Original Article

A method of abbreviating a laddering survey

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ABSTRACT The attributes-consequences-values associations, embedded in means-end chain theory, are often seen as a representation of the basic drive that motivates consumer behaviour. Laddering is a technique used to elicit such associations (ladders) from the respondent's cognitive structure. Unfortunately, the procedure is time-consuming and requires a considerable physical and mental effort from the respondent. We propose a method of shortening a laddering survey, while controlling the amount of information lost. We show that a laddering questionnaire may be shortened by more than 50 per cent and still allow the generation of approximately 95 per cent of the ladders produced by the full set of questions.

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INTRODUCTION

Laddering is a semi-qualitative measurement technique embedded in means-end chain (MEC) theory.¹ MEC theory posits that consumers learn to associate attributes (A) of products with particular consequences (C), and that these consequences are important because they relate to personal values (V) held by the individual. The A-C-V associations (ladders) are, therefore, often seen as representations of the basic drives that motivate consumer behaviour. The associations are presented as models ranging from three-level-

of-abstraction (attribute-consequence-value) through four-level-of-abstraction (attribute-functional consequence-psychosocial consequence-value), up to six-level-of-abstraction formats (two levels of attributes: concrete and abstract; two levels of consequences; and two levels of values: instrumental and terminal).

Numerous studies have shown that techniques based on MEC theory are suitable for a wide range of marketing applications, such as benefit-based market segmentation, promotion of products and development of advertising strategies, analysis of consumer goals and customer expectations, product knowledge and comprehension, industrial marketing, financial engineering, analysis of consumer perceptions of various products, and so

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on. A comprehensive history of the MEC approach and its applications can be found in the study by Olson and Reynolds.²

Laddering is performed either as soft laddering (conventional, one-on-one, usually tape-recorded, semi-structured interviews, where the natural flow of speech of the respondent is restricted as little as possible), or as hard laddering (usually a self-administered probing device, aimed at large samples of consumers, which forces the respondent to produce ladders in a pre-determined sequence³). Either procedure, when conducted in a real-life environment, is time-consuming, normally lasting – for soft laddering techniques – from 30 to 90 min.^{4–12} Durations reported for hard laddering surveys are somewhat shorter, although most of them did last at least 30 min.^{13–18}

In addition to its lengthy duration, a laddering interview requires a considerable physical and mental effort from the respondent, who is requested to produce one ladder after another until she/he is unable to provide any new concepts. It therefore seems natural to suspect that the latter minutes of such an interview may produce data of lesser quality.^{19,20} Unnecessary questions in a laddering survey may put strong demands on respondents to answer them anyway even if they are of little importance to them.²¹ There is ample evidence of the negative consequences of pressing respondents to provide more answers to questions they are having difficulty answering.^{22–27}

Our objective in this paper is to introduce a method of abbreviating a laddering survey, while controlling the amount of information lost. Achieving this will help to minimise respondent fatigue, boredom, irritation, non-response and failure to complete,²⁸ and to increase response rates,^{29,30} while increasing the quality of data collected.³¹ The tangible benefit of higher response rates is particularly important in view of the growing popularity of administering laddering instruments by mail,³² Internet¹⁵ or telephone.^{33,34}

LADDERING TECHNIQUES

Laddering techniques, as already mentioned, can be divided into two categories: soft laddering and hard laddering. Soft laddering does not differ

across studies – it tends to follow rules developed by Reynolds and Gutman,⁴ enhanced by Grunert and Grunert.³ Conversely, there is a noticeable variability among hard laddering formats. The need to guarantee anonymity for respondents, combined with the desire to achieve much larger sample sizes at much lower cost during much less time, and, at the same time, achieve as many of the benefits of soft laddering as possible, has prompted researchers to experiment with various full-scale, A-C-V-type, hard laddering approaches. We propose dividing hard laddering formats into two categories: the $p \times q$ and $p \times (1 + k + k \times m)$ formats.

The $p \times q$ formats

The $p \times q$ formats consist of sequences of horizontally arranged boxes connected by arrows that take the respondents from a product's attribute to reasons explaining why this attribute is important to them. The attribute and the reason boxes' statements are then content-analysed and coded, respectively, into attributes, and consequences and/or values. The number of rows (p) and the number of boxes (q) in each row vary across studies.^{13,32,35–37}

The $p \times (1 + k + k \times m)$ formats

First, a respondent is requested to provide the most important (to her/him) attribute of a product. The respondent is then asked to provide up to k most important consequences of this attribute. Finally, for each of the k consequences, the respondent is encouraged to give up to m reasons as to why this consequence is personally important. This process may be repeated several times, separately for each subsequent attribute. The $p \times (1 + k + k \times m)$ format resembles the Grey Benefit Chain³⁸ – a notable precursor of the hard laddering approach. The $3 \times (1 + 3 + 3 \times 3)$ questionnaire format (Figure 1) was first proposed by Mount and Kaciak³⁹ (see also Kaciak and Cullen⁴⁰).

HYPOTHESIS

We posit that the process of retrieving ladders from a respondent's cognitive structure can be analysed as a free-recall task. Such a task requires

Page 1 of the questionnaire*)

Figure 1: Hard laddering – the 3×(1+3+3×3) format for Attribute 1.

Note: (*) The same format will be repeated for the second and the third Attributes, on pages 2 and 3 of the questionnaire, respectively (39 steps in total).

respondents to produce as many examples as they can of items from some known set or category.^{22,41} With some exceptions, the free-recall procedure is essentially the same as free elicitation employed in marketing.⁴² A free-recall task presents a challenge to the respondent, who must try to continue to produce items from a pool of examples that decreases in size with each response: the rate of item-production declines with increasing time in the task. Bousfield and Sedgewick⁴¹ and Crowder⁴³ showed that the rate of cumulative item-production by a respondent for a free-recall task can be modelled with an exponential decay function:

$$Cum_n(t) = a(1 - e^{-bt}) \quad (1)$$

where $Cum_n(t)$ is the cumulative number of different items, produced by a respondent by time t , a is the total number of items the respondent can potentially produce, b is the constant rate of the exponential decay function and e^{-bt} is the proportion of items remaining in the set.

Accordingly, we hypothesise that the number of ladders elicited from a group of respondents during

a laddering experiment will also exponentially decrease with increasing time in the task:

Hypothesis 1: The cumulative number of ladders elicited from a sample of respondents during a laddering experiment can be described with an exponential decay function of type (1).

Hypothesis 1 is rooted in the Adaptive Control of Thought (ACT) theory⁴⁴⁻⁴⁶ – also known as ‘Atomic Components of Thought’ theory or ‘Anderson’s Cognitive Theory’. Ladders produced by a MEC-based technique are strings of words, and, therefore, may be treated as cognitive units in a way similar to cognitive units defined in the ACT. Details of how retrieval processes in a laddering interview can be explained by this theory are comprehensively presented by Grunert and Grunert.³ According to the ACT theory, a cognitive unit consists of a unit node plus a set of elements (associations or links). The ACT theory posits that the strength of cognitive units decays with delay. The theory also stipulates that the retrieval process of subsequent items from a respondent’s memory can be modelled with an exponential function.⁴⁶ In the MEC case,

concepts in a ladder are nodes, and a string of such nodes forms a semantic network – a cognitive unit (a ladder). Following Anderson's⁴⁵ notion of a cognitive unit, we assume that a ladder is a semantic network of hierarchically interlinked concepts in a consumer's cognitive structure (for a discussion of hierarchically versus non-hierarchically associated means-end structures, see van Rekom and Wierenga⁴⁷). We also assume that it is a pre-existent unit rather an interview artefact. In other words, we assume that when a concept in a ladder is retrieved from a respondent's memory, all the remaining elements of this ladder will also be retrieved, not just one or two.

Hypothesis 1 stems also from the findings of Ajzen and Fishbein,⁴⁸ Bech-Larsen and Nielsen⁴⁹ and Woodside and Trappey⁵⁰ that the first five to eight attributes that come to mind for a given product are the most important ones and are strongly associated with buying behaviour (top of mind awareness, Axelrod⁵¹). Subsequent product-related constructs that respondents attempt to retrieve from their cognitive structures are less relevant.

ANALYSIS AND RESULTS

We used data from a hard laddering study of smokers' perceptions of cigarettes, conducted in a European city, to test Hypothesis 1. The laddering data were collected among a quota sample of $n = 421$ smokers, through self-administered questionnaires following the $3 \times (1 + 3 + 3 \times 3)$ format.

Let us assign labels (p, k, m) to the ladders produced in this survey, where p relates to an attribute, k to an associated consequence, and m to a reason explaining importance of the consequence. We will call these labels questionnaire items (as in Figure 1). A complete sequence of such items that the respondent might generate for the first attribute, on the first page of the questionnaire, can be described as follows: (1,1,1), (1,1,2), (1,1,3), (1,2,1), (1,2,2), (1,2,3), (1,3,1), (1,3,2) and (1,3,3). The first element in each item relates to an attribute, the second element describes a consequence and the order of

its appearance (for example, the second consequence associated with the first attribute), whereas the third element tells us whether the value category, which explains the importance of a consequence associated with the first attribute, was provided by the respondent as her/his first (x,x,1), second (x,x,2) or third (x,x,3) choice. The smokers were requested to repeat this procedure two more times, each time for a different attribute.

For each questionnaire item, we recorded the number of ladders generated by this item across all respondents (the total number of ladders generated by the respondents was 1828). The items, ranked by the number of ladders they generated, are presented in Table 1. The dynamics of the laddering process are also presented graphically in Figure 2.

We estimated the parameters of function (1) with a non-linear regression method developed by Marquardt and Levenberg⁵²:

$$\begin{aligned} Cum_n(t) &= 1832.37(1 - e^{-(2.46)t}) \\ &\quad (2.46) \quad (0.002) \\ R^2 &= 0.99948 \quad MSE = 69.71 \end{aligned}$$

The results (the asymptotic standard errors are in the parentheses), graphically illustrated in Figure 2, clearly demonstrate an almost perfect fit of the data by the model, which supports Hypothesis 1.

To assess the predictive validity of the model, we constructed estimation and holdout samples by assigning, at random, one half of the respondents to the estimation sample and one half to the holdout sample. Then, for each questionnaire item, we recorded the number of ladders generated by this item across all respondents in the estimation and holdout samples. Next, based on the estimation sample, we estimated model (1) and used the results to predict the number of ladders generated by each item in the holdout sample. Finally, we compared the numbers of ladders obtained and predicted for the holdout sample by calculating the mean squared error ($MSE = 65.22$) and Pearson correlation coefficient ($r = 0.999$; $p = 0.000$). The

Table 1: Dynamics of the laddering process

Item no. (t)	Item description	No. of ladders n(t)	Cumulative no. of ladders Cum_n(t)	Cumulative percentage of items Cum%_t	Cumulative percentage of ladders Cum%_n(t)
1	111	421	421	3.7	23.0
2	211	303	724	7.4	39.6
3	121	234	958	11.1	52.4
4	112	205	1163	14.8	63.6
5	212	123	1286	18.5	70.4
6	311	111	1397	22.2	76.4
7	221	88	1485	25.9	81.2
8	122	81	1566	29.6	85.7
9	131	69	1635	33.3	89.4
10	312	49	1684	37.0	92.1
11	113	30	1714	40.7	93.8
12	321	23	1737	44.4	95.0
13	222	18	1755	48.1	96.0
14	132	18	1773	51.9	97.0
15	213	13	1786	55.6	97.7
16	231	11	1797	59.3	98.3
17	322	8	1805	63.0	98.7
18	123	7	1812	66.7	99.1
19	331	7	1819	70.4	99.5
20	332	3	1822	74.1	99.7
21	133	2	1824	77.8	99.8
22	232	2	1826	81.5	99.9
23	313	2	1828	85.2	100.0
24	223	0	1828	88.9	100.0
25	233	0	1828	92.6	100.0
26	323	0	1828	96.3	100.0
27	333	0	1828	100.0	100.0

Figure 2: The number of ladders produced by consecutive items in the survey.

high prediction accuracy supports the stability and validity of the laddering pattern identified with our method.

A procedure for abbreviating a laddering survey

Based on the numbers of ladders generated by each item across all the respondents (Table 1), we propose the following laddering procedure, involving only seven rather than 27 items. For the first attribute elicited from a respondent, continue with the sequence of items **(1,1,1)** and **(1,1,2)**, that is, ask for the first associated consequence and up to two underlying reasons. Then, ask for the second associated consequence, followed by only one underlying reason. This will produce item **(1,2,1)**. Do not ask for the third associated consequence (Figure 3).

For the second attribute, ask for the first associated consequence, followed by up to two underlying reasons – thus, items **(2,1,1)** and **(2,1,2)** will be activated. Then, ask for the second consequence, followed by just one underlying reason – this will initiate item **(2,2,1)** (Figure 4).

For the third attribute, ask for the first associated consequence, followed by just one, the most important, reason – this will set off item **(3,1,1)** (Figure 5).

Figure 3: Hard laddering – the $3 \times (1 + 3 + 3 \times 3)$ format (abbreviated) for Attribute 1.

Figure 4: Hard laddering – the $3 \times (1 + 3 + 3 \times 3)$ format (abbreviated) for Attribute 2.

In our study, the above procedure generated 81.2 per cent of the ladders that were generated in the full hard laddering procedure (Table 1). Five additional items (ranked by the number of ladders they have generated), namely (1,2,2), (1,3,1), (3,1,2), (1,1,3) and (3,2,1), should be added to the above seven items (44 per cent in total) in order to obtain approximately 95 per cent of the ladders (again, based on the results in Table 1).

Figure 5: Hard laddering – the $3 \times (1 + 3 + 3 \times 3)$ format (abbreviated) for Attribute 3.

FINAL CONCLUSIONS AND LIMITATIONS

In this paper, we have proposed a method of reducing the length of a hard laddering survey, while, at the same time, controlling the amount of information lost.

Our findings have important practical implications because they enable researchers to achieve almost the same results with much shorter questionnaires, thus helping to minimise respondent fatigue, boredom, irritation, non-response and failure to complete. As a result, the amount (sample size) and the quality of data collected may be increased.

Our findings should also help those using a soft laddering approach in their research. Following our approach, an interviewer may be instructed by a researcher not to pursue questions beyond a certain point. For example, once the first, most important attribute has been elicited, it might be followed by only two consequences (rather than as many as the respondent is able to provide). Or, once the third attribute has been obtained, it should be followed by only one consequence and one value, and so on.

Our method may also be used in the Association Pattern Technique (APT), which constitutes another approach to collecting MEC data.^{20,53}

The APT differs from laddering in that the laddering categories are pre-determined by the researcher, and then presented to the respondent. The computerised task of the respondent is to indicate which attributes relate to which consequences, and then, in a separate exercise, which consequences link with which values. The creation of the latter questionnaire items could be blocked by the computer system in order to eliminate unnecessary ladders of lesser quality.

This study has a number of limitations that one must consider when examining the relevance of the results. Our method of shortening the length of a hard laddering survey, the first such attempt ever reported in the literature, can be readily applied only by those researchers who decide to use in their research the $3 \times (1 + 3 + 3 \times 3)$ three-level-of-abstraction format described in this paper. We do not know how the results would change if another type of format were used. Another limitation of our study is unavoidably related to the very nature of hard laddering based on self-administered questionnaires. In such a case, it is impossible to control for every situational context (time, place, others present, other activities engaged in, and so on) to which a respondent may be exposed.^{4,37,54–57} Among the biggest challenges of laddering, in general, is breaking down barriers respondents have to revealing their emotional connection to a product, service or some public issue. Much of (soft) laddering technique focuses on helping respondents work around these barriers.⁵⁸ In this regard, hard laddering has obvious limitations compared to soft laddering. It does allow the respondents to provide answers, however, without the benefit of one-to-one probing questions that encourage respondents to explore beneath the surface (and, consequently, produce consumer insights, that is, a deep and profound understanding of consumers that unlocks opportunity in the product category). On the other hand, (self-administered) hard laddering permits much larger sample sizes and offers anonymity for the respondents, which is so important in research on socially sensitive topics.

The improvements to the laddering method presented in this paper are preliminary research.

Additional studies, using different data laddering collection techniques, combined with different hard laddering formats and different products (covering, for example, a set of product categories from high involvement – durable good, high involvement – consumable good to low involvement – durable good, low involvement – consumable good or, as an alternative, involving three varied domains such as product, service and public issue), are needed in order to validate our findings. In each case, the number of ladders generated by subsequent questionnaire items would be found, and a pattern of changes in the number of ladders investigated. Based on this pattern, a sequence of rules analogous to the $3 \times (1 + 3 + 3 \times 3)$ -based rules could be established.

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