is known about questionnaire design and layout with regard to conventional surveys, it is not certain that these same methods will work on the Web.

Conventional questionnaires are text based, even in telephone and face-to-face surveys. But, given that the Web typically utilises sophisticated graphics, colour and animation, and can

use sound and video as well as text, it is not at all clear that a text based questionnaire would be suitable. Furthermore, the Web requires the use of keyboard, mouse or touchscreen to elicit responses, rather than a pen, pencil, or simple spoken response, and this has implications for the way questions and scales are presented.

One of the exciting features of the Web is that it can make use of multimedia applications, including virtual reality. An increasing number of sites are utilizing virtual reality software to allow visitors to inspect three dimensional models of products, such as cars, cameras, and medical equipment, to name a few (Urban, Hauser, Qualls & Weinberg 1997). This technology opens up possibilities for research, as it would be a relatively easy matter to manipulate product characteristics (colour and design and price, for example) to determine the best mix (see Burke 1997; Needle 1995, 1996).

To estimate demand for the variants, given that actual sales data may not be an option, an instrument such as the Juster purchase probability scale (Juster Scale) could be used. This scale, developed by Thomas Juster (Juster 1966), has been used quite successfully to estimate demand for a range of products and services, including durables, fmcgs, and even specific brands (Juster 1966; Day, Gan, Gendall & Esslemont 1991; Hamilton-Gibbs; Esslemont & McGuinness 1992; Seymour, Brennan & Esslemont 1994; Brennan, Esslemont & U 1995). Forms of the scale have been used in self-completion questionnaires (Gendall, Esslemont & Day 1991) and telephone surveys (Brennan, Esslemont & Hini 1995).

While the printed form of the Juster scale can easily be included in a Web based questionnaire, only a limited amount of information can be displayed on a computer screen at one time. Scrolling up or down pages to view the scale when it has disappeared off the screen would be tedious, as would repeated presentations of the scale. A more compact form of the scale is needed for Web applications. One option is to present the standard scale as a pull down menu. Another is to use a different use a different form of the scale altogether.

The purpose of this research note is to report the findings of a study that compared two purchase probability scales in a Web based survey: a pull-down form of the Juster Scale, and a written version of the Verbal Probability Scale. Although the response rate to the survey was rather low, limiting the conclusions that can be drawn from the experiments, the results do identify important issues regarding the use of these scales in Web surveys.

## Method

Respondents were recruited via a letter sent with a newsletter mailed by a local Internet provider to all of its clients. The letter briefly outlined the purpose of the study and encouraged people to participate. Those willing to do so were directed to a Web site. The letter informed readers that all participants would be entered into a prize draw for $200 worth of products or services from the Internet provider. The URL for the survey site was posted on the Internet provider's home page for the duration of the study. No reminder letters or emails were used, on the insistence of the Internet provider.

The questionnaire comprised three web pages. The first page required respondents to complete some demographic questions, and included a reminder about the prize draw. The second page asked respondents to indicate, using a purchase probability scale, the likelihood that they would choose each of five alternative billing options. The third page asked them to

indicate, again using a purchase probability scale, the likelihood of using two services ("in-shop" or "on-site" help) at a particular price.

Three separate Web pages were needed for the questionnaire to allow respondents to be allocated to different experimental treatments. This was accomplished by using CGI (Common Gateway Interface) scripts. Respondents who completed and submitted the first page of the three-page questionnaire were assigned to one of two treatment groups, each of which was exposed to a different version of the purchase probability scale used on the second page. On submitting the second page, respondents were assigned to one of four treatment groups, each of which was exposed to a different version of the pricing options listed on the third page.

On submitting the third page, respondents were sent to the Marketing Bulletin homepage. This displayed one of four versions of a banner ad, as part of another study (see Rae & Brennan, 1998). The research design is shown in Figure 1.
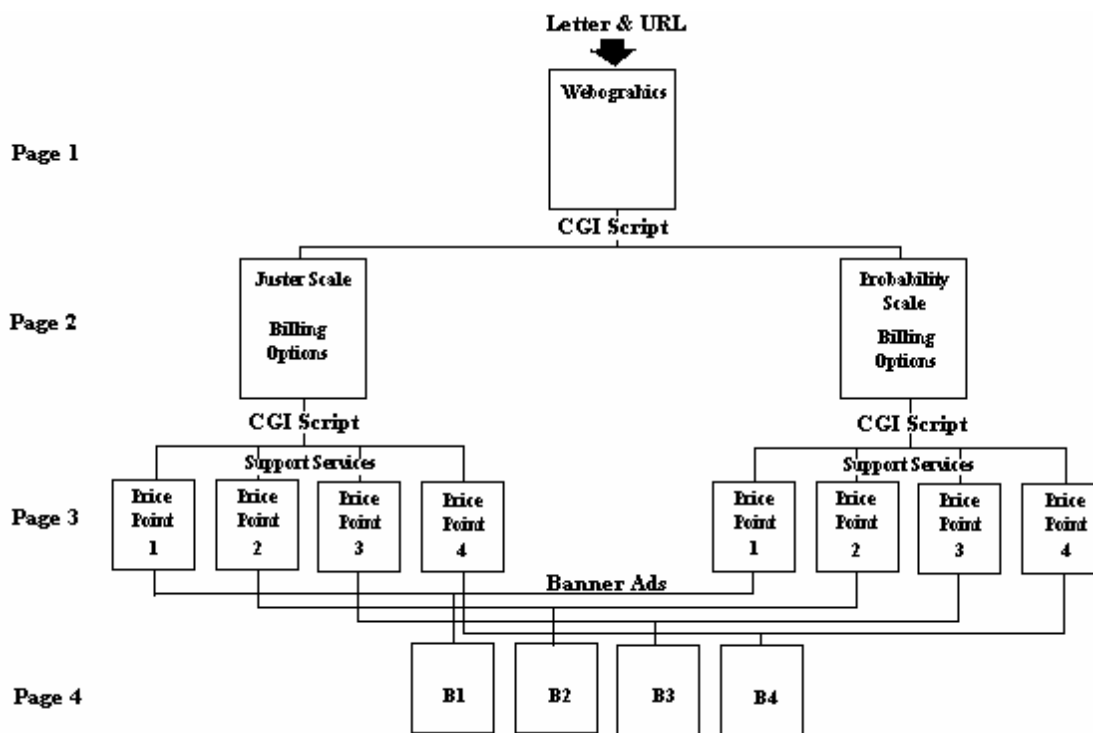


**Figure 1. Experimental Design**

## Instruments

The study compared two forms of purchase probability scale: The Juster Scale, and the Verbal Probability Scale.

**The Juster Scale**

The Juster Scale (Juster 1966) is an eleven-point scale from 0 to 10. Each point on the scale has a numerical and written description attached to it (see Figure 2).

The Juster Scale was presented as a drop down menu after each probability question. Respondents clicked on an arrow on the right hand side of an empty answer box to cause the menu to drop down, then clicked on the option they wished to select from the scale.

The first purchase probability question concerned the five billing options. These were described in the questionnaire at the top of the page.  The following directions for using the scale were provided:

> "We would like to know what the chances are of you choosing **each** of these five options. For each option, please select an answer from the pull-down scale provided.
>
> **If you are certain, or practically certain that you would choose the option then you should choose the answer '10'. If you think there is no chance or almost no chance of choosing the option, the best answer would be '0'. If you are uncertain about the chances, choose an answer as close to '0' or '10' as you think it should be**.*"*

Respondents were then asked questions of the form:

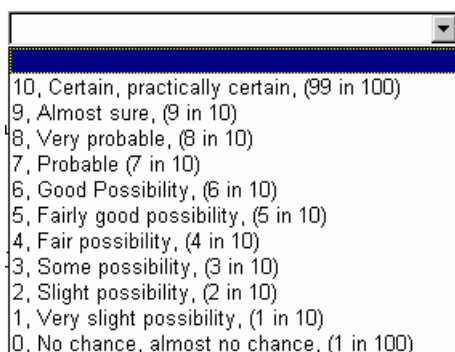"Taking everything into account, what are the chances that you would select **OPTION 1?"**

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┌──────────────────────────────────────────┬──┐
│                                          │▼ │
├──────────────────────────────────────────┴──┤
│                                              │
│ 10, Certain, practically certain, (99 in 100)│
│ 9, Almost sure, (9 in 10)                    │
│ 8, Very probable, (8 in 10)                  │
│ 7, Probable (7 in 10)                        │
│ 6, Good Possibility, (6 in 10)               │
│ 5, Fairly good possibility, (5 in 10)        │
│ 4, Fair possibility, (4 in 10)               │
│ 3, Some possibility, (3 in 10)               │
│ 2, Slight possibility, (2 in 10)             │
│ 1, Very slight possibility, (1 in 10)        │
│ 0, No chance, almost no chance, (1 in 100)   │
└──────────────────────────────────────────────┘
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**Figure 2. The Juster Scale presented as a drop down menu**


**Verbal Probability Scale**

The Verbal Probability Scale is an eleven-point scale with values ranging from 0 to 10. It has no graphical form; it is a text version of the spoken Verbal Probability Scale (Brennan, Esslemont & Hini 1995) developed for use in telephone surveys. Respondents were simply given the following direction:

> "We would like to know what the chances are of you choosing **each** of these five options. For each option, please give an answer between '0' and '10'.
>
> **If you are certain, or practically certain** ….<as for Juster Scale>

The respondents indicated their probability by typing their answer (a numeral between 0 and 10), into the space provided after each probability question.

Enter answer here: 

## Results and Discussion

### Scale Comparisons

In the first task, respondents were asked to give the probability of choosing each of the five billing options.

The results highlight a difficulty with this type of question. Implicit in the technique is the expectation that respondents will assign probabilities across the five options in such a way that the sum of the probabilities will equal 1, but this clearly did not happen. In reality, a respondent would have to adopt only one of the five options. But in this task, the respondents appear to have treated the options independently, that is, as if the other options did not exist when the probability of adopting a particular option was given. As a consequence, the sum of the probabilities often far exceeded 1. To estimate the proportion of the sample that would adopt each option, the probabilities had to be weighted.

To weight the probabilities, the probability for each option was divided by the sum of the probabilities across all five options. This was done separately for each respondent, before the mean probability for each option, across all respondents, was computed. It is these mean probabilities that provide the weighted estimates of the purchase rates for the five options. Both the unweighted and weighted probabilities for the five options are reported in Table 1.

While the weighting makes little difference to the rank order of the options, it does affect the interpretation of the results, as the unweighted probabilities suggest stronger demand for the five options. Unfortunately, it is not possible to say which level is the most accurate, but the need to weight the data at all is cause for concern.

Since both the treatments estimated the adoption rate of the five billing options in the same population, the estimates produced by the two scales should be the same. Indeed, the estimates produced by the two scales are very similar, suggesting that the scales are more or less equivalent, although the Juster Scale estimates tend to be lower than those produced by the Verbal Probability Scale. This is consistent with the findings of Brennan, Esslemont & Hini (1995), who developed the Verbal Probability Scale. Although the instructions to respondents in the original studies were spoken rather than written, the wording is identical. Brennan, Esslemont & Hini (1995) reported only minimal differences in purchases predictions using the Juster Scale (mailed out to respondents) and the Verbal Probability Scale (used in a telephone interview). The present result is therefore as expected.

Since the Internet provider did not introduce the billing options, it is not possible to say which scale provided the more accurate predictions. Until this validation is done, predictions undertaken using either of the scale, using the procedures used in this study, should proceed with caution.

**Table 1. Comparison of the unweighted and weighted mean probabilities for the two purchase probability scales**

|  | Juster Scale | | Verbal Probability Scale | |
| --- | --- | --- | --- | --- |
|  | Unweighted | Weighted | Unweighted | Weighted |
| Option 1 | 0.25 | 0.13 | 0.24 | 0.10 |
| Option 2 | 0.20 | 0.12 | 0.24 | 0.10 |
| Option 3 | 0.54 | 0.38 | 0.64 | 0.40 |
| Option 4 | 0.29 | 0.16 | 0.32 | 0.20 |
| Option 5 | 0.25 | 0.15 | 0.35 | 0.20 |
| | n = 84 | | n = 117 | |

## Price - Demand Estimation

In order to construct simple demand curves, respondents were asked to give the probability of purchasing two services. A different price was used with each of four groups, so the estimates are independent. The results, shown in Tables 2 and 3, show marked differences in the estimates produced by each scale. For both services, the Juster Scale gave much lower probabilities than the Verbal Probability Scale, at each price point.

**Table 2. Comparison of the mean purchase probabilities for the "in-shop" service**

| In-shop service | Juster Scale | | | Verbal Probability Scale | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Mean | SE | N | Mean | SE | N |
| @ $50 per hour | 0.22 | 0.07 | 18 | 0.54 | 0.09 | 16 |
| @ $70 per hour | 0.18 | 0.05 | 18 | 0.30 | 0.10 | 10 |
| @ $90 per hour | 0.08 | 0.04 | 14 | 0.30 | 0.10 | 10 |
| @ $110 per hour | 0.04 | 0.02 | 10 | 0.30 | 0.10 | 6 |

**Table 3. Comparison of the mean purchase probabilities for the "on-site" service**

| On-site service | Juster Scale | | | Verbal Probability Scale | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Mean | SE | N | Mean | SE | N |
| @ $60 per hour | 0.21 | 0.09 | 15 | 0.54 | 0.09 | 16 |
| @ $80 per hour | 0.17 | 0.03 | 15 | 0.40 | 0.10 | 9 |
| @ $100 per hour | 0.14 | 0.07 | 10 | 0.30 | 0.10 | 9 |
| @ $120 per hour | 0.07 | 0.02 | 9 | 0.70 | 0.30 | 5 |

This result was either due to differences in the characteristics of the respondents using each version of the scale, although they were randomly assigned to each of the eight treatment groups, or due to differences in the way people use the scales. Since the demographic composition of the respondents did not differ for the two scales, it would appear that the scales are not completely equivalent. However, as the sample sizes are very small, the result may be spurious, so caution is advised in interpreting these results. Again, since we are unable to validate the results, it was not possible to establish which scale performed best. But the fact that the two scales produced different estimates deserves further examination. For further discussion, see Parackal & Brennan (1998)

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