Fuzzy Measurement for Durable Goods Market Segmentation

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FUZZY MEASUREMENT FOR DURABLE GOODS MARKET SEGMENTATION

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DURABLE GOODS

- Durable goods, also referred to as durable goods, are products purchased for consumption, the use of which does not cause immediate destruction, so that they can participate in a number of subsequent acts of consumption.
DURABLE GOODS

- Price
- Penetration
- Time on market (innovativeness)
- ???

Price vs. Penetration vs. Time on market (innovativeness) diagram:

- Luxus goods: High price, long time on market
- Standard goods: Low price, short time on market
- Easy accessible innovative goods: Medium price, medium time on market
CONSUMER DURABLE GOODS MARKET

New Offtake

Initial Purchasers

Goods in Use

Replacement Purchasers

Second hand pool

Scrappage
MARKET SEGMENTATION

- One of the crucial marketing tasks is market segmentation. The richness of characteristics which may be used for customers’ classification contributes to difficulty of this goal. Additional issue is the product type market. The topic of analysis here is durable goods market, and its segmentation.
LINGUISTIC VARIABLES

- **Linguistic variables** were used to describe potential users' preferences towards analyzed products.
- Can be defined as a variable where values are determined by verbal categories.
- Are a convenient and intuitive way to assess preferences of respondents.
- Researcher encounters a difficulty of proper coding the verbal statements.
The procedure of coding the linguistic statements uses the concept of triangular fuzzy sets defined as a set of three parameters: $a$, $b$, $c$, where $a < b < c$. 

\[ \mu(x) \]

\[ 0, 1 \]

\[ a, b, c \]
The respondents were asked to evaluate ten chosen brands of smartphones in terms of reliability, modernity, design, technical support, prestige and overall evaluation of the brand.

Each brand of smartphones was evaluated by selecting one of the proposed verbal terms:
- very low, low, medium, high, very high assessment
THE SURVEY RESEARCH

- Respondents were asked to indicate their subjective numerical equivalent for these variants of answers
  - Each respondent independently, alone defined her/his numerical equivalent for linguistic assessment
  - Each category was quantified by defining the beginning, the middle and the end of the interval \((a, b, c)\) - on the scale from 0 to 100.
DEFINITION OF THE TRIANGULAR FUZZY NUMBER DOMAIN. STRONGLY OVERLAPPING INTERVALS

<table>
<thead>
<tr>
<th>Linguistic variable</th>
<th>Very low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivalent number (a, b, c)</td>
<td>(0; 0; 30)</td>
<td>(20; 30; 40)</td>
<td>(20; 50; 85)</td>
<td>(55; 85; 95)</td>
<td>(70; 100; 100)</td>
</tr>
</tbody>
</table>

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![Graph showing the overlapping intervals for different linguistic variables: Very low (VL), Low (L), Medium (M), High (H), Very high (VH).](image)
DEFINITION OF THE TRIANGULAR FUZZY NUMBER DOMAIN. NON OVERLAPPING INTERVALS

<table>
<thead>
<tr>
<th>Linguistic variable</th>
<th>Very low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivalent number (a, b, c)</td>
<td>(0; 0; 20)</td>
<td>(20; 30; 40)</td>
<td>(40; 50; 65)</td>
<td>(65; 80; 85)</td>
<td>(70; 100; 100)</td>
</tr>
</tbody>
</table>

- Very low (VL)
- Low (L)
- Medium (M)
- High (H)
- Very high (VH)
The frequency (in %) of answers defining begin, middle and top value of fuzzy description of the feature assessment variant. Each respondent independently, alone defined her/his numerical equivalent for linguistic assessment.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Very low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a, b</td>
<td>c</td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>0</td>
<td>100</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>13</td>
<td>22</td>
<td>0</td>
<td>0</td>
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<td>1</td>
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<td>0</td>
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<tr>
<td>70</td>
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<td>0</td>
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<td>4</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
FUZZY LINEAR ORDERING OF RESPONDENTS

1. More fuzzy (wide interval) than whole data set
2. Less fuzzy (narrow interval) than whole data set
3. Fuzzy linear ordering (all respondents)
FUZZY LINEAR ORDERING
CLASSIFICATION FOR ALL RESPONDENTS
CLASSIFICATION FOR PART OF RESPONDENTS
PROFIT (PROperty FITting) ANALYSIS

- Input data:
  - respondents assess the attributes of objects
- Objects are presented on the preference map alongside with regression lines for each attribute to show similarities of objects and attributes, as well as the perception of objects in terms of the attributes
PREFERENCE MAP FOR SMARTPHONE USE PATTERNS
CONCLUDING REMARK

- To conclude, it may be stated, that the statistical analysis of survey data proved that the results may be a good base for decision recommendation.
- Respondents consider the fuzzy measurement as easier to implement in quantification of linguistic statements. Groups of respondents may be identified on the way they define the interval for fuzzy numbers.
THANK YOU FOR YOUR KIND ATTENTION!

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