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Attribute Preference Stability for Complex Products

The key main focus of our research is understanding consumers' preference for complex products. First, we describe some different dimensions of product attribute preference investigation as attribute preference measurement methods, preference construction process, type of attributes and stability in term how the product complexity affects these investigations. Then we present the results of an empirical research measuring stability of product preference of complex products using an experiment built into longitudinal survey. In this article the complex product investigated is mobile phone, which has many attributes and characteristics. Finally we discuss empirical and practical consequences, and further research plans.

Keywords: complex product, mobile phone attributes, preference stability

INTRODUCTION

In monopolistic competition companies try to differentiate their products from the competitor's product in the industry. The more successful the differentiation is the more independent from other companies will be the demand (Carlton, Perloff 2000). One possible way to differentiate the product is to expand core products function with additional new characteristics. Many products (and services) became more complex, marketing managers and decision makers wish to measure preferences of consumers toward complex products (Rao and Hauser 2004, Bradlow 2005, Netzer and Srinivasan 2011). Scholz et al. (2010, p.) considered products complex "if they are characterized by large number of attributes and levels that are relevant in purchase decisions". Netzer and Srinivasan (2011) describe product or service as complex, when it has a ten or more attributes.

The key main focus of our research is understanding consumers' preference for such complex products. In this article mobile phones play the role of complex products, which have many attributes and attribute levels. First, we describe some different dimensions of product attribute preference investigation as attribute preference measurement methods, preference construction process, type of attributes and stability in term how the product complexity affects these investigations. Than we show the results of an exploratory research measuring preference, dispreference, and stability of preference of complex product. The investigated product is a complex product, participants are familiar with, and have previous experience with it. Finally we discuss empirical and practical consequences, and further research plans.

THEORETICAL BACKGROUND

Consumer's product attribute preferences have been analyzed in many different ways in the literature. In this article we will focus on that dimension of product attributes preference, which has influenced by complexity of product: attribute types, measurement methods, preference construction process, and stability.

Product characteristics and attribute types

In the economic model introduced by Lancaster (1966) the goods do not offer utility to the consumer, collection of characteristics "give rise to utility" (Lancaster, 1996, 134). The basic theory based on objective characteristics was expanded with other factors. For example McFadden (1986) integrated choice models with attitudinal scaling and perceptual mapping. Ben-Akiva et al. (2002) included latent variables (attitudes, perceptions) into choice model. Luo et al. (2008) propose a model in which consumer preferences are affected by both the subjective and the objective characteristics. In their model subjective characteristics are treated as latent variables. The results indicate that including subjective characteristic to the choice model provides a better understanding of consumer preferences than traditional methods.

As products and services became more complex, the number of attributes and/ or its levels has increased for such a complex products. This has an effect on consumer decision making process: consumer has to take into account many alternatives during purchase decision.

Attribute preference measurement methods

The most commonly used methods for measuring consumer's product attribute preference in marketing research are conjoint analysis and self-explicated approach. While conjoint analysis is a decompositional approach, self-explicated approach (Green and Srinivasan, 1990) is a compositional method, in which interviewer directly ask individual participants about their preferences for each attribute and/or levels. Self-explicated method is a two-stage method. In the first stage unacceptable attribute levels are being eliminated. In the second stage, respondent determines most preferred-least preferred levels, and the desirability ratings.

Conjoint analysis is as an indirect psychometric method for measuring and analyzing consumer preferences. A full-profile conjoint analysis is efficient for small number of attributes, but is hardly usable for complex products, which has large number of attributes and levels. In early 1990s Green and Srinivasan (1990) suggested developing methods coping with large number of attributes and levels as a key direction. Many other methods were developed (e.g. hybrid CA, adaptive CA, choice-based CA). V. Srinivasan and Chan Su Park (1997) introduced a method called customized conjoined method, which combines self-explicated and conjoint method to deal with large number of attributes. They find that self-explicated approach has a slightly more predictive validity than the combined method. Another approach was introduced for dealing with complex products: a web-based upgrading method (Park et al. 2008), which combines self-explicated method and conjoint analyses. The method allows participants to stepwise upgrade a bare-bone product to a more desirable level. Sattler and Hensel-Börner (2000) gave a broad overview of empirical studies comparing conjoint measurement and self-explicated approach, concluding, that the majority of empirical comparisons either have non significant differences between methods or even higher predictive validity or reliability for self-explicated approaches.

Preference construction process

Classical utility theory assumes that consumers are rational, and have well-defined preferences, and the role of researcher is to reveal these preferences. Behavioral decision theorists demonstrated (Kahneman, Tversky, 1981, Slovic, 1995) that assumption of rationality is violated, consumers do not make their choice always rationally, preferences are not stable in different contexts.

Hoeffler and Ariely (1999) investigated the impact of different dimensions of experience (effort, choice, and experience) on preference stability. They describe that with increased experience preferences can change although stabilize over time. The preference stabilization process has both objective

(revealed preferences) and subjective aspects (self report of attribute importance and persistence of the preference).

Bettman et al. (1998, p.187) assume that preferences for objects are often constructed in the generation of a response to a judgment or choice task. This mean, that the consumers "do not have well-defined preferences, but construct them using a variety of strategies contingent on task demand".

Environmental influences

Stability of product preferences can be also influenced by environmental cues. Laboratory and field experiments are commonly used methodologies to investigate individual and environmental influences on consumer perceptions and preferences. Novemsky et al. (2007) focus on the influence of preference fluency on consumer choice, focusing on meta-cognitive experiences that occur during the preference construction process. They define preference fluency as "the subjective feeling of easy or difficulty experienced while making decision" (Novemsky et al. 2007, p.347). Authors conducted four studies where directly manipulated the subjective experience of difficulty, concluding that the fluency accompanying preference formation may influence the size of deferral and the compromise effect.

Kramer (2007) identifies task transparency "as a critical property" for understanding consumers' stated preferences (on attribute importance see also Veres 2008). The research shows that consumers "must be able to see though or understand the construction of their preferences to maximize utility" (Kramer, 2007, p.224).

Berger and Fitzsimons (2008) describe how priming in everyday environment can influence product evaluation and choice. In a field experiment authors examined the accessibility of various consumer products at two stages: the day before Halloween and one week later. Their study examined that prevalence of simple environmental clues, as orange color can affect product accessibility.

Attribute preference stability

The stability of consumers' verbal responses was described by Olson and Muderrisoglu (1979) by using the free elicitation procedure to measure salient product attributes. In order to measure stability respondents were asked to return after one week, hence repeating the elicitation. They find that 50-60% of the concepts elicited at second phase were elicited in first phase.

Dolnicar and Rossiter (2008) used an experiment embedded into a longitudinal survey measuring the stability of consumer's brand-attribute associations. On two distinct occasions (a week apart) participants filled in a brand-image survey. They demonstrated, that the low stability of consumers brand-attribute association might be partly explained by certain methodological aspects (e.g. task easy, consumer involvement, brand familiarity, etc.).

Bond et al. (2008) examined the ability of decision makers to generate self-relevant objectives for consequential decision. Respondents were asked to generate and list all objectives that were personally relevant to their decision. Than participants were shown a master list with potential objectives and they had to check all that they considered as personally relevant. The empirical results show that respondents omitted nearly the half of the objectives that they later identified as personally relevant. Omitted objectives were perceived to be almost as important as those spontaneously generated.

As regards attribute preference stability the so-called gap-tolerance can also be taken into consideration (Veres 2008).

RESEARCH QUESTIONS AND HYPOTHESIS

What are the consequences of the above mentioned findings on marketing research methodology of product attribute preference measurement? How to apply these findings in the marketing research methodology?

Our goal was to investigate consumer's preferences toward large number of attributes for complex products. We are not

intending to predict buying behaviour. Instead we are willing to get a more clear picture of the consumers' attitude toward a previously bought complex product featured with desired and some useless characteristics. In this exploratory research we tried to find answers for following questions:

- Hypothesis 1. Consumers have three types of attitudes toward product attributes for complex products: preference, dispreference or indifference.
  - H1.1. There is a significant difference in stability of different attributes.
  - H1.2 There is significant difference in stability of different preference types.
- Hypothesis 2. Following Bond et al. (2008) I hypothesize, that consumers can only partly formulate their preferences toward complex product attributes.
  - H2.1 There is a significant difference on preferred attributes that are mentioned in the spontaneous stage.

EMPIRICAL SURVEY
Research design
We designed a product attribute stability measuring survey to be administered to the same respondents on two occasions a week apart. The research design – an experiment built into longitudinal survey - is partly inspired by the above introduced design of Dolnicar & Rossiter (2008). In our design we followed the similar methodological approach, although focused on respondents' product attribute preferences and dispreferences. Mobile phone was chosen for investigation due to several reasons. First, mobile phone has a large number of attributes and/or levels within each attribute. Second, all participant has had mobile phone for more than one year, so they had previous experience with product. It is important, since we assume that with increased experience preference are more stable (Hoeffler, Ariely 1999).

Within mobile phone attributes we included not only objective, but also subjective attribute (design), following Luo at all

(2005) research, which has indicated that including subjective characteristic to the choice model provides a better understanding of consumer preferences. We wanted to know, whether there is a significant difference in the stability of different types of attributes.

Methods
The 137 participant were undergraduates at several Hungarian business schools and universities (Budapest, Gyöngyös, Győr). Although this is a relatively small, convenience sample, it has some advantageous characteristics. It is relative homogenous: respondents are in the same age group; all of them are students and share similar professional interest.

1st and 2nd stage questionnaire
At the first stage subjects were faced with the followings: their cellphone has been broken, so they have to purchase a new one. They were then asked to describe: first, what kind of characteristics the new mobile phone is required to have; what price they are willing to pay (WTP) for the new mobile phone, and what characteristics of the lost mobile phone were useless for them. Answers were completely spontaneous. Respondents were allowed to describe as many characteristics as they wanted.

In the second stage a week later the same students were asked to answer the same questions again. In this stage participants were told that unfortunately their answers were lost, so they have to answer the same spontaneous questions once again. Afterwards they were asked to complete a standardized questionnaire with 8 attributes and 53 attribute levels (stated preference task).

Attributes for this stated stage were selected using 2 sources: online sources (online pages developed for product selection by mobile network providers and mobile phone manufacturers) and the attributes mentioned by the students at the first stage. Online sources indicated 8 basic attributes (manufacturer/brand,

styles, price range, camera options, design, multimedia, business, connectivity, basic features).[1] We decided using categories used by online shops of mobile phone providers and producers. Number of levels assumed for attributes (characteristics) are so: 11 brands, 4 different styles, 3 basic features, 8 business features, 6 multimedia features, 3 connectivity features, 5 camera options, 13 design related characteristics. They were further asked to indicate their maximum amount they would be willing to pay (WTP).

For brand and styles attribute levels – were respondent can choose one from different characteristic (only one brand can be chosen in final decision) we asked respondent to determine their primary preference (most preferred attribute level), secondary preferences (I will consider...), dispreference (It is not to be thought of...). In case of other features (basic, multimedia, connectivity...) respondent were asked to determine whether they need the feature or it is useless for them.

Results

One of our goals was to understand attribute stability of desired and useless attributes. Through the two stages we have measured totally 1280 observations for desired characteristics, 592 observations for useless characteristics. For product attribute stability we followed approach used by Dolnicar & Rositter (2008): stability was measured with the number of attributes made by the respondent on both surveys (11) expressed as a percentage of total number of attributes indicated on either survey (10+01+11) – proportion of double positive attributes among all attributes.

Attributes and characteristics mentioned in spontaneous stage

An average 5 number of characteristics mentioned in first stage (M=5,06, SD=2,12), whereas in second stage 4-5 (M=4,6, SD=2,17) characteristics. The average number of useless characteristics was 2,4 in first stage (M=2,40, SD=1,44), and 2,39 (M=2,39, SD=1,46) in second stage. Table 1 shows the proportion of respondents who mentioned different types of attributes in spontaneous stages. Surprisingly among spontaneously mentioned desired characteristics 86% of respondents mentioned some very basic characteristics (e.g. SMS, alarm clock), which can be found at any mobile phone. Among students multimedia attributes were also very popular: 85% of respondents have mentioned spontaneously multimedia attributes among desired characteristics. We also observed that opposite to our expectations there were fewer responses about brands and style in spontaneous part: only 21% of respondents has mentioned desired brand name, and 15% has mentioned a specific style in spontaneous stages.

Among useless attributes most frequently mentioned characteristics were basic (e.g. games, MMS), and business attributes (e.g. Pocket Office, Email, ..). More than two-third (69%) of students finds same basic characteristics, and 52% has mentioned some business characteristics are useless for them.

Overall stability of desired and useless characteristics

The double positive level of overall stability for desired characteristics was 45% (M=0,45, SD=0,22). Although this result is lower, than the level measured by Dolnicar & Rositter (2008) for brand attribute associations (average 53%), we should point out, that in our method we used completely spontaneous answer. Only 5% of respondents did not show any stable characteristics among all characteristics mentioned.

The double positive level of overall stability for useless characteristics was 44% (M=0,44, SD=0,33), which is very similar to the overall stability measured for desired characteristics. 18% of respondents did not have stable characteristics. This number is significantly higher, than the number of desired characteristics.

The willingness to pay (WTP) was measured in both stages. More than half of the respondents mentioned identical price (55%

Table 1: Attribute types mentioned spontaneously (N=137)

	Desired attributes		Useless attributes	
	N	%	N	%
Basic	118	86	94	69
Business	53	39	71	52
Multimedia	116	85	59	43
Connectivity	60	44	16	12
Design	78	57	7	5
Brand	29	21	0	0
Style	21	15	1	0
Other	32	23	40	29

Source: Own calculation

Table 2: Desired and useless attributes

	Desired		Useless	
	1st stage Spontaneous	2nd stage Spontaneous	1st stage Spontaneous	2nd stage Spontaneous
Average number of characteristic	$M=5,06$ $SD=2,17$	$M=4,6$ $SD=2,17$	$M=2,4$ $SD=1,44$	$M=2,39$ $SD=1,46$
The double positive level of overall stability	45% (M=0,45, SD=0,22)		44% (M=0,44; SD=0,33)	

Source: Own calculation

Table 3: Stability of desired and useless attributes

	Desired attributes			Useless attributes		
	N	Mean	SD	N	Mean	SD
Overall	137	,45	,22	129	,44	,33
Basic	118	,39	,40	94	,45	,45
Business	53	,25**	,37	71	,41	,44
Multimedia	116	,62***	,41	59	,45	,45
Connectivity	60	,45	,48	16	,22**	,41
Design	78	,38	,43	-	-	-
Brand	29	,53	,50	-	-	-
Style	20	,50	,51	-	-	-
Other	32	,19	,38	40	,38	,45

Paired Sample T-test, Correlation is significant at the level.: *** p=0,00; ** p=0,01; * p<0,05
Source: Own calculation

of the subjects) in second stage as in the first stage. The Pearson correlation coefficient was 0,865, which was significant at level 0,01.

On the aggregate list of first ten most stable desirable characteristics some very basic characteristics are found (e.g. SMS, alarm clock). We also observed that opposite to our expectations there were fewer responses about brands and style in spontaneous part. This questions our hypothesis 2.1.

Attribute level stability

Characteristics mentioned spontaneously indicated to develop 8 attribute types: basic attributes (e.g. SMS, display options, memory, talk time...), business (email, internet, pocket, office, WIFI, WLAN, GPS,..), Multimedia (e.g. MP3, music player, FM radio, Camera, video, ..), Connectivity (Bluetooth, Infraport, USB, synchronization), Design (e.g. easy to use, slim, elegant, modest,..),

Brand, Style (slider, touchscreen, bar...), and other (eg. Stock, world time, currency converter...).

Table 2 shows the stability of desired and useless product attribute preferences. The Paired Sample T-test shows that the stability of multimedia attribute and business attribute is a significantly different from overall stability: stability of desired multimedia attribute is higher (t-value: -5.19, p=0.00), while in case of desired business attribute lower (T-value: 2,61, p=0,01). In case of useless attributes only the stability of the connectivity attribute is significant smaller than overall stability (t-value: 2.50, p=0.25), stability of other attributes dos not differ significantly from overall stability of useless attributes (brand and style attributes are not included into a table because of small sample size).[2]

This result shows that there is a significant difference in stability of different attributes which means that some attributes are more stable, than others. Multimedia seems to be more stable attribute, than other, while business attribute less stable, than overall stability of attributes. This supports our hypothesis 1.1.

Stated preferences

In second stage we measured stated preference of desired and useless characteristics. For brand and styles attribute levels we asked respondent to determine their primary preference (most preferred brand), secondary preferences (I will consider...), dispreference (It is not to be thought of ...). In case of other features respondent were asked to determine whether they need the feature (desired) or it is useless for them.

Nearly all of respondents (95%) had a primary preference on mobile phone brands, and 87% on style attribute. We find, that 74% of respondents hadn't mentioned brand on spontaneous stage, but had primary preference in stated part. Similarly, 62% of those, who hadn't mentioned style on spontaneous stage, had primary preference in stated part. This reject are hypothesis H2,

that all preferred attributes are mentioned spontaneously by respondent. This result is in line with Bond et al (2008) results, were authors find, that respondents omitted nearly the half of the objectives that they later identified as personally relevant.

When comparing attributes of spontaneously mentioned and stated preferences of attributes we have to point out some limitation of these comparisons: The mentioned attributes at the two stages (spontaneous and stated) contain different number of characteristics, mainly because there were some basic differences in spontaneously mentioned characteristics and in predefined stated attributes and characteristics. First, respondents mentioned many basic characteristics as desirable, which can be possessed by any mobile phone (e.g. making phone call, SMS, alarm clock...). We exclude these characteristics in the stated part, since these characteristics are included in all mobile phones. Second, there were fewer responses regarding brands and style in spontaneous part of survey, than we have expected. This is the reason why we excluded these attributes (brand and style) from comparison with stated responses.

There was a positive correlation between spontaneously mentioned and stated preferences for business attributes, either in case of all spontaneously mentioned attributes (Pearson corr.coeff.0,423, p<0.01), both stable spontaneously mentioned attributes (Pearson corr. 0,495, p<0.01). In case of multimedia attributes we also found a positive correlation between spontaneous and stated preference: Pearson corr. coefficient was 0,453, p<0.01; and 0,212, p<0.02, respectively. This supports our hypothesis H1.1, that there is a difference in stabilities of attributes.

We also analyzed the indifferent characteristics that were not chosen neither as desirable nor useless. For example, from 4 different styles nearly a third of respondents were indifferent at least to one level – so they did not choose them as desirable, or unacceptable. For 24 feature attributes the average number of indifferent characteristics were 6 (M=6, SD=5,4).

DISCUSSION

In our study we have measured a stability of consumer preferences for a complex product (mobile phone) attributes. We designed a product attribute stability measuring survey administered to the same respondents on two occasions a week apart. We conducted an experiment built longitudinal survey to measure spontaneously desired and useless attributes, then in second occasion we asked to fill a questionnaire with list of attributes and characteristics to measure a stated preference of respondents.

We find that some product attributes were more stable, than other. Multimedia attribute was significantly more stable than overall stability, and business was less stable than other attributes among respondents (students). Further research has to uncover the causes of why some attributes are more stable than others.

We find that some attributes, for which respondent has a primary preference, weren't mentioned spontaneously as desired attributes. Brand and style attributes were mentioned only by 21% and resp. 15% of respondent. On the other hand, in stated preference measurement part of questionnaire we find that 95% of respondents had a primary preference on mobile phone brands, and 87% on style attribute. This result is in line with Bond et al (2008) results, were authors find, that respondents omitted nearly the half of the objectives that they later identified as personally relevant. These findings are consistent with a wide range of evidence that shows that decision makers respond to the complexity by simplifying the task. This simplification caused that the respondents also omitted personally relevant attributes. We agree with the view of Bond et al (2008) that unaided preference questions are not sufficient for preference measurement, and we would like to point out, that the carefully created "master list" in stated preference part may play crucial role in preference measurement. Our aim was to understand the preference elicitation process of respondents and not to find inadequacies in the study to degrade preference measurement. Our research has shown that complex product with large number of characteristics often have useless or indifferent characteristics. We try to understand why consumers do buy products where a large number of characteristics are useless or indifferent for them. Following that we would like to conduct an iterative qualitative research module, which allow a deeper understanding of consumers' attitudes toward complex product attitudes. Further research could also examine these conditions that moderate the stability of attribute preference.

It would be as well fruitful to investigate surveys in other product categories or services, e.g. another complex product like digital camera, computer. Also we suggest comparing a preference stability of complex and simple products, to find out how the choice difficulty, the number of attributes affects stability of attributes.

Table 4: Correlation between stated attributes and spontaneously mentioned attributes

Stated attributes	All spontaneously mentioned	Stable spontaneously mentioned
	Corr.	Corr.
Basic	-	-
Business	0,423**	0,495**
Multimedia	0,453**	0,212*
Connectivity	0,053	0,092
Design	0,025	0,053
Brand	-	-
Style	-	-

*Pearson corr. coeff, Correlation is significant at the level: ** p<0,01; * p<0,05*

Source: Own calculation

NOTES

1 The most serious problem was defining which attributes and levels to include into the study, because technical information on mobile phones includes a very large number of information (e.g. different protocols, producer dependent services, applications...). The author thanks to Jaszicky Andrea (Vodafone) for her help in defining attribute categories.

2 Non-parametrical version of Paired Sample T-test, Wilcoxon Signed Rank Test gave the same result: stability of business and multimedia attributes were significantly different from overall stability. We used SPSS 18.0 for analyses.

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