

A NEW PROPOSAL FOR A SURVEY-BASED PREFERENCE ELICITATION PROTOCOL

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ABSTRACT

Many protocols for preference elicitation currently used in compensatory Decision Analysis, such as the widely employed swing weighting method, were originally designed to be employed by a decision analyst. They may not be suitable to be applied via surveys, as they do require a high level of understanding and a high cognitive effort from the respondents. We suggest a new protocol for eliciting individual preferences via surveys, which captures strict preference relations. We base this protocol on the marketing research literature, which has dealt extensively with similar surveys, but adapt it to avoid the range-insensitivity bias in multi-attribute choices.

KEYWORDS: Behavioural Operational Research. Preference elicitation. Pairwise comparison.

1 Introduction

Preference elicitation compensatory methods have been developed for decades to support decision-makers in Decision Analysis (DA). Some suitable methods based on normative rules are swing weighting (SW) (von Winterfeldt & Edwards, 1986), matching (Delquie, 1993), MACBETH (Bana E Costa, 2001), and the trade-off method (Keeney & Raiffa, 1976). These methods involve experts, who are supported by a decision analyst that elicits their preferences

A more recent trend in community OR is to employ (SW) online surveys to elicit the preferences of community members (Aubert et al., 2020; Haag et al., 2022). However, these methods may be difficult to consistently answer by members of a large community while being surveyed, particularly whether we consider laypeople (Aubert et al., 2020), causing a negative impact on the quality of their responses.

This proposal suggests a new protocol for eliciting preferences to be applied via surveys, in any community, given the potential benefits of this elicitation mode for community OR and the challenges of using traditional elicitation protocols from Decision Analysis highlighted above. We base the protocol on the marketing research literature, which has dealt extensively with similar surveys, but adapted it to avoid the range-insensitivity bias in multi-attribute choices.

Our proposal contributes to this emerging trend by providing a streamlined and easily implementable protocol designed for eliciting preferences via surveys. This protocol incorporates best practices from Decision Analysis, such as anchoring the judgments on the ranges of the attributes for the elicitation of preferences.

2 Literature Review

2.1 Survey-based preference elicitation in the decision analysis literature

While there are several elicitation compensatory methods for preference elicitation in decision analysis (Riabacke et al., 2012), most survey-based decision analysis interventions have employed the SMART (von Winterfeldt & Edwards, 1986) or (online) SW protocols (Keeney & Raiffa, 1976). The preference protocol of SMART for attribute importance may not consider attribute ranges, so it is not recommendable. On the other hand, while relatively simple, the SW method is conceptually sound.

The SW method has been amply and successfully employed in traditional decision analysis interventions. However, in those interventions, a decision analyst must guide and support the decision maker during the preference elicitation phases. This is obviously not the case of survey-based elicitation processes, in which there is either a mere interviewer with rather limited knowledge of decision analysis or a self-report form (online or on paper). There is some evidence of challenges in adopting the SW method in (online) survey-based preference elicitation.

2.2 Survey-based preference elicitation in the marketing literature

The fields of marketing and consumer behaviour have developed many protocols for eliciting individual judgments of multi-attribute preferences for products and services (Carson et al., 1994). Despite these sophisticated methods for large-scale preference surveys, their elicitation protocols often focus on choice or lack rigour from a Decision Analysis perspective (e.g., most do not consider ranges of attributes when eliciting attribute weights). We summarise the main existing compensatory approaches to measure preferences in marketing into three main groups:

The first group encompasses three multi-attribute preference methods based on importance level or beliefs about attributes: Rosenberg's (Rosenberg, 1956), Fishbein's (Fishbein, 1963), and (c) adequacy-importance (Bass & Talarzyk, 1972).

The second group encompasses several methods based on paired comparison. Once the subject selects the most valuable attribute (anchor), the respondent evaluates the remaining attributes in a rating/ranking scale. In this method, the respondents evaluate a pair of profiles, either showing alternatives described by their performance on every attribute (full profile), or else, described by only two attributes (partial profile) (Rao, 2014). The pairwise comparison is most effective when the number of alternatives involved is small (less than seven) (Larichev, 1992), and the variation in scores for the relevant alternatives involved is not wide.

The third group of methods deals with a large number of attributes and multiple attribute levels. In this group are hybrid (Rao, 2014) and adaptive methods (Scholz et al., 2010). However, we do not consider a large number of attributes in multiple levels as provided by these methods.

3. Proposed Survey-based Preference Elicitation Protocol

There is some evidence that decision-makers often resist sophisticated elicitation methods (Kottemann & Davis, 1991) and prefer more straightforward and easier-to-understand methods, such as pairwise comparisons (Tversky et al., 1993). Because some respondents are easily distracted while rating or scoring alternatives (Bryson et al., 1995), pairwise comparisons may facilitate the choices. In addition, judgments of strict preference are cognitively easier to make and more stable than the quantitative judgments required by the trade-off and SW methods (Larichev, 1992).

On the other hand, a key characteristic of any sound elicitation protocol for the elicitation of attribute weights is the need to anchor the judgments on the ranges of the attributes (Montibeller, 2018) to avoid the range-insensitivity bias (Von Nitzsch & Weber, 1993). Our proposed method implements this requirement. In addition, the suggested protocol is based on the pairwise comparison of partial profiles employed in marketing research (Green & wind, 1975), which simplifies the judgment task compared to full profiles.

A major advantage of employing an adapted protocol from marketing is that it was originally designed to be used in preference-elicitation surveys, in contrast to the protocols developed in DA, which were designed to be administered by a decision analyst. In addition, we designed the protocol to minimise the cognitive burden, as it does not require any quantitative judgment, only judgements of strict preference. The protocol is formalised as follows.

Let $\mathbf{X}$ be a set of N (with $N > 1$) attributes, X_i representing distinctive attributes:

$$\mathbf{X} = \{X_1, X_2, \dots, X_N\}$$

The levels of each attribute describe ordered improvements, with the lower bound denoting the status quo situation and the upper bound denoting the best possible situation. Hence, for each X_i attribute we define two bounds:

X_i^0 = the lower bound of the i – th attribute

X_i^* = the upper bound of the i – th attribute

Assessors are asked to compare two profiles. The first profile (X_i^*, X_j^0) , with $i \neq j$, represents a dummy alternative in which the i -th attribute is at the best level (hypothetical situation) and the j -th attribute is at status quo level. The second profile (X_j^*, X_i^0) , again with $i \neq j$, represents a dummy alternative in which the j -th attribute is at the best level (hypothetical situation) and the i -th attribute is at status quo level. The subject is then asked to establish their strict preferences over these two profiles, selecting one of the two dummy alternatives:

$$(X_i^*, X_j^0) \succ (X_j^*, X_i^0) \text{ OR } (X_j^*, X_i^0) \succ (X_i^*, X_j^0)$$

with $i \neq j$ (and $i, j = 1, 2, \dots, n$)

For example, two attributes could be represented by the following profiles. The decision maker decides on the preferred profile.

Profile (X_{ES}^*, X_{HS}^0)	Profile (X_{HS}^*, X_{ES}^0)
X_{ES}^* = Full-time Nursery	X_{HS}^* = Several health services in loco
X_{HS}^0 = Online health services	X_{ES}^0 = Part-time Nursery

respondent. Subsequently, various approaches can be employed to derive the attribute weights after conducting the pairwise comparisons. In many approaches that define individual weights, the ratios among weights are determined by converting ranks into ratios (Riabache et al., 2012).

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