

PRODUCT ATTRIBUTE PREFERENCES – A MULTIDISCIPLINARY APPROACH

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Abstract

The basis of buyers' preferences are the differences of goods. Revealed preferences can be deduced from the market behaviour of the consumers, that is from their choices. In marketing consumer preferences are defined as the subjective tastes, as measured by utility, of various bundles of goods. They permit the consumer to rank these bundles of goods according to the levels of utility they give the consumer. In an expert brainstorming process we have identified eight factors that can determine the perception of product attributes: attribute strengths, preference interval, stability, product complexity, consumer task, life-likeness, environment and experience. Our series of research plans to analyse the perception of product attributes and the system of the parameters of preferences related to them in a complex way. We aim to investigate preference systems that relate to the system of attributes with a multidisciplinary, multifocus, hierarchic series of surveys. As a first stage in our experimental study we are investigating intransitivity occurring in participants' preferences during selection between simple, medium complex, and complex products. The participants' task is to make pair-wise comparisons of preference between specific realizations of each product group. There are two possible versions to show up the pairs of virtual products to the subjects. We show up to the subject those attributes, which are not different, then only those that are different from each other. Using a computer based experimental design every participant has the personalized attribute set.

Keywords: Products, preferences, consumer psychology, marketing research

Introduction

The basic hypothesis of microeconomics is that consumers decide on their choices based on their preferences. The basis of buyers' preferences are the real or presumed differences of goods, including also the circumstances of the purchase. In the behaviour of households, microeconomics assumes an effort to maximize utility in the decisions (Schumann, 1998). It was Lancaster (1971) who pointed out that when defining utility, consumers actually evaluate certain measurable features – i.e. attributes - of goods.

Consumer psychology deals with the mental process, the output of which is described by preferences in the utility theory. Psychologists, in this way, are after explanation of preferences. The consumers though, are aware of these preferences only partly and on different levels for each individual, in each situation and for each product. Not conscious i.e. underlying preferences effect their choices just the same way. According to the behaviourist axiom - introduced by Samuelson (1938) - the observable, so called revealed preferences can be deduced from the market behaviour of the consumers, that is from their choices. Usually, with the methods of the psychology of economics and of marketing sciences, only the

revealed preferences can be measured, the underlying preferences can only be assumed if at all. With the examination of revealed preferences, alongside with taking underlying preferences into consideration, the background for consumer behaviour becomes analysable. Researching this behaviour means the survey of characteristics of product choices, or, consumer decisions. Key question to our research is the perception of attributes, that are the object of consumer preferences, the mapping of this system in the consumer's mind.

Revealed preferences from various points of view

process of product selection can be modelled with the process of visual perception, where the individual identifies, evaluates, the seen object (the product) by its certain features (attribute dimensions) then recognizes it or makes a decision regarding it, based on the perceived characteristics. As the shape of a mug suggests the information that it contains liquid and its handle suggests „take me here” so can features be divided into attributes during the perception of products (such as size, shape etc.) Regarding these attributes, apart from the perceived features, experience is also adding to the evaluating process: for example, about the shape of a handle one knows that it is for taking the mug. Translating the perception metaphore onto the general level of product perception: when the consumer perceives the product, it is a perception through its attributes. During the product perception the values to certain attributes (size of the mug) appear based on seen/perceived, others appear based on our knowledge (shape: handle - it is customary to take the mug by its handle). Therefore, during the perception of a product, it is represented by its attributes and the values (realisations) of those. The rational base of consumer decisions are the preferences, that can be either revealed - therefore can be measured - or underlying preferences that are only assumed. The perception of products, including perception of its attributes means the starting point for the consumer decision.

We aim to investigate/analyze preference systems that relate to the system of attributes with a multidisciplinary, multifocus, hierarchic series of surveys. For this, we start with in-person factors proceeding in the direction of environmental factors. In an expert brainstorming process we have identified eight (8) factors that can determine the perception of product attributes, through this the consumer preferences as well (Table 1).

	Factors
1.	Strong vs. neutral characteristics of attributes, from consumer point of view
2.	Interval characteristics of preferences, related to attributes or to their realisations
3.	Stability of preferences related to attributes or their realizations
4.	Complexity of perceived products (the number of attributes and their realizations)
5.	Type of consumer „task” (rating-ranking-choice)
6.	Level of life-likeness of the consumer decision situation during the research
7.	Effect of the decision environment on the preferences
8.	Effect of experience on the preferences (e.g. in case of a repurchase situation)

Table 1. Factors defining product attributes, in hierarhic order

Ad 1. **Strong or neutral characteristics of attributes** means the subjective importance of a given feature. According to our assumption it determines to what extent a given product attribute adds to the preference of an individual. The neutral attributes are less considered by individuals while forming their evaluation, while the strongly important or strongly unimportant attributes play a significant role in consumer decisions. We assume, furthermore, that with the increase of „strong” marker the intransitivity of preferences decreases in product-comparing situations (see Veres, Tarján and Hámornik, 2012). Extremely strong attributes are the „must” or dichotom attributes (as per Kano, 1984), when the presence of a given feature leads to preference and the absence of it leads to dispreference in every case.

Ad 2. Preferences related to attributes cannot be considered as discrete values in every case, what is more, we assume that attribute preferences modelled with discrete values would give us a convenient, but highly simplified hypothesis. Instead, regarding the realization of a certain attribute we think that a preference is deviated or better expressed „floating” within a zone (an **interval**) This area is characterized by its expected value, but it is also characterized by its maximum, minimum and the characteristics of distribution (skewness or kurtosis). In case we do not examine preferences by the expectable values (say discrete values), but rather they are modelled as intervals to a continuous scale then the appearing intransitivities (inversions, ambiguities) are well explained. In case the intervals are (partly or entirely) overlap, then certain preferences can be intransitive as well when compared, still, the expectable values fall to their own intervals. This overlap, according to our expectations, is probably bigger in case of neutral attributes and smaller in case of strong attributes. All this can be examined both in rating and ranking situations as well. It is to be noted that among the axioms of microeconomic system of preferences the unambiguity of rank of utilities, that is the transitivity of consumer comparisons was already set by Hicks and Allen (1934), while Arrow (1963) reveals that as opposed to the transitive rating/evaluation of the individual, the preference system of a group is intransitive.

Ad 3. Revealed preferences, related to attributes that are the objects of our observation, are variable to time and situation. In this research, the examination of their **stability** with investigating ranking, rating and product choice is crucial in order that we will be able to describe those attributes and situations which promote or impede stability. These are the factors that also talk about the possibility of generalization of the results: which preferences under which circumstances remain stable in time, and which ones are changeable.

Ad 4. The choice of products, the product perception establishing preferences of it is greatly influenced by the **complexity** of the product (Hlédik 2012). It is an important point how many attributes describe the product, and how many more potential realizations to these attributes are probable among which (the product variants) the individual should make a comparison. In case of simple products that can be described with a small number of attributes and, as such, easier can be mapped mentally, we can count on more separated and stable preferences. In case of more complex products, where a big number of neutral attributes are present, we can count on more overlapping preference intervals and consequently, on intransitivities, moreover, on lesser stability.

Ad 5. The perception of product attributes, and their preferences can also be determined by the **character of research task**. Depending on whether the individual has to perform ranking, rating or choice, the intervals of product attribute-related preferences and the stability of preferences may change. In the ranking-rating-choice sequence, we assume an increasing thoroughness and commitment of the individuals, therefore we assume more and more separating preference intervals and greater stability in case of the strong attributes. Along with this we also expect less of intransitivity. For examining these assumptions, the experimental situations should comprise of tasks of ranking, rating and choice characters as well. Here we do not enter into the long-disputed question of microeconomics whether or not the consumer is able of continuously „measuring” utilities (cardinal utility) or merely the rank of certain attributes compared to each other mean his/her underlying preferences. (ordinal utility)

Ad 6. Moving away from intra-personal factors, the next important point is the **level of life-likeness of examined situations**. The more life-like a situation is, the more likely it is suitable for analyzing real consumer behaviour. In conjunction with our assumption the more real a behaviour is, the greater extent the underlying preferences and their influence can be captured. Life-likeness increases the ecological validity of research, thus the likelihood of generalization of the results. Life-likeness gradually increases with moving on from

laboratory experiments to in-store field-research. Comparing different situations makes a thorough research of product-related attribute preferences possible.

Ad 7. Life-likeness is closely related to the effect of research **environment**, choice or rating environment on preferences. Therefore, apart from laboratory research, it is necessary to perform field (e.g. in-store) consumer research as well. With the systematic manipulation of the environment we can explore which are the factors that have an effect on the system of preferences. For example, the proportion of intransitivity of preferences, or even the level of overlap of intervals may vary according to the scope of assortment, or to the difference between the products of comparison (the number of their differing attributes).

Ad 8. Finally, the last factor to be analyzed is the effect of **experience** on the features of preferences. According to our assumption, individuals – after using the product or after gaining information on the usage of it -, can change their system of preferences formed regarding the features of a product. Research questions: What experience fosters stability, what experience causes changes, intransitivity?

Apart from the above factors, fatigue and mental strain have also effect on the system of preferences, as a **moderating** agent. Certain features of the environment may also behave as moderators in some situations. And for the sake of historical trustworthiness here we should mention the famous critical analysis of Sen's (1973) which showed that while observing revealed preferences, the interpretation of underlying preferences can be mistaken in at least two cases:

- 1, when the consumer's level of preference is the same and the choice is forced
- 2, when other e.g. moral concerns or external expectations overwrite underlying preferences

Our series of research plans to analyse the perception of product attributes and the system of the parameters of preferences related to them in a complex way. We analyse the effect of intra personal and extra personal factors on these preference systems with the above described hierarchic research design. In the analysis of the relations between our ratings, preferences and behaviour – that is our product choices, the research relies on the classic sociopsychological research direction of relations between attitudes and behaviour, which is rooted in the works of Brehm (1956) and Festinger (1957) (see cognitive dissonance reduction, free-choice paradigm: FCP) and reflects on the questions raised by Chen and Risen (2010) respectively.

Consumer psychology on choice

According to Brehm (1956) the core of FCP is the situation to choose among more alternatives, which do not substantially vary in their attractiveness. This phenomenon is usually studied in experiments by having subjects rate an enhanced number of options, and then the participants are faced to choose between two highly similar alternatives (of approximately similar utility). After the one's choice has been made, researchers have observed a decrease in the rating of the refused object and an increase in the rating of the chosen one (Brehm, 1956; Bendersky & Curhan 2009).

Cognitive psychologists have been also bound up in the cognitive dissonance reduction (Dias et al., 2009). Their problem statement was whether this is a characteristic phenomenon in an intrinsic manner for human mind and information processing, or this is the result of motivational contradictions. Dias et al. (2009) argue that cognitive dissonance reduction is incorrectly thought of as a phenomenon of motivation, as recent results suggest that it is a process typical of the functioning of human mind in an inherent way. They proved this assumption by the findings that cognitive dissonance is present even in the absence of any stimuli in the system, moreover it works unconsciously.

A human tendency toward harmony and to reduce contradictions in opinion, intransitive attitudes in decision, is leading to biases raise the question whether spreading in

free choice paradigm can be explained by the theory of dissonance reduction at all? The limited mental computational capacity on its own leads the system to use heuristics (Eysenck & Keane, 2000) that incorporate biases. The question is that how large is the biasing effect, and what function describes its growth and change? We aim to answer this question using product attributes that participants rank as less important. Despite the low subjective importance of some attributes, these features are present as differences of product realizations, and they could have an effect on decision. More than 40 years after Rosenthal's critics on experimenter bias, Chen and Risen (2010) raise methodological and mathematical arguments against the dissonance reduction in FCP detailed in the next section. This can lead to serious questions about FCP, dissonance reduction, and their application in marketing research.

Mathematical Background

In the first step of the Chen-Risen experiment 10-15 goods should be sorted on the basis of lots of conflicting aspects (i.e. in a transitive way).

Let $k \in \{1, 2, \dots, n\}$ denote the index number of good $x_k \in X$, where X denotes the set of possible goods. If for all goods $x_k \in X$, a „preference level” or „utility value” (denoted by u_k) is associated in such a way that for each pair of goods $x_k, x_l \in X, x_k \neq x_l$ exactly one of the two preference relations hold: $u_k > u_l$ or $u_k < u_l$, then an *underlying preference* is defined for the set X of goods.

Note that the latter is a bijection of X onto the n -element subset of the integer numbers, i.e. a transitive digraph. Let us suppose that people have perfectly stable *underlying preferences* and they are asked (that was the first step of the Chen-Risen's model scheme) to rate all goods $x_k \in X$ in a bijective way that for each pair of goods $x_k, x_l \in X, x_k \neq x_l$ exactly one of the two relations hold: $r_k > r_l$ or $r_k < r_l$. It is supposed, as well that r_k is a random variable of which there exists the expectation and it coincides with the so called associate "preference level" or "utility" u_k of the good $x_k \in X$ that is to say

Assumption 1 (ASMP 1): $E[r_k] = u_k$

The random variable r_k on which it is supposed only that there exists its expectation and that coincides with the "preference level". This is - in our view – an impermissibly broad assumption and due to our criticism as we were able to show that the three mathematical assumptions are too "liberal" as compared to reality. The premise from which the main statement on the (FCP) on the positive spread has been derived, is equivalently reformulated as follows:

ASMP 1a: $\Pr(B_t | A) > 1/2$,

ASMP 2: $\Pr(C | A) > 1/2$,

ASMP 3: $1 > \Pr(A | B_t) > 1/2$,

where the following three types of random events are defined as below:

$A \equiv \{u_k > u_l\}$; $B_t \equiv \{r_k^t > r_l^t\}$; $C \equiv \{c_{\{k,l\}}^2 = x_k\}$.

We have shown that the above three assumptions allow the ratios to range between "dissonance" (disagree) and "consonance" (agree) of both preference & ratings or preferences & choices up to 100%. That is to say the dissonance of the random events A and B_t may extend up to the size of their consonance, or making use of a metaphor the "misdirected transmission" of the stable underlying preferences may have an extent of 100 %, as well.

1) We have there proposed that the extent of the "misdirected transmission" allowed only up to 10~25% instead of that limit of 100%. Thus the positive spreading of the FCP really proves to be with an order of magnitude 5~10-times less than they suppose it. This may

involve that this, in theory, very important spreading effect obtained by pure deduction remains within the measurement error limits.

2) Now we examine another approach to the reality. This is a correction, in a more elementary sense, that is built only on Assumption 1 (ASMP 1), the other three conditions is not necessary for the formulation. Consequently, our findings *are not related only to the FCP-research but to any study of consumer preferences* as well.

It is assumed for the random variable r_k not only that there exist its expected value and it is equal to their "preference level" (ie, $E[r_k] = u_k$), and still arbitrary distribution, but the possible values of r_k may be no longer from minus infinity to plus infinity, but the reasonable value of a certain $r_k \in [u_k - \Delta; u_k + \Delta]$ falls into a finite interval in the vicinity of u_k , where $\Delta, \Delta > 0$ (see 2nd factor in Table 1). It is known about consumer preferences (at least we have good reason to believe) that the above width of the occurrence interval ($\Delta + \Delta$) for the best and the most rejected attributes is less since the uncertainty and the error rate is less than in the mid-range case, which latter therefore has an increased consumer uncertainty, or mistake. This inevitably leads to the fact that the various occurrence intervals of attributes overlap in the center, or even coincide with each other, even though it has been assumed for the *underlying preference* u_k for any pair of attributes $x_k \neq x_l$ either the relation $u_k > u_l$, or the opposite one $u_k < u_l$ is satisfied. When the occurrence intervals fall together with each other approaching to the center, we can get to the "Q-sort" arrangement (or Q methodology) which has been a central and very important tool in psychology and the social sciences during more than the last half century.

Q methodology was introduced in a letter to Nature written by William Stephenson (1935), and it has been widely adopted in the social sciences basically for the technical procedure of Q sorting (see Brown 1966) . Fundamentally, Q sorting calls for a person to rank-order a set of stimuli according to an explicit rule (condition of instruction), usually from agree (+5) to disagree (-5), with scale scores provided to assist the participant in thinking about the task. The operation is inescapably subjective in the sense that the participant is sorting the cards from his or her own point of view.

Now let us show an example of what our above statement asserts if e.g. each attribute x_k has $n = 11$ finite intervals. For simplicity the "preference levels" or "utility values" u_k of the 11 attributes range over the integers from 0 to 10, i.e. $u_k = k$, where $k \in \{0, 1, \dots, 10\}$.

x_k	Δ	Δ	u_k	r_k	$[u_k - \Delta; u_k + \Delta]$	$E[r_k] = u_k$
0	0.5	0.5	0	r_0	$[-0.5; 0.5]$	0
1	0.5	1.5	1	r_1	$[0.5; 2.5]$	1
2	1.5	0.5	2	r_2	$[0.5; 2.5]$	2
3	0.5	4.5	3	r_3	$[2.5; 7.5]$	3
4	1.5	3.5	4	r_4	$[2.5; 7.5]$	4
5	2.5	2.5	5	r_5	$[2.5; 7.5]$	5
6	3.5	1.5	6	r_6	$[2.5; 7.5]$	6
7	4.5	0.5	7	r_7	$[2.5; 7.5]$	7
8	0.5	1.5	8	r_8	$[7.5; 9.5]$	8
9	1.5	0.5	9	r_9	$[7.5; 9.5]$	9
10	0.5	0.5	10	r_{10}	$[9.5; 10.5]$	10

Table 2. Preference levels of attributes

Table 2 clearly shows the "Q-sort" arrangement, where in the central 5 attributes $x_k \in \{3,4,5,6,7\}$ completely overlap, so the following "Q-sort" arrangement no longer distinguish them from each other, then $x_k \in \{1,2\}$ and $\{8,9\}$ $x_k \in \{8,9\}$ attributes or another.

Taking smart-phones as complex products for the testing, 11 attributes are considered to be important, which are in the rows A-K of Table 3. All the 11 attributes have three property types as specified in the rows. Then the subject is asked to perform a one-to-one correspondence between the 11 attributes and the so-called "Q-sort" arrangement in Figure 1

(bijection). It is to mention at this point that the forced choice in Q-sorting is equally advantageous: each attribute „finds” its position in the Q-grid; and disadvantageous: does not allow else but a symmetric distribution of the attributes. This latter can cause a non-measurable distortion in the analysis.

Attribute dimension	Examples of Attribute values / realizations
A. Shape	<i>Classic, flip, slide</i>
B. Brand	<i>Apple, Samsung, Nokia</i>
C. Thickness	<i>Thin, medium, thick</i>
D. Color	<i>Metal, black, vivid color</i>
E. Style	<i>Fancy, simple, elegant</i>
F. Usage	<i>Simple, multifunctional, easy-to-use</i>
G. Camera	<i>Under 2 MP, 2 to 3 MP, above 3 MP</i>
H. User interface	<i>Classic keyboard, QWERTY keyboard, touchscreen only</i>
I. Entertainment	<i>Radio, music player, applications to download</i>
J. Internet	<i>None, WIFI, 3G</i>
K. Connectivity	<i>USB, Bluetooth, Infra-port</i>

Table 3. Attributes (11 pieces)

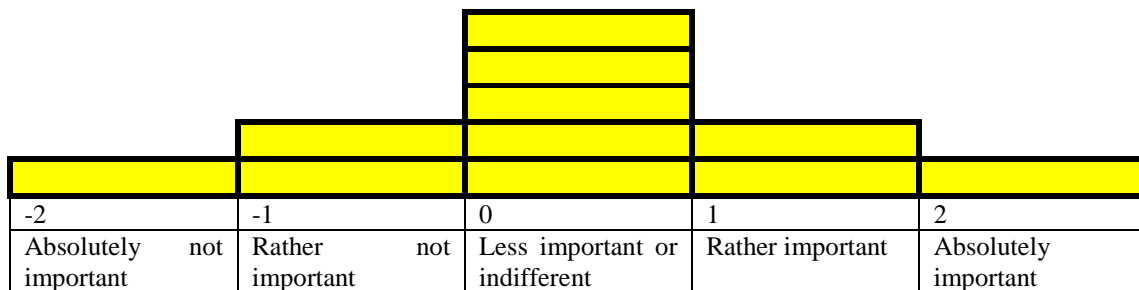


Figure 1. Q-grid

The subjects are asked essentially: what are the most important 3 attributes among the total 11 ones and the least important 3 ones, according to them, and therefore in the middle column will remain 5 attributes. Then "we create", based on the 5 attributes left in the middle column (denote them by {A1, A2, A3, A4, A5}), all the theoretically possible $3^5 = 243$ virtual products, since each attribute has 3 (0, 1, 2) possible states. In selecting from among 243 items 9 pcs (R0 - R8) representative items so that they fall apart as far as possible and fill out "evenly" possible the space formed by the 243 member products. The distance between two products are quite obviously defined as how many times differ the possible states (that could be 0, 1 or 2) between 2 given rows. The distance is denoted by **d**.

Complying with the above conditions, 9 representative items can be easily found. See eg. the following (R0-R8) representative products (Table 4).

	A1	A2	A3	A4	A5
R0	0	0	0	0	0
R1	0	1	1	2	2
R2	0	2	2	1	1
R3	1	0	2	1	2
R4	1	1	1	1	1
R5	1	2	0	2	1
R6	2	0	1	1	0
R7	2	1	0	0	1
R8	2	2	2	2	2

Table 4. Between-product distances

It can be seen that any pair of rows in the above matrix (rows of representative products R0-R8) differ in at least 3 columns, i.e.

$d(R_i, R_j) \geq 3$, for any $i \neq j$.

Then each pair ($R_i \leftrightarrow R_j$, $i \neq j$) of the above 9 products (created as virtual representative products in rows R0-R8) are shown in random order to the experimental subjects to qualify as a better-worse. 2 out of 9, i.e. totally 36 such pairs exist.

A Marketing Science Perspective

Following the simplified microeconomic preference model marketing science and especially corporate marketing practice accept the more comfortable transitivity premise. Consumer preferences are defined as the subjective tastes, as measured by utility, of various bundles of goods. They permit the consumer to rank these bundles of goods according to the levels of utility they give the consumer. In other words, the consumer has different preferences over the different combinations of goods defined by the set of commodity bundles. A latent assumption about the consumer's preferences is consistency in rankings, i.e. transitivity. Nevertheless, transitivity stereotype became deeply rooted in the industrialized market research as well. Companies routinely test the market to find out what customers like and dislike about their products and competitors' product. This is outsourced to a market research firm. After gathering information, the next step for the company is to determine what it means. Analysis of the information may lead the company to change the formula, packaging, color, size or some other feature of the product.

It must be realized that automatic assumption of transitivity can be range among such mental stereotypes as e.g. repurchase willingness of satisfied customers or the natural development of firms' orientation from manufacturing to marketing (Brown, 1995; Reinoso, 2011). Such a simplification can be understood if we think of the daily decision pressure at management level. Without easily applicable rules of thumb the operation of the firm could be paralyzed. Some techniques estimate consumer preference functions by representing „consumer utility” as a function of the product's attribute levels. Such techniques are useful in the product design because they indicate the relative effects of changes in the attributes of that product. Conjoint analysis is an effective technique to measure ordinal preference functions, and this method has been considered for long time as a research mass-product establishing numerous managerial decisions. Traditional technique of conjoint analysis has been quite successful in marketing, but its application can be improved (Veres-Tarján, 2013). As regards the methodological development in such directions only sporadic attempts can be found until now in the marketing research literature (see e.g. Hauser & Shugan, 1980 or Bouyssou & Pirlot, 2002).

The research

As a first stage in our experimental study we are investigating intransitivity occurring in participants' preferences during selection between simple, medium complex, and complex products. In the phase of preliminary data collection, our sample consists of 200 participants (balanced by age) recruited from a business school and a technical university. The participants' task is to make pair wise comparisons of preference between specific realizations of each product group. The product realizations that the participants received for comparison differed in those attribute dimensions that they rated less important in phase 1 (middle in the grid). Currently we are using a computer based experimental design including a web-based application, which performs the procedure detailed above. By this, every participant has the personalized attribute set (that they rated less or medium important) for the pair wise comparisons.

For the pair-wise comparisons the participants were instructed to *”Choose the preferred one among the two presented! Imagine that you can win it as a prize, and imagine that price is indifferent, and equal in this case!”* The test terminated when the participant

gives the first intransitive answer, or if the participant compared all possible pairs. In this phase, we counted with the number of comparisons without intransitivity (the comparisons accomplished until the first intransitive reply) as a dependent variable. To analyze the effect of product complexity on intransitivity, we are going to use a one-way ANOVA design (with levels of simple, medium complex and complex product groups). Participants are blind to the aim of the experiment until the end of the procedure. The test lasts for maximum 20 minutes including debriefing. Participants complete the task online. Both phases are executed with computer-based data collection.

It is important to note that there are two possible versions to show up the pairs of virtual products to the subjects and there may be found arguments for and against. We show up to the subject those attributes, which are not different (In Table 4 at most 2 of such attributes may exist); or only those that are different from each other (these attributes may exist, at least 3). At the latter, the argument is that the test subjects will not be charged by that extra information, while at the former is that all five coordinates (attribute values) may be seen to decide. Of course, the order of the showing up of the attributes are not changed. In each case the vertical order (top to bottom) of the middle column of the Q-sort (e.g. the 5 most indifferent attributes, out of the total 11 ones in case of smart phones), is understood as a horizontal one (left to right). Further details of our research will be presented at the conference.

Instead of epilogue

While "revealed preferences" are empirically measurable notions, "underlying preferences" do exist just in theory i.e. they are purely hypothetical notions. Therefore, the most general framework is if at the start, it is discussed in the context of a conceptual model or within a so-called "black-box". The input of the model are the real or virtual items/products and their properties to qualify or to choose, while the output of it are the "revealed preferences". However, from this point on several hypotheses, axiomatic assumption emerge. The most common is that in our brain a binary relation evolve on the set of objects, which governs this transformation into structured sets. Related to the "underlying preferences" four questions arise immediately:

- 1) Is it justified to assume that there exist?
- 2) If they exist and can be described as binary relations, are they transitive or not?
- 3) Are they constant or stable?
- 4) If they are not stable, a functional relationship or assuming a random rule, can they be modelled in a realistic way?

These are all crucial questions for future research.

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