

# Investigating the Contextual Requirements of the Juster Scale

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## Abstract

Researchers have employed the Juster Scale to collect purchase probability data with notable success. Reviewing the Juster Scale studies, however, has revealed that there is considerable variation in its performance. Some of these variations appeared to be caused by the context in which the Juster Scale has been presented to respondents. This paper discusses three factors that influence the context of the Juster Scale and reports the results of a study that attempted to standardise its contextual requirements.

The results substantiate further the Juster Scale's satisfactory performance in collecting purchase probability data.

## 1. Introduction

In survey research, the poor performance of intention scales to forecast purchase behaviour has led researchers to test probability scales. The earlier studies that compared probability scales with intention scales found the former to produce more accurate forecasts (Day et al. 1991; Gan, Esslemont and Gendall 1985; Pickering and Isherwood 1974; Clawson 1971; Gruber 1970; Juster 1966; Ferber and Piskie 1965). Since then, investigators have tested an eleven-point scale pioneered by Juster (1966) and found it to produce satisfactory results (Gan et al. 1985; Gruber 1970; Juster 1966). The Juster Scale (Figure 3 & 4) as it is known in the academic literature has been customised for use in self-completion questionnaires (Gendall, Esslemont and Day 1991), telephone surveys (Brennan, Esslemont and Hini 1995) and Internet-based surveys (Parackal and Brennan 1999).

Versions of this scale have been successfully tested to forecast purchase rates (Gendall et al. 1991; Gan et al. 1985; Gabor and Granger 1972; Clawson 1971; Juster 1966), purchase levels (Brennan

et al. 1995; Brennan, Esslemont and U 1995; Brennan and Esslemont 1994;

Seymour, Brennan and Esslemont 1994; Hamilton-Gibbs, Esslemont and McGuinness 1992), mutually exclusive behaviours (Parackal and Brennan, 1999; Hoek and Gendall, 1997), demand schedules (Brennan 1995) and customer loyalty (Garland, 2002; Danenberg and Sharp, 1999; 1996a; 1996b). In recent years, the scale has been employed in choice modelling studies (Rungie and Danenberg 1998) and in modelling repeat purchases using the Dirichlet model (Wright, Sharp and Sharp 2002).

## 2. Literature review

The Juster Scale studies cited above were successful in achieving their respective objectives. Nonetheless, there were considerable variations in the accuracy of the scale across the studies mentioned. For example, forecasts of automobiles made on the Juster Scale were reasonably accurate (Juster 1966; Stapel 1968; Pickering and Isherwood 1975; Gan et al. 1985) but forecasts of other durables were not so accurate (Brennan et al. 1995; Pickering and Isherwood 1975; Clawson 1971; Heald 1970; Juster 1966). A critical examination of the Juster Scale literature revealed that some of the variations could have been caused by the context in which

the scale was set. In the following section the Juster Scale literature is reviewed from such a viewpoint.

### **2.1 Question-order effect**

The literature on context suggests that questions asked previously influence the contexts of those asked subsequently, and in turn influence the responses collected (Lorenz, Robertson and Lesser 2001; Schwarz and Nippier 1995; Schuman 1992; Johnson, O'Rourke and Severns 1998; Schuman and Presser 1981). Such contextual effects appear to have occurred in the earliest Juster Scale studies. These studies were carried out by including the scale in omnibus surveys (Brennan 1995; Brennan and Esslemont 1994; Gan et al. 1986) and by piggybacking on other studies (QIS studies by Juster 1966; Byres 1964). Consequently, investigators have had very little control over where the Juster Scale and its question appeared in the questionnaire. The placement of the Juster Scale in a questionnaire was not a concern (see Kalton and Schuman (1982) for a discussion on placement of questions in a questionnaire), but the questions asked before the Juster Scale were a concern, as they could influence the context and consequently the responses collected.

Brennan (1995) attributed such contextual effect to the illogical estimates made for an innovation in two successive omnibus surveys. The Juster Scale was included in the 1994 and 1995 Household Omnibus Survey conducted by the Department of Marketing at Massey University, New Zealand to collect purchase probability data for laser disc players, a product for viewing digital video discs (DVDs). The product was introduced in 1994; one would expect its adoption to have increased in the following year (1995). This, however, was not reflected in the adoption rates estimated in the two omnibus surveys. The estimates for the two years were in the reverse order, with adoption in 1994 being greater than in 1995. In the 1994 questionnaire, the question about laser disc players was placed after a series of questions about video and video stores, whereas in the 1995 questionnaire there was only one item

on this topic. It appears that the questions on videos and video stores gave the 1994 questionnaire a "video hiring and viewing context". The question on laser disc players was the same in the two questionnaires except for the overshadowing context of video hiring and viewing. The illogical adoption rate estimated for this product was attributed to the context (Brennan 1995).

Similar contextual effects (in this case a question-order effect) could be present in the results of studies implemented in other omnibus surveys (Brennan 1995; Brennan and Esslemont 1994; Brennan et al. 1994; Gan et al. 1986) and piggybacked on other studies (Juster 1966; Byres 1964). Thus, some of the variations in the performance of the Juster Scale observed in those studies could be due to contextual variation arising from question-order effects.

### **2.2 Item-order effect**

It has been a common practice amongst investigators to test the Juster Scale concurrently on different product categories (e.g. Day et al. 1991; Brennan and Esslemont 1994; Brennan et al. 1995; Hamilton-Gibbs et al. 1992; Seymour et al. 1994; Clawson 1971; Gabor and Granger 1972; Gan et al. 1986; Gruber 1970; Heald 1970; Juster 1966). While there is no contention as to the purpose of this practice, listing test items of different categories one below the other could give rise to order effects. To differentiate this type of order effect from the previous one (question-order effect), it has been labelled "item-order effect".

Test items listed at the start could set the context and tone of response for those listed lower down in the order. Consequently, responses to items listed lower in the order could suffer item-order effect and may not be reflective of the corresponding behaviours. This may have been the case in three studies that reported forecasting errors based on recall data (Day et al. 1991; Gan et al. 1986; Clawson 1971).

In these studies, the Juster Scale was concurrently tested on three product categories (durables, services and fast moving products). Forecasting errors reported across these studies ranged from -17% to +245%. It was not possible to conclusively establish whether the variations observed were because of item-order effect. All the same, it is plausible to argue that item-order effect was responsible for some of the forecasting errors observed in those three studies.

Similar to item-order effect is response-order effect (Redline et al. 2005; Krosnick 1999; Ayidiya and McClendon 1990; Krosnick and Alwin 1987; Shuman and Presser 1981). It refers to respondents' tendency to select the first listed response category, known as primacy effect, or the last listed response category, known as recency effect. The literature on these two types of response-order effects reveals that they are associated with the way response categories are presented, either visually (as in the case of a self completion questionnaire) or orally (as in the case of telephone and face-to-face interviews), to respondents. Primacy effects have been observed in visual presentation whereas recency effects were observed in oral presentation (Krosnick 1999; Krosnick and Alwin 1987). The theory behind primacy effect is that the first response category on a list establishes a cognitive framework of comparison that directs the interpretation of subsequent categories on the list (Krosnick and Alwin 1987). Recency effect results from the availability of more cognitive processing time for the last response category on the list (Krosnick and Alwin 1987). When response categories are presented orally one after the other, the presentation of a subsequent category terminates the cognitive processing of the previous one. In general after the last category is presented, respondents tend to receive more processing time as there is a longer pause to receive a response before moving on to the next question. In this case the cognitive framework tends to be around the last items. The same sorts of ramifications are plausible in the three Juster Scale studies (Day et al. 1991; Gan et al. 1986; Clawson 1971) discussed

above, except they are for test items listed one after the other. Thus, some of the errors observed in the three studies may be because of item-order effect.

### 2.3 Question Wording

In Juster Scale studies, respondents are encouraged to consider all factors that influence their purchase behaviour before indicating their purchase probability scores. For this purpose, many investigators have adopted the question formulated by Juster (1966) ("Taking everything into consideration what are the chances of you buying a < >?"). Other question versions were also used in conjunction with the Juster Scale in the literature (Brennan et al. 1995; Urban et al. 1996; Day et al. 1991; Gan et al. 1985). Forecasting errors across the studies cited ranged from -5% to +245%. The studies mentioned above employed the same approach of getting respondents to indicate their purchase probability data using the Juster Scale. They, however, have used different question versions and some of variations in the performance of the Juster Scale could be because of the versions used.

Studies that investigated question versions have observed considerable variation in the interpretations given (Gendall 1998; Schuman and Presser 1977). Turner and Krauss (1978) observed that interpretations influence the context of the question and the response collected. In survey research, respondents have to understand and interpret the questions appropriately. For this reason, questions are pre tested to ensure there is reasonable consistency in the way respondents understand and interpret them (Gendall and Hoek 1990; Belson 1986). While investigators testing the Juster Scale may have pre tested their versions, because of differences in the wordings there may have been differences in interpretation between the Juster Scale studies mentioned above. Contexts could also vary with interpretations and consequently result in these studies not being strictly comparable.

Discussions so far have raised question-order effect, item-order effect and question versions as potential factors that influence the context and the responses collected on the Juster Scale. These factors seem to exist in most Juster Scale studies and their influence on the context and the forecast obtained is plausible. If this is the case, then Juster Scale contexts could be varying across the studies and results may not be comparable as was seen in the mainstream survey contextual literature (Schuman and Presser 1981). The Juster Scale would require fresh testing to produce comparable results to assess its reliability to forecast purchase behaviours. The seriousness of this matter warrants a systematic investigation of the contextual factors raised in this literature review. First it was seen necessary to standardise the contextual requirements of the Juster Scale. The following sections outline the research objective, describe the methodology, and provide a discussion on the results.

### 3. Research Objective

The objective of the research reported in this paper was to find out whether the Juster Scale required standardisation of context to collect purchase probability data. This objective was formulated into the following hypothesis for statistical testing:

H1: The Juster Scale implemented without providing contextual information produced purchase probability data that was similar to when implemented after providing contextual information. (Mean purchase probability scores obtained in the versions were similar).

To test the above hypothesis, quantitative data were collected through questionnaire versions implemented in separate treatments. The versions were made different by presenting the Juster Scale with and without providing contextual information. Internet technology was used to supply contextual information in the relevant version; hence, the questionnaire was applied through two Internet-based sur-

veys. Mean scores obtained on the Juster Scale in the versions were compared for statistical difference. The hypotheses were tested in two separate samples (one for a sample of business clients, one for a sample of the general public, labelled respectively as Business and National survey). In the National survey, information on search behaviour was collected allowing additional analysis.

### 4. Questionnaire versions

A questionnaire on Wireless Application Protocol (WAP-capable) mobile phones, new generation mobile phones introduced in the market at the time of this research, was developed and used in this research. This questionnaire was made into separate versions to generate the required comparisons. In the first version, the Juster Scale was presented without providing any information about the test product. This version was the standard against which comparisons were made, therefore will be referred to as "Standard" in this paper. Respondents were given the following simple description of the test product before being presented with the Juster Scale questions:

*"WAP-capable mobile phones can access the Internet and download emails and Web pages. We would like to find out what you think about this idea of WAR Click the "Next" button when you are ready..."*

In the second version, the Juster Scale was implemented after respondents had had the opportunity to view information about WAP capable mobile phones. Information was supplied via a web page by listing hyperlinks to relevant web sites. By clicking on the hyperlinks, the corresponding web pages loaded onto respondents' computers ready for viewing (Figure 1). When respondents had viewed the information, they were presented with the twelve and six months Juster Scale questions shown in Figure 3 and 4. This version is called "Point & Click" for the sake of simplicity.

Figure 1: Point & Click

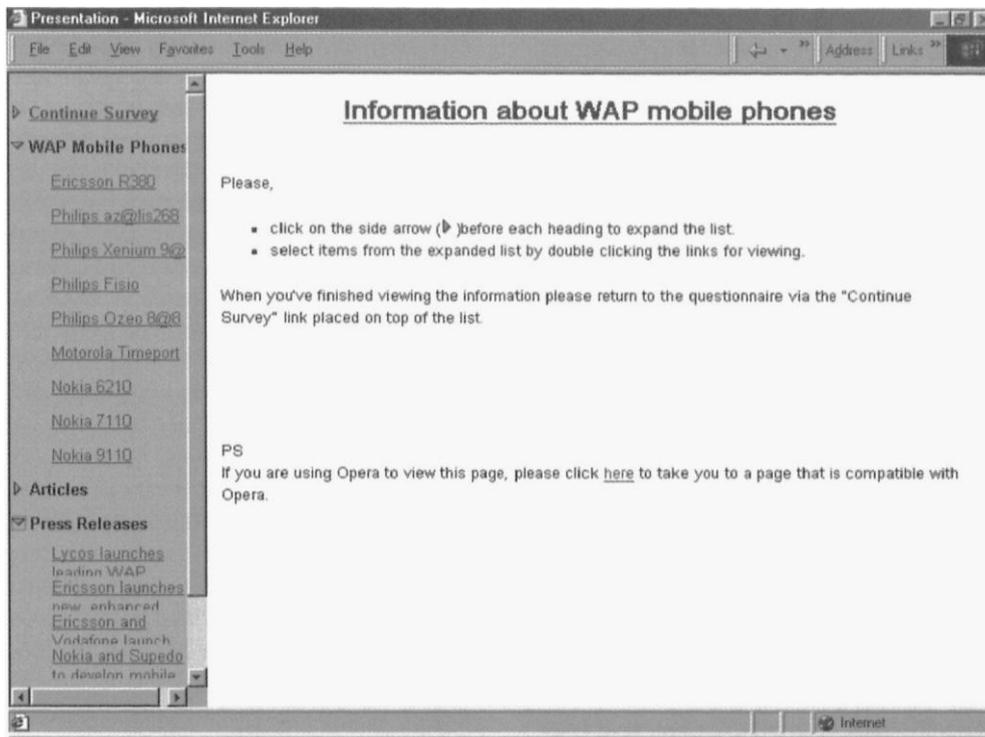
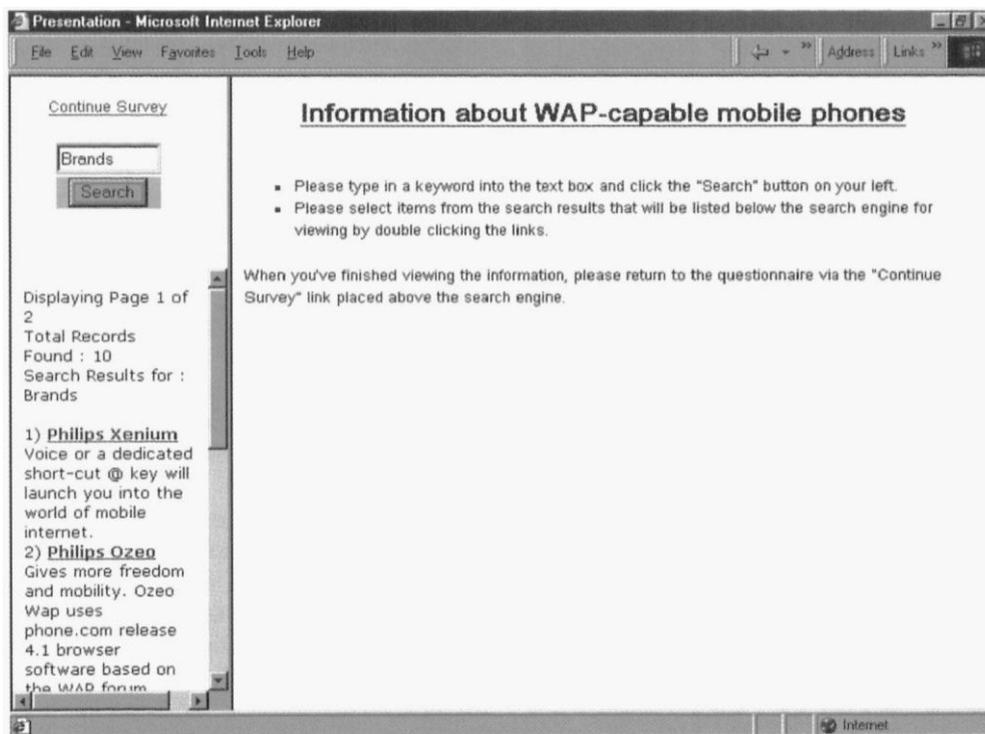
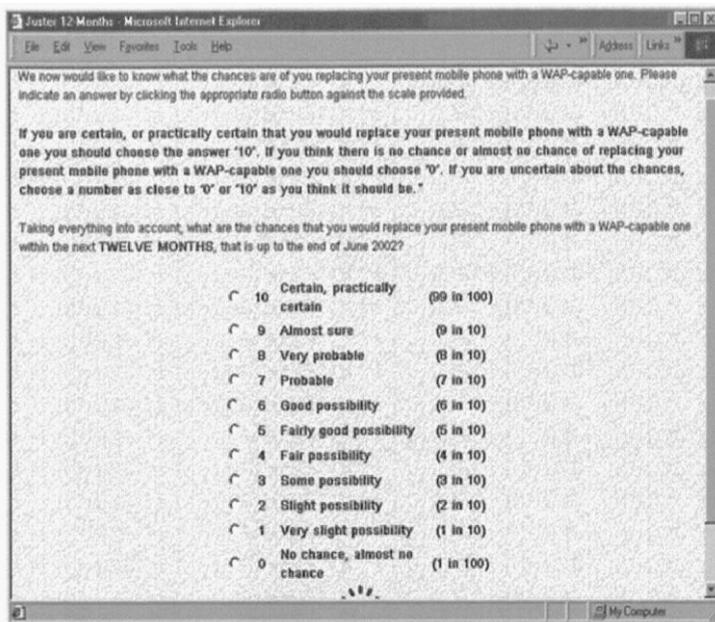


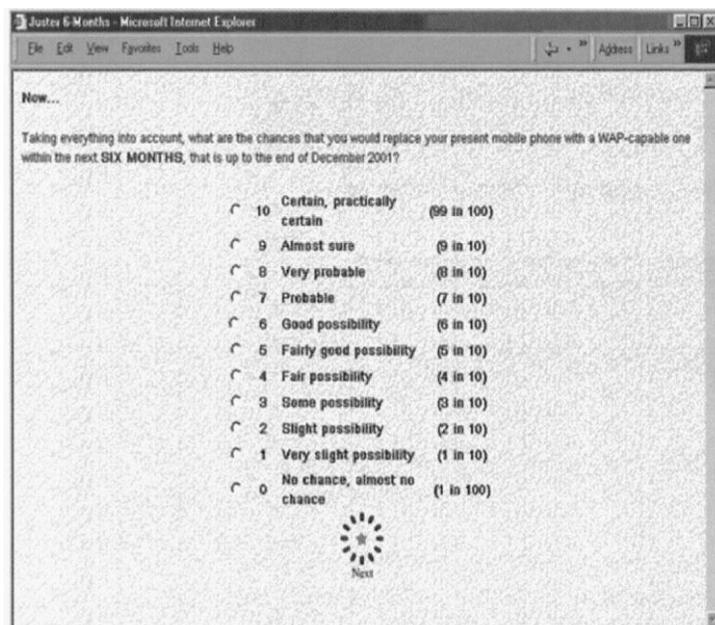
Figure 2: Search Engine



**Figure 3: Juster Scale and the question for the 12 months time horizons**



**Figure 4: Juster Scale and the question for the 6 months time horizons**



Point & Click was an adaptation of the approach used by Urban et al. (1997), Urban, Weinberg and Hauser (1996) and Urban, Hauser and Roberts (1990) to provide contextual information about test products. In their approach, respondents were brought into a lab and provided with computers to view contextual information. Information items were listed on the computer screen and respondents selected items for viewing using a mouse. On completion of viewing, respondents were presented with the Juster Scale and the associated questions. The same format was used in the current research with the adaptations made for an online environment.

To verify whether listing information items (see Figure 1) had any effect on the purchase probability scores given, a third version of the questionnaire was included in the comparison. In this version, information was supplied via a search engine (Brucke 1985). Respondents were required to enter keywords (e.g. brand, price) into the search engine which then produced a list of hyperlinks to web sites containing the corresponding information. This version has been called "Search Engine" in the discussion that follows.

In all three questionnaire versions, purchase probability data were collected for two time horizons - twelve and six months. The questions accompanying the Juster Scale for the two time horizons were as follows:

- Taking everything into account, what are the chances that you would replace your present mobile phone with a WAP-capable one within the next TWELVE MONTHS, that is up to the end of < >? (see Figure 3)
- Taking everything into account, what are the chances that you would replace your present mobile phone with a WAP-capable one within the next SIX MONTHS, that is up to the end of < >? (see Figure 4)

## 5. Survey approach

As the Internet was used to provide contextual information in the relevant versions, the survey was carried out over the Internet. The research used an approach recommended by Kingsley & Anderson (1998) to undertake probability based Internet surveys. The rationale behind the approach is that Internet users tend to be normally distributed within most general populations. Hence, a simple random sample drawn from a general population would have Internet users in the same proportion and make-up they are found in that population. Approaching respondents by their postal address with a request to participate in an Internet-based survey achieves the recruitment of Internet users into the sample. The approach relies on the innovativeness of such individuals to engage in new Internet tasks (Eastlick & Lotz 1999; Well & Chen 1999; Citrin et al. 2000; Goldsmith 2001; Mai & Mai 2002) to participate in the research. As the initial sample was a random selection, the final sample possessed sufficient randomness, and ensured a normally distributed Internet user population. The current research employed this research approach to implement the questionnaire versions in two separate surveys. One was on a simple random sample from a client list of a communication business (Business survey) and the other from the electoral roll of New Zealand (National survey).

The Business survey was carried out on a random sample of 3,400 respondents selected from the client list of a business. The survey produced 460 useable responses. As the survey was on the Internet population, response rate was weighted to the size of this population (52% incidence of households with Internet (Ministry of Economic Development (2003)) and was 30%, after the initial number of contacts was adjusted for refusals and ineligible. This response rate was within the range (9% to 44%) reported for similar surveys in the literature

(Schonlau et al. 2001). Subjects were randomly assigned to the three questionnaire versions (n = 167 for Standard; n= 139 for Point & Click; n=154 for Search Engine).

The National survey was carried out on a random sample of 3,000 respondents selected from the electoral roll. In this survey, non-Internet users were offered the option of completing the survey using a paper version of the questionnaire (Quigley et al. 2000). The number of respondents who completed the survey over the Internet was 403 (55% of the total sample) and those completing using the paper version was 326 (45%). The proportion of Internet participants (55%) was comparable to the percentage of households (52%) with Internet connection in New Zealand at the time of the research (Ministry of Economic Development 2003). This observation confirmed that the approach used (perhaps) was successful in reaching the Internet population under investigation. The analysis required for this research was, however, restricted to those who participated on the internet.

As the sample was drawn from the general population it included both mobile phone users and non-mobile phone users. For this research, only the responses of mobile phone users were used. Compliance of respondents to perform the required antecedent activities, that is, to view contextual information, was recorded in the versions that provided this (Point & Click and Search Engine).

## 6. Results

### 6.1 Business survey

The mean purchase probability scores collected in the three questionnaire versions exhibited logical progression over the two horizons, that is, adoption rate increased over time (see Table 1). Analysis of variance tests were used to investigate whether the mean purchase probability scores were statistically different in the three versions.

**Table 1: Mean probability scores of the 12 and 6 months time horizons**

	n	12 months mean	6 months mean
Standard	167	0.41	0.26
Point & Click	139	0.39	0.24
Search Engine	154	0.41	0.24
		F= 0.17, p = 0.84	F = 0.22, p = 0.81

**Table 2: Mean probability scores of the 12 and 6 months time horizons**

	n	12 months mean	6 months mean
Standard	103	0.33	0.22
Point & Click	85	0.27	0.16
Search Engine	106	0.27	0.17
		F= 0.96, p = 0.39	F = 1.52, p = 0.22

**Table 3: Mean probability scores of the 12 and 6 months time horizons after applying the information viewership criterion**

	n	12 months mean	6 months mean
Standard	103	0.33	0.22
Point & Click	53	0.28	0.17
Search Engine	39	0.29	0.20
		F= 0.45, p = 0.64	F = 0.62, p = 0.54

The analysis of the twelve months probability data produced an F value of 0.17 with an associated p value of 0.84. The analysis of the six months probability data produced an F value of 0.22 with an associated p value of 0.81. In both cases, the p values did not reach the rejection level ( $p = 0.05$ ), hence, the evidence collected was not sufficient to reject the hypothesis. Mean purchase probability scores produced in the three versions were similar with differences attributed to sampling error.

### 6.2 National survey

The mean purchase probability scores collected for the National survey respondents exhibited logical progression over the two horizons that were consistent with those seen in the Business survey (see Table 2). Results of ANOVA for the twelve month-probability data produced a F statistic of 0.96 with a p value of 0.38 (see Table

2) and that for the six months-probability data produced a F statistic of 1.52 with a p value of 0.22 (see Table 2). In both cases, the p values did not reach the rejection level ( $p = 0.05$ ), thus, the evidence was not sufficient to reject the hypothesis (H1). These results concurred with those of the Business survey.

Compliance status recorded in the National survey revealed that 62% ( $n = 53$ ) in the Point & Click version and 37% ( $n = 39$ ) in the Search Engine version performed the precursory task of searching and viewing information. The number of items viewed by these respondents ranged from one to fourteen. Mean purchase probability scores of those who viewed and did not view information within each questionnaire version were compared. For the Point & Click version, an independent sample

test revealed that the means were similar with the p value not reaching the rejection level for both time horizons (12 months:  $t = 0.09$ ,  $df = 82$ ,  $p = 0.93$ ; 6 months:  $t = 0.34$ ,  $df = 82$ ,  $p = 0.73$ ). The same results were observed for the Search Engine version (12 months:  $t = 0.79$ ,  $df = 86$ ,  $p = 0.43$ ; 6 months:  $t = 1.15$ ,  $df = 86$ ,  $p = 0.25$ ). These results confirmed those reported in Table 1 and 2.

Analyses were carried out after removing the responses of respondents who failed to view information in the two experimental groups (Point & Click and Search Engine). The ANOVA for the twelve month-probability data produced a F statistic of 0.45 with an associated p value of 0.64 (see Table 3) and that for the six months-probability data produced a F statistic of 0.62 with an associated p value of 0.54 (see Table 3). These results concur with the earlier observations.

## 7. Discussion

The research reported in this paper compared the Juster Scale with and without providing contextual information. The variations were made in three separate versions of a questionnaire on WAP-capable mobile phones which collected purchase probability data from two separate samples. Purchase probability data were collected for twelve and six-months time horizons. In total, the research produced six separate comparisons based on analysis of variance (ANOVA) to investigate for statistical differences between purchase probability scores.

All six ANOVA tests produced non-significant results; hence, the evidence was not sufficient to reject the hypothesis (H1). From this, it is concluded that the Juster Scale implemented without contextual information produces forecasts similar to those produced when the scale is implemented with contextual information. This observation implies that the Juster Scale does not require any additional contextual input.

An earlier study enquiring into the extensiveness of describing a new service

when collecting purchase probability using the Juster Scale observed similar results (Armstrong 1971). In that study, a brief description utilising one-way communication was compared with a comprehensive description that encouraged two-way communication. Comparisons were made for estimates of demand at various prices, price elasticities, and segment creation. For all comparisons, estimates produced were similar; hence, that study concluded that there was no difference derived from the amount of description provided. The product used in the above mentioned study was a new and expensive transportation service.

The observation made from the research reported in this paper was based on tests carried out on a single test item (WAP-capable mobile phones) that belongs to an Information Communication Technology (ICT) category. The observation, however, was in line with Armstrong's (1971) study. At least now there are two test situations in which comparable results have been obtained. It would be worthwhile seeing if the results hold across other products and product categories.

## 8. Future direction

As for the contextual issues raised in this paper, investigation can now be carried out using WAP-capable mobile phones as the test product. Question-order effect could be investigated further by comparing questionnaire versions in which the position of the Juster Scale question for WAP-capable mobile phones is varied. Item-order effect could be investigated by included WAP-capable mobile phones along with other test items. The order of the test items could be varied in versions with WAP-capable mobile phones placed at the top and bottom of the list. A control version in which the WAP-capable mobile phone is included on its own would help in establishing the extent to which item-order effect influences the Juster Scale forecasts. Question forms used with the Juster Scale could be investigated by including them in separate questionnaire versions. In each of these versions prob-

ability data could be collected for WAPcapable mobile phones. Such future studies would help in establishing best practices for using the Juster Scale to forecast future purchase behaviour.

## 9. Conclusion

In this paper, three factors (question-order effect, item-order effect and question version) that exhibited strong tendencies to influence the context of the Juster Scale were raised. They are pertinent to most Juster Scale studies and hence warranted future investigation. To sys-

tematically investigate them, it was first necessary to standardise the context of the Juster Scale. The results suggest that the Juster Scale does not require any additional contextual input and remains a satisfactory instrument for collecting purchase probability data. This result has provided a starting point for commencing a systematic investigation into the three contextual factors mentioned above. The WAP-capable mobile phone is recommended for the future investigation into the Juster Scales's question-order effect, item-order effect and question version.

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