Science: Integrating Theory and Practice
ICET, Bozeman, MT, USA. 2014.

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DEVELOPMENT OF TECHNIQUE FOR MATERIAL SELECTION FOR WOMEN’S SUITS FOR DIFFERENT PRICE MARKET SEGMENTS FOR CREATING A DATA BASE

Lazzat Sarttarova, Nataluya Mokeeva

Analysis of women’s wear assortment in Kazakhstan revealed that customers of different price segments have different requirements for the materials used as they influence considerably a unit cost. It is commonly known that the following aspects influence the cost of material: fibre composition, manufacturing country and company, use of special finish, use of innovation developments, aesthetic appeal, and degree of reliability. For this purpose, this article describes a system where price group of material is determined by integrated index in order to evaluate the material characteristics. This index takes into account quality and cost of the material.

Thus, when choosing material in the preparation process of launching into manufacture a product for a certain price segment, it is important to have an instrument to determine whether this material satisfies the customer’s requirements of a particular segment taking into account psychometric characteristics of quality perception by a human.

In order to create such an instrument, there is a technique including the following stages:
1) Determining nomenclature of groups of material properties;
2) Determining weighting of groups of material properties for customers of high, medium, and low price groups;
3) Development of the unified system for material quality assessment;
4) Development of complex index of material quality to determine compliance of the material properties with the requirements of each price group;
5) Development of the unified system for material cost estimate;
6) Development of integrated index for reliable determining price group of material taking into account quality and price;
7) Testing of the technique.

Block diagram of stages of technique to refer material to a particular price group is shown in Figure 1.

Traditionally, there are the following groups of material properties: mandatory, economic, aesthetic, sanitary, design and technological, reliability [1]. Specialists in materials technology determine index values in these groups of properties in laboratories. This process is rather complicated, time-consuming and cost-consuming. Unfortunately, time and money are limited in manufacturing process of clothing manufacturers. Kazakh companies therefore often neglect studying the properties of materials, and for sure determining the compliance of the material with preferences and requirements of a particular group.

Determining weighting of groups of material properties for customers of high, medium, and low price groups. Expert survey was carried out in order to determine weighting criteria for particular properties of material for different price group.

Each expert gave ranking R to each out of six groups of material properties in the questionnaire (fibre composition, material brand, aesthetic properties, innovation, reliability, design and technological), differentiated for three price group: low, medium, and high.
For this context, the most important group of properties has ranking \( R = 1 \), and the least important with \( R = 6 \). The results of the expert survey are summarized in a matrix whose data were used to calculate the weighing ranking of individual groups of properties and the degree of concordance of rankings.

Ranking sums \( \sum_{j=1}^{n} R_{ij} \) of each expert are the same and are calculated by formula (1):
\[
\sum_{j=1}^{n} R_{ij} = (1 + 2 + 3 + \cdots + n) = 0.5n(n + 1), \quad \text{for} \quad i = 1 \ldots m
\]  
where \( n \) is a number of groups of material properties

\( m \) is a number of experts

Vertical Ranking sum \( S_j \) for each group of properties \( X_j \) is calculated by formula (2):
\[
S_j = \Sigma_{i=1}^{m} R_{ji}, \quad \text{for} \quad j = 1 \ldots n
\]
and used for comparative evaluation of weighing of these groups of properties.

Weighing coefficient is calculated for each group by formula (3):
\[
Y_j = \frac{mn - S_j}{mn^2 - m \Sigma_{i=1}^{n} R_{ij}}
\]

In order to determine concordance of expert valuations by ranking data, we shall calculate the coefficient of concordance \( W \) by formula (4):
\[
W = \frac{\Sigma_{j=1}^{n} (S - \bar{S})^2}{\frac{1}{12}mn^2(n^3 - n)}
\]
where \( \bar{S} \) is an average sum of ranks for all groups of properties

**Figure 1 – Block Diagram of Stages of Creating the Instrument to Determine Price Group of Materials**

In order to evaluate weighing coefficient of concordance, we shall calculate Pearson Criterion \( \chi^2 = wmn(n-1) \), which matches table value of criterion \( \chi^2 \) with the degree of freedom \( S = n-1 \). Brief description of criteria is shown in tables 1 – 4.
In table 1 we can see that fibre composition is significant for each price group. Fibre composition is more important for medium price group than for others. This is due to the fact that the customers from medium price group tend to buy products with the best quality-price ratio, and the quality is largely determined by fibre composition. As a result, weighing coefficient of fibre composition for medium price segment is also significant – 0.26 (0.19 for low segment, 0.16 for high segment). Design and technological properties of little importance for customers of high, medium and low price segments and have low weighing in the calculation of the complex quality index: 0.06, 0.09 and 0.1 respectively.

From table 2 we can see which groups of material properties are top-priority for customers of low price segment and which share each of them occupies. The most important are aesthetic properties (0.33) and the least important is material brand. Expert concordance is rather high (with coefficient of concordance 0.78).

From table 3 we can see which groups of material properties are top-priority for customers of low price segment and which share each of them occupies. The most important are aesthetic properties (0.33) and the least important is material brand. Expert concordance is rather high (with coefficient of concordance 0.78).

<table>
<thead>
<tr>
<th>Groups of Material Properties</th>
<th>Place of Group of Material Properties according to the Survey</th>
<th>Rating of Groups of Material Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>1</td>
<td>0.33</td>
</tr>
<tr>
<td>Reliability</td>
<td>2</td>
<td>0.25</td>
</tr>
<tr>
<td>Fibre Composition</td>
<td>3</td>
<td>0.19</td>
</tr>
<tr>
<td>Design and Technological</td>
<td>4</td>
<td>0.10</td>
</tr>
<tr>
<td>Innovative</td>
<td>5</td>
<td>0.07</td>
</tr>
<tr>
<td>Material Brand</td>
<td>6</td>
<td>0.06</td>
</tr>
<tr>
<td>Coefficient of Concordance W</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Pearson Criterion ( \chi^2_{\text{calc}} )</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>Pearson Criterion ( \chi^2_{\text{table}} ) with probability value 0.05</td>
<td>11.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups of Material Properties</th>
<th>Place of Group of Material Properties according to the survey</th>
<th>Weighing Coefficients of Material Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>1</td>
<td>0.33</td>
</tr>
<tr>
<td>Fibre Composition</td>
<td>2</td>
<td>0.26</td>
</tr>
<tr>
<td>Material Brand</td>
<td>3</td>
<td>0.14</td>
</tr>
<tr>
<td>Innovative</td>
<td>4</td>
<td>0.12</td>
</tr>
<tr>
<td>Design and Technological</td>
<td>5</td>
<td>0.09</td>
</tr>
<tr>
<td>Reliability</td>
<td>6</td>
<td>0.06</td>
</tr>
<tr>
<td>Coefficient of Concordance W</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Pearson Criterion ( \chi^2_{\text{calc}} )</td>
<td>25.6</td>
<td></td>
</tr>
<tr>
<td>Pearson Criterion ( \chi^2_{\text{table}} ) with probability value 0.05</td>
<td>11.1</td>
<td></td>
</tr>
</tbody>
</table>
The most important for medium price segment are aesthetic properties (0.33) and the least important is reliability (0.06). Expert concordance is rather high (with coefficient of concordance 0.73).

Table 4 – Weighing Coefficient of Material Properties for High Price Segment

<table>
<thead>
<tr>
<th>Groups of Material Properties</th>
<th>Place of Group of Material Properties According to the Survey</th>
<th>Rating of Groups of Material Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Brand</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>2</td>
<td>0.26</td>
</tr>
<tr>
<td>Innovative</td>
<td>3</td>
<td>0.22</td>
</tr>
<tr>
<td>Fibre Composition</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Design and Technological</td>
<td>5</td>
<td>0.06</td>
</tr>
<tr>
<td>Reliability</td>
<td>6</td>
<td>0.01</td>
</tr>
<tr>
<td>Coefficient of Concordance W</td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>Pearson Criterion $\chi^2_{tab}$</td>
<td></td>
<td>28.9</td>
</tr>
<tr>
<td>Pearson Criterion $\chi^2_{tab}$ with probability value 0.05</td>
<td></td>
<td>11.1</td>
</tr>
</tbody>
</table>

In order to determine the level of conformity of material properties to the requirements of each price group, it was offered to use a complex quality index, calculated by formula (5):

$$K = \sum_{i=1}^{n} (X_i \cdot Y_i)$$

where, $X_i$ means the value of i-st nondimensional quality index (assessment); $Y_i$ means weighing coefficient of i-st quality index, previously calculated.

Thus, this index will enable to create a data base for automated selection of materials for women’s jackets of different price segments. Criteria for constructive and technological solution shall be input by analogy for women’s jackets for customers with different income levels that further assisted in creating automated workstation for a production engineer.

References:

LEGAL REGULATION OF RADIATION SAFETY ENSURING OF THE POPULATION IN THE REPUBLIC OF KAZAKHSTAN

Aizhan Satbayeva

In the conditions of the continued development of nuclear energy and wide contribution of atomic energy for peaceful and military purposes the use of ionizing radiation sources (IRS) in research and in many sectors of the national economy, medicine, industry, agriculture, urgency of the problem of legal regulation of nuclear and radiological safety preserved. Radiation safety is closely correlated with the problem of nuclear security because the nuclear materials, special non-nuclear materials and nuclear facilities are the particularly dangerous sources of ionizing radiation. The complexity of the legal and institutional securing of radiological safety of the population is determined by the lack of a unified methodology and integrated use of nuclear energy and radiation safety in the use of atomic energy. The scientists and official sources make judgments about the necessity to establish a unified national approach to the development of