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RANKING CUSTOMER REQUIREMENTS IN TOY DESIGN USING CONJOINT ANALYSIS

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ABSTRACT: *The key to success in new product development is the information that indicates what customer desire. People have been making toys for thousands of years. Toys are often viewed as a form of simple entertainment for children, but they are also intellectually valuable. When designing products for children, there are additional considerations to those used when designing for adults. This paper attempts to present a ranking process of the customer's requirements regarding to toys, using conjoint analysis which can be used to determine an optimal product concept and to identify market segments who appreciate more a specific product concept. It is a multivariate technique that captures the exact levels of utility that an individual customer puts on various attributes of the product offering. This technique is able to put numerical values on the mysteries of the consumer's mind. The result of conjoint analysis is a set of utility values for every product variation and attribute's level. **Key words:** toy design, customer, conjoint analysis*

1. INTRODUCTION

Knowledge of market needs essential to develop new and innovative products. This knowledge is what leads to the development of successful business strategies. Any product development strategy which is not based on market needs will lead to failure.

The most difficult thing is to identify customer's needs because it requires the collection and processing of large amounts of information from several sources. Customer demands can emanate from a variety of sources: some of them are required others not, some of them are measurable quantitative or qualitative, some are obtained in a structured form while others in a random way.

Given price and cost constraints, a company can't completely satisfy all its customers' wishes. Consequently an important task of a company's marketing department is to create a profit maximizing bundle of product or service attributes or in other words a profit maximizing value proposal. It is vital to use the limited

resources of the company in product and service design and development to maximize its profit. Conjoint analysis is one of the best methods for investigating and analyzing customer needs. Analysis allows finding out which product attributes create highest value to a customer and how customers are likely to react to different product configurations. This information can lead to the creation of optimal value propositions. Conjoint analysis is relatively unknown to Romanian marketing practitioners and theorists. Using the method requires thorough knowledge of statistical data analysis which may be the reason why in the present it is not in common use.

The aim of this article is to present the applicability of conjoint analysis for prioritizing the needs of customer's regarding to a toy. For the beginning there are some aspects discussed regarding to the toy market and to the customers who represents the market segment for this kind of products. After this discussion, considering the novelty of the conjoint analysis in Romanian marketing

practice and also the complexity of the method, this article offers the explanation of the concepts, calculations and logic behind the method. This theoretical discussion is followed by an application of conjoint analysis for ranking customer's requirements regarding to a teddy bear. As a result of the empirical study the authors are able to estimate the value created for the customers by each product attribute, based on the choice of 20 respondents.

2. TOY MARKET AND INDUSTRY

The market for toys is huge and remains promising. It is anticipated that the demand for toys will increase every year. In addition to high-tech toys, toys such as intelligent games and traditional toys will always have their place, no matter what happens in the field of technology, it is likely, for example, that girls will always want to comb a doll's hair, to touch the doll, or dress her. The toy market had long been characterized by rapidly changing fashion and taste. When a product suddenly became very fashionable, its manufacturers could earn huge considerable revenues. [1]

Toy industry is one of the world's oldest creative of industries. For centuries, toys help children to have fun to transform in creator, masters, educators, emulators, nurturers, friends, collectors, story lovers, and experience seekers however, creative business such as toys is extremely volatile and seasonal in nature, which is relatively different from other industries. [2] Volatility in the industry is caused by variable and unpredictable demands, very short and specific selling-windows and short product-life-cycles. Therefore, investors and practitioners know very well that the toy industry is far from tranquil. [3] The toy industry has incurred relatively higher costs on obsolete inventory, lost sales and markdown as compared to other industries. These are typical consequences of volatility in the toy supply chains, akin to the fashion clothing industry.[4] The success of companies operating in the field of toys depends on several factors: economic, demographic changes, seasonal, and the successful introduction of products on a regular basis, the most important being the last one.

(Latter) The toy industry is one of the most dynamic sectors in terms of the new product development. His own history shows that it is a progressive, innovative, and dynamic industry. This industry plays a very important role, from the point of view of child development; because the toys are tools that help to enhance the imagination, creativity and sociability of the child. The local industry is facing many problems. Imports of toys have increased significantly, especially from the Asian countries, which led to the disintegration of the Romanian toy industry, which until now could not recover. The local producers complain about the prices of the imported toys, which are hard to compete.

This sector would have to go through a process of restructuration through mergers and alliances between companies, to enhance competitiveness. Given the increasing need for innovation among toys and games, the Romanian industry should invest in creating and developing new products. The Romanian Toy Association is being restructured. It does not receive any support from State or international authorities. Moreover, it does not have adequate resources to create a database of information on the Romanian toy industry. Nevertheless, it would be interested in cooperation with TIE [5].

3. CHILDRENS AS CUSTOMERS

In the toy trade one of the dilemmas encountered is who chooses the toy: child or adult? For the child the favourite toy is one that best reflects its aspirations and dreams, his desires to be grown up, to imitate or reproduce the surrounding world. The parent's educational impulse to deliver their values to the child is combined with the desire to provide what was denied in childhood.

Children represent a significant part of the consuming public that has some specific characteristics, such as:

- They distinguish harder the essential from the non-essential (inessential);
- They are:
 - easily influenced;
 - attracted by bright colours and sounds;

- very affective but can not express their wishes clearly;
- are very sensitive, creative, imaginative;

3.1. Product and Brand Knowledge

To children, products and brands are probably the most salient aspects of the marketplace. Products and brands are advertised on television, displayed in stores, and found all around one's home. Even before they are able to read, children as young as two or three years of age can recognize familiar packages in the store and familiar characters on products such as toys and clothing. [6]

By preschool, children begin to recall brand names from seeing them advertised on television or featured on product packages, especially if the brand names are associated with salient visual cues such as colors, pictures, or cartoon characters. By kindergarten and first grade, children begin to read and spell brand names, which opens up even more opportunities for children to add to their knowledge base. By the time children reach middle childhood, they can name multiple brands in most child-oriented product categories such as cereal, snacks, and toys.

As they mature, several trends in children's brand awareness are evident. First, as suggested above, children's awareness and recall of brand names increases with age, from early to middle childhood and from middle childhood through adolescence. Second, brand awareness develops first for child-oriented product categories, such as cereal, snacks, and toys. [7]

3.2. Decision-Making Skills and Abilities

Children assume the role of consumer decision makers at a young age. Children as young as 2 years of age are commonly allowed to select treats at the grocery store, express desires for fast food, and indicate preferences for toys on visits to Santa. As they grow older, children develop more sophisticated decision-making skills and abilities. They become more aware of different information sources, seek out information about important functional aspects of products, utilize more attribute information in evaluating products, and adapt their decision strategies to the nature of the choice environment they face. [8]

3.3. Purchase Influence and Negotiation Strategies

Children exert substantial influence on family purchases in several ways. Purchase requests are the most overt of all influence attempts, with children asking for a wide array of products such as toys, candy, clothing, sporting goods, and other products for their own use. Over time, children influence purchases for many of these items in a more passive way due to the fact that parents know what their children like and make purchases accordingly. But the extent of influence does not stop with frequently purchased consumer package goods, toys, and athletic equipment. Children also exert some degree of influence in family decision making regarding items such as cars, vacations, computers, and home furnishings. In this role, they might initiate the purchase, collect information about alternatives, suggest retail outlets, and have a say in the final decision. [8].

4. CONJOINT ANALYSIS

Conjoint method was first proposed in marketing by Green Paul. Its concept is rooted from the fact that buyers will not always get the best of what they desired. They will have to make a 'trade-off' between the best attributes in a certain product when making decision to buy the product and the true value will be known from this process. Attributes are known as characteristics, factors, or quality in property. [9]

This concept is based on the integration of information which says that users will integrate information on a set of determinant attributes, which will form an overall opinion on the product profiles. In this way two assumptions have been made out of this technique. [10] Firstly, a product is a synthesis of a combination of various levels of a set of attributes. Secondly, the level of attributes determines overall user's opinion in the product. The objective of this technique is to identify the combination of attributes that gives the highest utility to users and to determine the relatively important attributes in the form of their contribution in the total utility derived. In general, the outcome from the analysis assists

in marketing by resolving problems such as identifying the favorite shares, competitor analysis, product design, advertising strategy, elasticity analysis, and marketing map.

4.1. Steps of the Conjoint Analysis

There are six steps in completing a typical conjoint analysis. These steps are shown in Figure 1.

- Select attributes: The attributes used will stem primarily from the objectives of the study. The attributes should be both capable of being acted on and important to consumers. [11]
- Determine attribute levels: The number of levels for each attribute has a direct bearing on the number of stimuli respondents will be asked to judge. The more there are, the heavier the burden that is placed on the consumer.
- Determine attribute combinations: This will determine what the full set of stimuli will look like.
- Select form of presentation of stimuli and nature of judgments: Basically, three approaches can be used, namely: verbal description, picture presentation, existing products or prototypes.

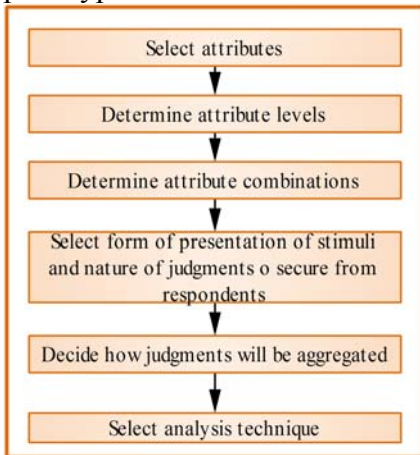


Figure 1. Stages of the conjoint analysis (Adapted from Churchill & Iacobucci 2002)

- Decide on aggregation of judgments: This step basically involves the decision whether the responses from consumers or groups of consumers will be aggregated [11]
- Select analysis technique: The final step in the design of a conjoint analysis

project is to select the technique that will be used to analyze the data. The choice depends largely on the method that was used to secure the input judgments by the respondents. For example, when rank-order data have been obtained, the assumption of a linear relationship may be dubious, so a non-metric regression model may be substituted to estimate the utilities. [11]

In figure 2 are represented the three methods used for presenting the stimuli. These examples are adapted to the case study presented in this article, and the authors preferred the second one, because they consider that this one compared to oral presentation method leaves no room for different interpretations by the respondents and compared to the method of presentation whit existing products or prototypes requires fewer financial resources. This method is useful when a new concept is the theme of the study and there is no similar product, neither prototype which can be presented to the respondents.

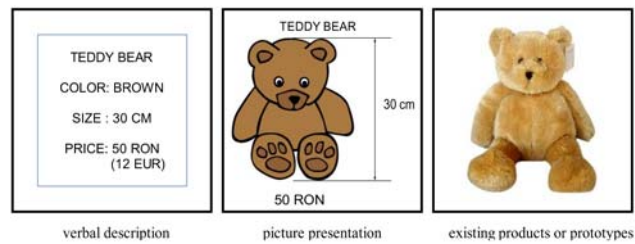


Figure 2. Form of stimuli presentation (adapted to case study)

4.2. The basic model

The basic model in a conjoint analysis is:

$$Y = b_1 + b_2 + b_3 + \dots + b_n + c + \varepsilon \tag{1}$$

$$Y = \sum_{i=1}^n b_i + c + \varepsilon \tag{2}$$

where:

Y – respondent’s preference for the product concept (metric or non-metric)

b_n – beta weights (utilities) for the features (non-metric)

ε – an error term

c – constant

Most conjoint analysts fit what is known as the part-worth model to respondents’ evaluative judgments, whether they obtain these judgments using full-profile, self-explicated, or

hybrid approaches. However, they occasionally use vector and ideal point models.

The vector is represented by a single linear function, which supposes that preference will increase as the quantity of p attribute increases (preference decreases when the function is negative). The vector is defined as:

$$v_j = \sum_{p=1}^t W_p \cdot Y_{jp} \tag{3}$$

Where:

- v_j – consumer preference for j stimuli
- W_p – denotes the respondent's importance weight for each of the P attributes
- t – number of attributes
- Y_{jp} – denote the desirability of the p th attribute for the j th stimulus;
- j – number of stimuli used in the study design.

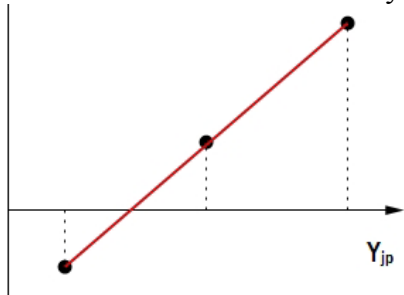


Figure 3. Vector model (Adapted from Green,[12])

In the *ideal-point model*, the analyst posits that preference v_j is inversely related to the weighted squared distance d_j^2 of the location Y_{jp} of the j th stimulus from the individual's ideal point X_p , where d_j^2 is defined as:

$$d_j^2 = \sum_{p=1}^t W_p (Y_{jp} - X_p)^2 \tag{4}$$

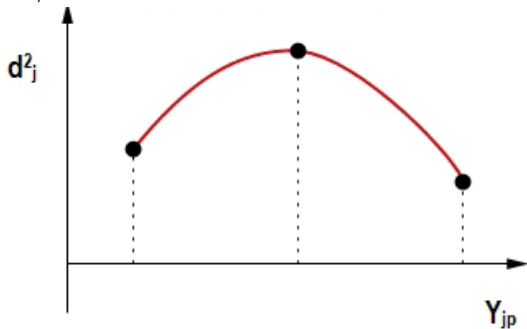


Figure 4. Ideal-point model [12]

The part-worth model is the simplest one to estimate the utility. This model is representing the utility of the attribute by linear portions. This consists of a set of straight lines, connecting the points which estimate the utility for the attribute level. The part-worth model is defined as:

$$p_j = \sum_{p=1}^t f_p \cdot Y_{jp} \tag{5}$$

where Y_{jp} is the category level and f_p is a function denoting the part-worth corresponding to level Y_{jp} . In practice, the analyst estimates $f_p(Y_{jp})$ for a selected set of discrete levels of Y_{jp} .

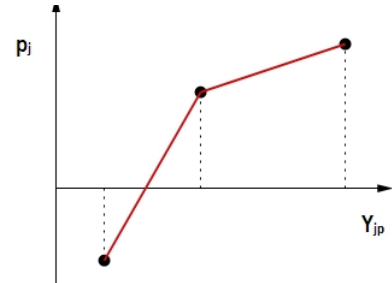


Figure 5. Part-worth model [12]

5. CASE STUDY

In this paper conjoint analysis was applied to rank customer preferences regarding to a teddy bear. Whit conjoint analysis we can convert ordinal scale rankings given by the respondents into an interval scale value or utility scale.

5.1. Data Preparation

First we identified the relevant product attributes that we wanted to study and selected the levels for these attributes. The selected attributes and its levels can be viewed in figure 6.

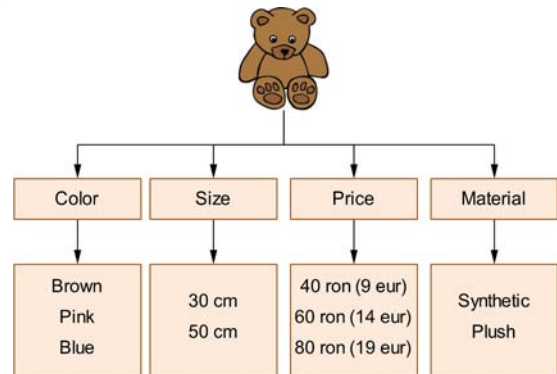


Figure 6. Selected attributes and levels

To complete the analysis we used SPSS software package (Statistical Package for Social Sciences) which contains programs that enable and support the preparation, the running of a conjoint analysis and the interpretation of its results. Figure 7 is a capture that shows how we defined the attributes and its levels in the SPSS software.

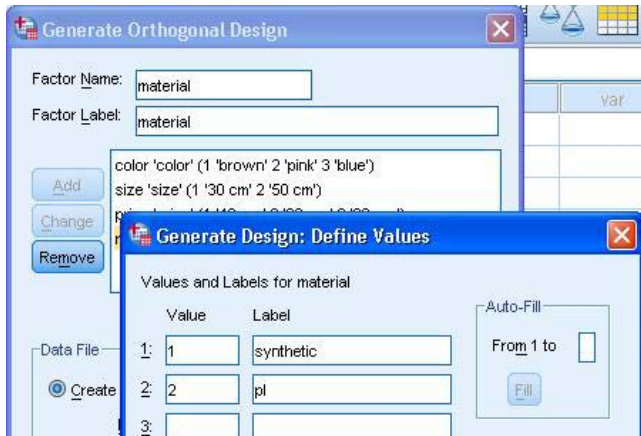


Figure 7. Defining attributes and levels in SPSS

5.2. Designing the Cards

After we defined the attributes and their levels, we generated the partial fractional model. For this we used the “generate orthogonal design” command which generates a data file containing an orthogonal main-effects design that permits the statistical testing of several factors without testing every combination of factor levels. This matrix is usually the starting point of a conjoint analysis. This orthogonal array is represented in figure 8.

| | color | size | price | material | STATUS_ | CARD_ |
|---|-------|-------|--------|-----------|---------|-------|
| 1 | blue | 50 cm | 80 ron | synthetic | Design | 1 |
| 2 | blue | 30 cm | 40 ron | plush | Design | 2 |
| 3 | pink | 30 cm | 80 ron | plush | Design | 3 |
| 4 | pink | 30 cm | 60 ron | synthetic | Design | 4 |
| 5 | pink | 50 cm | 40 ron | synthetic | Design | 5 |
| 6 | brown | 30 cm | 80 ron | synthetic | Design | 6 |
| 7 | brown | 30 cm | 40 ron | synthetic | Design | 7 |
| 8 | blue | 30 cm | 60 ron | synthetic | Design | 8 |
| 9 | brown | 50 cm | 60 ron | plush | Design | 9 |

Figure 8. Orthogonal design generated in SPSS

Under the name “card” there is the nine concept profiles that will be the investigation subject. These profiles can be displayed in separate tables to list and can be shown to customers, if we choose the method of presentation by description.

5.3. Presentation of stimuli and response form

The concepts were presented to the respondents by pictures. We asked the respondents to order the card by their preferences, so the most preferred card was noted whit 9 and the less preferred whit 1. In the figure 9 we can see that the first respondent preferred most the 9th

concept and the less preferred concept was the 8th.

| ID | PREF1 | PREF2 | PREF3 | PREF4 | PREF5 | PREF6 | PREF7 | PREF8 | PREF9 |
|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 9 | 5 | 7 | 4 | 2 | 1 | 3 | 6 | 8 |
| 2 | 7 | 4 | 9 | 1 | 6 | 8 | 2 | 5 | 3 |
| 3 | 1 | 7 | 9 | 5 | 3 | 6 | 2 | 4 | 8 |
| 4 | 5 | 9 | 7 | 6 | 4 | 3 | 1 | 2 | 8 |
| 5 | 4 | 5 | 9 | 2 | 7 | 1 | 8 | 6 | 3 |
| 6 | 5 | 7 | 2 | 1 | 8 | 9 | 4 | 3 | 6 |
| 7 | 9 | 5 | 7 | 4 | 2 | 8 | 3 | 1 | 6 |
| 8 | 5 | 2 | 9 | 7 | 4 | 6 | 1 | 8 | 3 |
| 9 | 7 | 9 | 5 | 2 | 8 | 1 | 6 | 3 | 4 |

Figure 9. Consumer responses introduced into SPSS

5.4. Running the Conjoint Analysis

The next step is to analyze the data gathered from respondents. The “conjoint command” is not yet included in the SPSS as a user-friendly icon, so it requires the use of command syntax:

```

CONJOINT PLAN='G:\teddybear.sav'
/DATA=*
/SEQUENCE=PREF1 TO PREF9
/SUBJECT=ID
/FACTORS=CULOR (DISCRETE)
PRICE (LINEAR LESS)
SIZE (LINEAR MORE) MATERIAL
(DISCRETE)
/PLOT=ALL.
    
```

5.5. Results

The results obtained after running the program are very detailed, so here we present the results summarized. The table 1 shows the utility (part-worth) and standard deviation for each factor level. Higher values indicate greater preference utility.

As expected, there is an inverse relationship between price and value; higher prices are corresponding to lower utility (larger negative values mean lower utility).

Table 1. Utilities and standard deviations

| | | Utility | Std. |
|----------|-----------|---------|------|
| color | brown | 1,133 | ,262 |
| | pink | -,183 | ,262 |
| | blue | -,950 | ,262 |
| material | synthetic | -,175 | ,197 |
| | plush | ,175 | ,197 |
| size | 30 cm | 1,900 | ,393 |
| | 50 cm | 3,800 | ,787 |
| price | 40 ron | -1,858 | ,227 |
| | 60 ron | -3,717 | ,454 |
| | 80 ron | -5,575 | ,681 |
| Constant | | 6,242 | ,721 |

Since all utilities are expressed in a common unit, they can be aggregated in order to give the total utility for any attribute combination. For example, the total utility for a brown teddy bear made from plush, with the size of 50 cm and having the price 60 ron, can be calculated using the (1) formula presented earlier:

$$Utility(color)+utility(material)+utility(size)+utility(price)+constant=total\ utility$$

$$1.133+(-0.175)+3.800+(-3717)+6.242=7.283$$

Therefore the total utility for the concept described earlier is 7.283. We mention that this combination of attributes was not present between the 9 cards presented to the respondents, but the analysis results can be used to calculate the total utility for this combination of attributes. Table 2 shows the importance values for each attribute, these values are evidenced in the figure 10.

Table 2. Attributes importance values

| Attribute | Importance value |
|-----------|------------------|
| color | 28,695 |
| material | 9,384 |
| size | 21,517 |
| price | 40,404 |

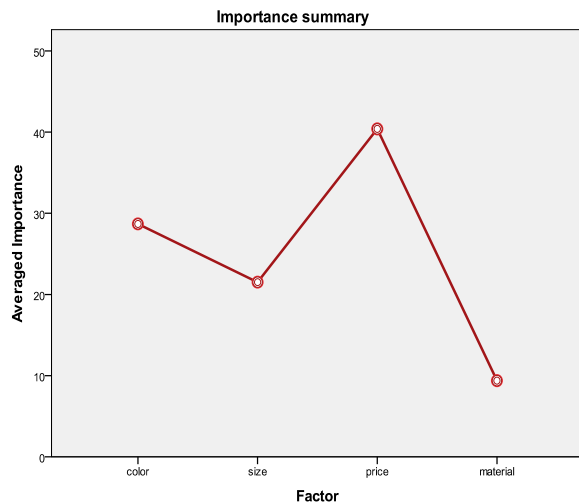


Figure 10. Importance value for attributes

The results show that from the studied attributes the most important for the respondents is the price with the value of 40.404 %, followed by the colour with 28.695%, and the less important is the material from which the teddy bear is made, this attribute having just 9.358% of importance.

Further we present some plots provided by the analysis.

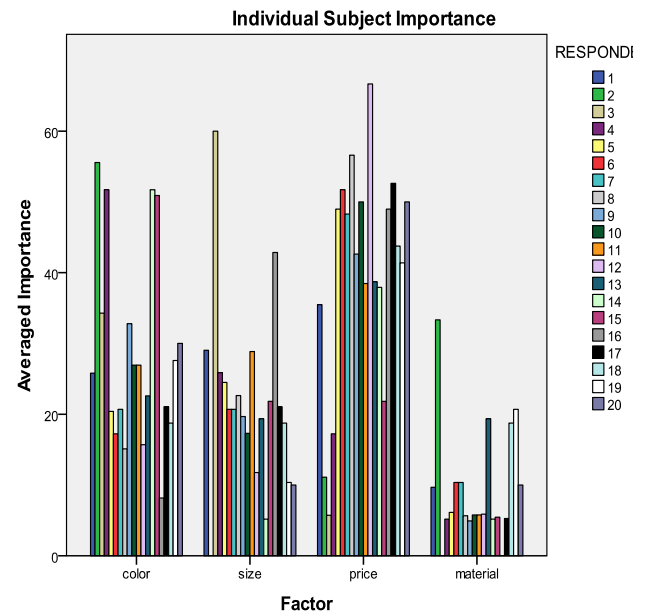


Figure 11. Individual subject importance (%).

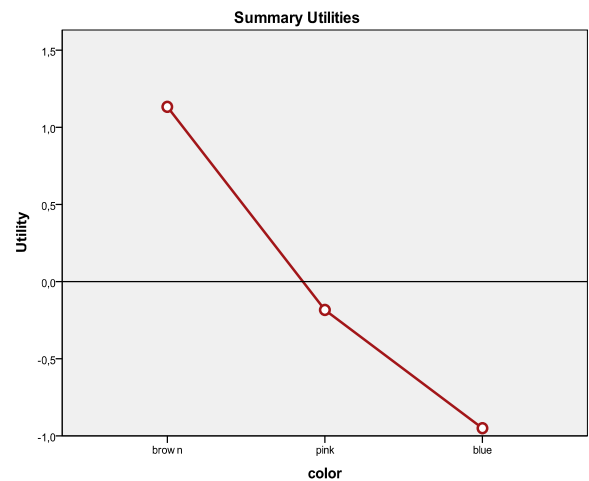


Figure 12. Summary utilities for colour (%).

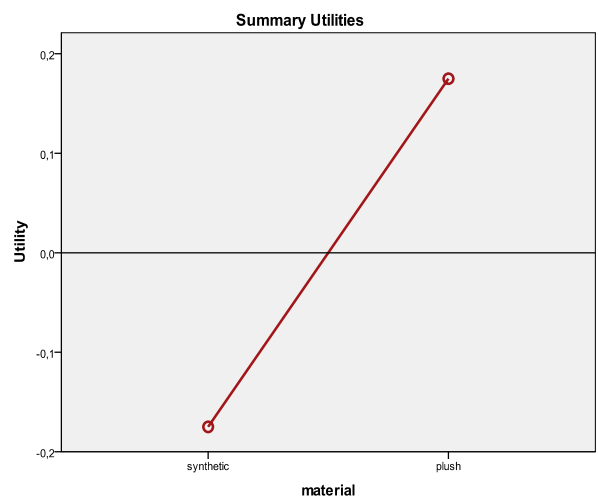


Figure 13. Summary utilities for material (%)

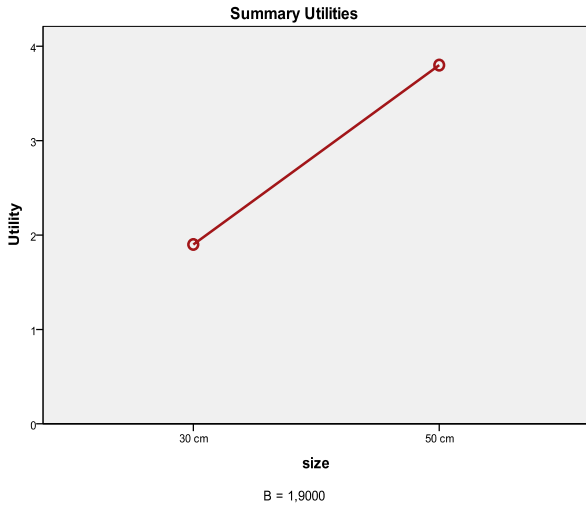


Figure 14. Summary utilities for size (%).

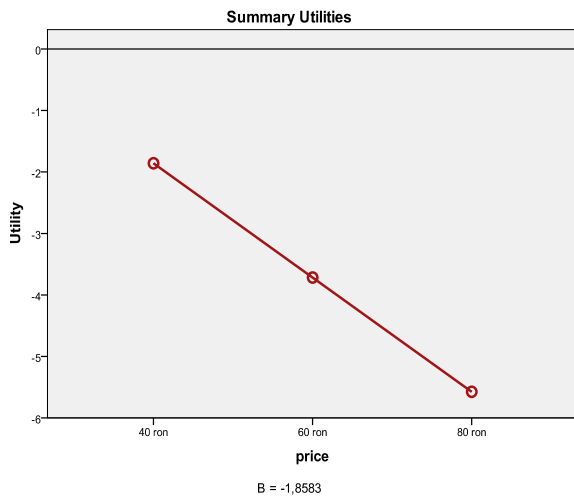


Figure 15. Summary utilities for price (%).

6. CONCLUSIONS

Knowing customer needs and designing accordingly is a crucial success factor in today’s competitive markets. The present article has discussed the potential of using conjoint analysis, which is relatively unknown in Romania, for analyzing and measuring consumer’s needs regarding to a teddy bear. After a short discussion about the toy market and the local industry we presented the theoretical framework underlying the conjoint analysis. This theoretical framework was applied in prioritizing a teddy bear customers needs.

Whit conjoint analysis we force the respondents to make trade-offs between various features, because usually we can not afford to have everything included in the concept. This analysis is a technique where we give

customers combinations, pairs or groups of products that are combinations of various feature and ask them which they prefer. We can drive out how much utility, importance they place on each of those various attributes. It is the only technique that has been shown to be valid in evaluating price. It answers the question, how much a customer is willing to pay for a given feature or level of attribute. Conjoint analysis presents price as trade-off in a series of attributes. In other words, the result of conjoint analysis is a set of utility value for every product variation and attributes level on offer.

Based on the choices of the 20 respondents, the authors were able to estimate the value created for the customers by each product attribute.

After analyzing the data using conjoint analysis, the relative importance of the attributes for each customer was found. It appeared that the most important attribute is the price of the teddy bear that determines 40 % of average customer’s purchasing decision. The next most important attributes are color (28%) and size (21%).

In conclusion, it can be said that conjoint method helped to analyze and prioritize the needs of a teddy bear customers with considerable accuracy. This helped to understand what factors created value for individual customers.

7. ACKNOWLEDGEMENTS

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IERARHIZAREA CERINTELOR ÎN PROIECTAREA JUCĂRIILOR UTILIZÂND ANALIZA CONJUGATĂ

Rezumat: Cheia succesului în dezvoltarea produselor noi este informația care indică cea ce clientul își dorește. Deși jucăriile sunt adesea privite ca o formă simplă de divertisment pentru copii, acestea au valoare intelectuală. La proiectarea produselor pentru copii, există criterii suplimentare față de cele folosite la proiectarea pentru adulți. Această lucrare prezintă un proces de ierarhizarea cerințelor exprimate de consumatori cu privire la jucării, utilizând analiza conjugată care poate fi utilizată pentru a determina un concept de produs optim și pentru a identifica segmente de piață care apreciază mai mult un anumit concept de produs. Analiza conjugată (conjoint) este o tehnică multivariată care determină cu exactitate nivelul de utilitate pe care un consumator pune pe diferite atribute ale produsului studiat. Această tehnică oferă posibilitatea de a pune valori numerice pe „misterele minții” consumatorilor. Rezultatul analizei este un set de valori pentru utilitatea fiecărei variante de produs.

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