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Methodology of the product line matrix formation of the enterprise fabricating clothes

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Abstract. The paper has considered the questions connected with formation of the rational range of the enterprises of clothes production. It has also analyzed the factors influencing the range formation subject to the principles of the rational wardrobe design (a capsular approach and a colour type of one's appearance). The algorithm of the range formation of the enterprises of clothes production in a mass-market segment on the basis of a brand standard subject to the principle of rational wardrobe is developed in the paper. It has created the mathematical model of a rational a product line matrix of the sewing enterprise in a mass-market segment.

Keywords: Product Line Policy, Product Line Matrix, Rational Wardrobe, Capsular Approach, Colour Type of one's Appearance

1. Introduction

Any modern enterprise aims to maximize its profit most often by increasing volume of sales and minimizing the cost price. The prime cost reduction has its limits, but the volumes of realization are limited only to the existing resources of a company and market capacity of consumption.

In this regard the majority of the companies daily face a problem of searching of customers. They search for new markets with the use of various tools: advertisement, price competition, etc. The use of already known tools will not give a desirable result if they do not become an integral component of a certain strategy. This paper considers a product line policy of small and medium business enterprise of clothes production. It is very important to research the development process of a rational product line matrix to implement this policy.

Technological processes transformation in the light industry production of goods has affected all segments of the industry and had the essential impact on the formation of consumer preferences.

The task of producers and sellers of clothes at this stage consists in the development of common integrated algorithms of organization and realization of a product line matrix with the principle of the rational system in basis. In particular, the use of the principle of rationality by a consumer at the creation of his or her own wardrobe, and the reconsideration of a place and role of each element of clothes both when determining an individual capsule and in "person is clothes" system in general is of great interest, where the new forms of the rational interaction appear. On the other hand, the small and medium-sized enterprises producing clothes with chaotically formed range are actively developing under the influence of random factors and often have no common algorithm of the range formation. [1-2, 5, 9, 12, 13].



Despite considerable researches devoted to a problem of the formation of a range now there is no common methodological approach. Methodical tools of the range formation of the sewing industry enterprises are insufficiently developed. On one hand, it would be economically advantageous for the industrial enterprises and, on the other hand, it would satisfy consumers' preferences.

The existence of a stated problem has caused the relevance of scientific researches directed on the improvement of the formation process of a rational commodity range of the enterprises fabricating clothes.

2. Research methodology

The paper has used a system analysis which allowed considering structural and elementary connections in the integrated interaction a producer - a seller - a consumer at the stage of predesign researches of new clothe models from relevance positions and competitiveness. The data obtained on the basis of methods of group questioning and an expert assessment have allocated additional factors of the influence on the definition of the range structure, namely, the necessity for the specification of consumer groups on a color type of appearance. Also the method of the typization and the structurally functional method were used.

3. Research

A product line policy of the enterprise fabricating clothes at the present stage has to consider the factors connected with specific features of a consumer. Appearance of a person defines dimensional characteristics of clothes, a form (silhouette) and color appearance. Features of the identity of a consumer are shown in his or her lifestyle and connected with consumer's style preferences in clothes and a choice of these or those composite and product line decisions. The practice of the formation of a modern person's collection of clothes is connected with a tendency to the rational capsular wardrobe creation. In the course of the design of an industrial collection such approach allows, on one hand, to consider features of production, and on the other hand, to create prerequisites for real customization. [6,13]

Thus, a problem of the formation of a product line policy is closely connected with a problem of the study of the enterprise target audience. An analysis of the target audience gives a chance to define the basic data for the formation of a product line matrix of the enterprise.

A product line matrix is a document in tabular format, in which reflect a company range of products and information with certain characteristics of a range for a certain period of time. The information in a product line matrix is given according to the hierarchical principle, from a category to a unit of a commodity stock account [10].

The present research has offered to consider the following major factors when forming a rational product line matrix of the enterprises fabricating clothes:

- A consumer's lifestyle, a strength of his or her predilection to fashion;
- The segmentation of consumers on style figurative groups to style preferences;
- A level of satisfaction with the individual wardrobe in a consumer group;
- The capsular structure of the client wardrobe and, as a result, the capsule essence of a product line of the enterprise and its continuity in relation to the previous collections;
- The availability in the wardrobe of a consumer of universal products which are coherent between the main capsules;
- A colour type of a person's appearance as one of the criteria of the definition of a collection number coloristic palette of the enterprise product line matrix.

Such approach demands the stable communicative relations between a consumer and a producer. A lifestyle and a individualization of consumer are the elements of an individual image and they form consumer preferences in a concrete target group. In turn, the segmentation of target groups from positions of socioeconomic factors which influence a choice and decision-making on purchase by a consumer, allows connecting the audience's choice to a certain price segment. From this point of

view it is expedient to consider preferences of the target audience through a prism of the known brands - standards.

As a result of the research conducted by the authors it is possible to point out the main stages of the formation of a product line matrix of the enterprise:

1. An analysis of analogs (brands-standards):
 - The definition of the target audience.
 - The formation of check-sheets (№ 1 - selection criteria of a suitable analog, № 2 - criteria of an analysis of a collection of a brand - standard).
 - Standard brand choice.
 - The testing/research/analysis of a collection of a brand - standard on commodity groups.
2. An analysis of commodity groups on the basis of the results over the last seasons and the enterprise work on trend watching.
3. The definition of a percentage ratio of commodity categories:
 - The definition of a percentage ratio of commodity categories depending on the results of sales over the last season.
 - The definition of a percentage ratio of commodity categories depending on a color type of consumers' appearance.
 - A comparison of the available data with data of a brand - standard.

4. The formation of a product line matrix.

An analysis of characteristics of a brand-standard corresponds to an analysis stage of analogs in general practice of the design and allows minimizing costs of the enterprise of small and medium business of market researches. An analysis of the sources has showed that at a choice of a brand-standard it is possible to refer to the main criteria of an assessment: Price segment; a consumer's satisfaction/dissatisfaction; loyalty to a brand; the perceived quality; leadership/popularity; the perceived value; the memorable attributes; associations with the organization; awareness on a brand; representation of a brand in the distributive network.

At the same time it is important for an enterprise to consider the results of its own work over the last seasons in which features of its target audience are reflected and which allow to plan, for example, the replenishment of a consumer's wardrobe including purchased clothes/commodity categories acquired by him or her from the last collections.

Each commodity category has its silhouette decisions. An analysis of silhouette decisions helps to trace the actual trends of fashion and to define the strategy of the enterprise in solutions of a model range.

In the offered approach the accounting of a factor "a color type of a consumer's appearance" is new to the formation of a product line matrix in comparison with the existing approaches. The earlier obtained data testify that, for example, in Primorsky Krai of the Russian Federation 54% of all products of an industrial collection have to be designed for a "summer" color type, 28% - for "a winter" color type, 13% - for "a spring" color type, and 5% for "a autumn" color type [11].

It should be noted that the received results are actual for a certain target audience during a concrete period of time for territories of the concrete geographical region.

At the final stage the enterprise independently solves what data to use. However, the carried-out work increases reliability of made decisions. On the basis of the above stated facts the distribution of percentage ratios between commodity categories concerning all collection variety of the enterprise presented in a season is possible. In turn, the advent of coefficients defining a dominating color type of person's appearance and the leading silhouette solutions of a brand-standard allows to receive a product line matrix defining the quantitative indices commodity categories, silhouette decisions and a coloristic decision of a range of the enterprise over the actual period.

From the mathematical point of view, the considered set of characteristics is defined by variables (a commodity group and silhouette decisions), and a group of constant values (a color type of person's appearance) which can be presented in the form of 4 matrixes:

A constant matrix Y (constant values, the length is constant). A matrix is a vector “color type,” consisting of 4 elements: Winter, summer, autumn, spring. For Russia an elements value of a matrix are constant and do not depend on a collection. The values of elements are expressed in percentage.

A matrix of the variable length X (values change, length changes). A matrix is a vector “silhouette” of the variable length. The length of a vector depends on a commodity group, and the values of elements depend on a collection. The values of elements are expressed in percentage.

A matrix of the constant length W (the values change, the length does not change). A matrix is a vector “commodity group” of the constant length. A vector consists of 8 elements: Blouses, trousers and jeans, outerwear, dresses, sweaters and cardigans, t-shirts and tops, shorts and bridges, skirts which values depend on a collection. The values of elements are expressed in percentage.

A matrix of the variable length Z (the values change, the length changes). The quantity of elements of a matrix depends on a commodity group and is a product of elements’ quantity of matrixes X, Y, W. The values of elements of a matrix reflect the quantity of products of a certain color type and a certain silhouette in a commodity group concerning the total number of products of this commodity group in a collection expressed in percentage.

A value of a matrix element Z is calculated by the formula:

where:
$$Z_{ij} = \frac{X_i * Y_j * W_k}{100\% * 100\%} \tag{1}$$

$$j \in [1;4] \quad k \in [1;8] \quad i \in [1;n] \quad i$$

A k value depends on a commodity group and is appointed by an expert-estimator. In our research we will accept the following k values:

$$\left\{ \begin{array}{l} k = 1 - \text{blouses}; \\ k = 2 - \text{trousers and jeans}; \\ k = 3 - \text{outerwear}; \\ k = 4 - \text{dresses}; \\ k = 5 - \text{sweaters and cardigans}; \\ k = 6 - \text{shirts and tops}; \\ k = 7 - \text{shorts and bridges}; \\ k = 8 - \text{skirts}. \end{array} \right.$$

A choice of k value at the calculation of an element of a matrix Z is conducted by an expert, depending on what goods are now calculated.

n – a number of possible silhouettes for this commodity group.

$$\left\{ \begin{array}{l} n = 4, \quad \text{if } k = 1, \quad k = 3, \quad k = 4, \quad k = 5; \\ n = 3, \quad \text{if } k = 2, \quad k = 7, \quad k = 8; \\ n = 2, \quad \text{if } k = 6. \end{array} \right.$$

Let’s conduct the calculations for a commodity group “blouses” for an autumn-winter collection.

$$Y = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{pmatrix}, \tag{2}$$

where $y_1 = 28\%$, $y_2 = 54\%$, $y_3 = 5\%$, $y_4 = 13\%$.

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}, \tag{3}$$

where $x_1 = 69,7\%$, $x_2 = 30,3\%$, $x_3 = 0\%$, $x_4 = 0\%$.

$$W = \begin{pmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \\ w_5 \\ w_6 \\ w_7 \\ w_8 \end{pmatrix}, \tag{4}$$

where $w_1 = 8,895\%$,
 $w_2 = 20,25\%$,
 $w_3 = 20,79\%$,
 $w_4 = 17,205\%$,
 $w_5 = 11,48\%$,
 $w_6 = 9,455\%$,
 $w_7 = 2,36\%$,
 $w_8 = 9,565\%$.

As in this example the calculation of a range for a commodity group “blouses” is calculated, the calculations have used a $w_1 = 8,895\%$ coefficient.

$$Z = \begin{pmatrix} z_{11} & z_{12} & z_{13} & z_{14} \\ z_{21} & z_{22} & z_{23} & z_{24} \\ z_{31} & z_{32} & z_{33} & z_{34} \\ z_{41} & z_{42} & z_{43} & z_{44} \end{pmatrix}, \tag{5}$$

where z_{11} - a range of blouses of a direct silhouette for “winter” color type;
 z_{12} - a range of blouses of a direct silhouette for “summer” color type
 z_{13} - a range of blouses of a direct silhouette for “spring” color type;
 z_{14} - a range of blouses of a direct silhouette for “autumn” color type;
 z_{21} - a range of blouses of a semi-adjacent silhouette for “winter” color type;
 z_{22} - a range of blouses of a semi-adjacent silhouette for “summer” color type;
 z_{23} - a range of blouses of a semi-adjacent silhouette for “spring” color type;
 z_{24} - a range of blouses of a semi-adjacent silhouette for “autumn” color type;
 z_{31} - a range of blouses of the fitted silhouette for “winter” color type;
 z_{32} - a range of blouses of the fitted silhouette for “summer” color type;
 z_{33} - a range of blouses of the fitted silhouette for “spring” color type;
 z_{34} - a range of blouses of the fitted silhouette for “autumn” color type;
 z_{41} - a range of blouses of a trapezoid silhouette for “winter” color type;
 z_{42} - a range of blouses of a trapezoid silhouette for “summer” color type;
 z_{43} - a range of blouses of a trapezoid silhouette for “spring” color type;
 z_{44} - a range of blouses of a trapezoid silhouette for “autumn” color type.

$$Z_{11} = \frac{X_1 * Y_1 * W_1}{100\% * 100\%} = \frac{69,7\% * 28\% * 8,895\%}{100\% * 100\%} = 1,74\%$$

Thus, the received formula is the tool for the calculation of a range of the enterprise. It can be used for the calculations manually, or to use for special programs, for example, Excel.

5. Conclusions

A problem of the effective planning of a range is solved by the formation of an effective product line policy of the enterprise. The conducted researches on the formation of the rational structure of a range of the sewing enterprise allowed solving the following problems:

1. The factors influencing the formation of a rational range of the enterprises fabricating clothes on the basis of individual consumer preferences are studied.

2. The mathematical model of the formation of the rational structure of a matrix of a range of the enterprises fabricating clothes is developed.

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