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Forecasted Labor Functions of Fashion Industry Specialists

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Abstract. The labor functions of the fashion industry workers during cutting of the garments in case of modern and forecasted productions for substantiation of the content of training of qualified workers have been analyzed. The labor functions have been characterized in the context of structuring the production operation as to its phases: preparatory, executive, and control and management. For the operation on cutting of the clothing, the models of the content of the workers` labor for three types of production have been prepared: for industrial, individual, and forecasted. It has been grounded that during the forecasted production the major changes in the content of the cutters` work would take place at the preparatory stage and at the executive stage. It is summarized that during the forecasted production of garments, the qualified workers will need the knowledge and skills on the use of new technologies and materials, computerized equipment, and professionally-oriented software.

INTRODUCTION

Statement of the Problem

The analysis of the worker`s functions during the performance of the most typical labor actions is one of the most significant parameters of the model of a specialist. In this study, as the model of the specialist we understand the description of the specialist`s qualification as a set of acquired knowledge, skills and competencies that are necessary for the performance of professional tasks. The model of the specialist provides the initial data for modeling both the content of training and the choice of means and methods of training of a future qualified worker. Before developing the recommendations on the content, forms and methods of training of the specialist, you must answer the following questions: Where will the graduate work? What types of work will he do? Thus, the analysis of the specialist`s labor functions is an important scientific problem, the solution of which creates the basis for the development of a system of selection, training and upgrading of the personnel`s qualification. This problem is also relevant for the fashion industry, in which the high dependence of the quality of products on the skills of the workers remains.

Analysis of Recent Studies and Publications

Numerous researches of the scientists contain the analysis of the workers` labor functions, namely: researches on the labor law, sociology of labor, professional pedagogy.

The researches have studied the requirements to the professional qualities and the models of training of the fashion industry workers.

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The article [1] considers skill requirements in retail work, drawing on the example of high-end fashion retailing.

In the article [2] the models of training of specialists of different levels of the fashion industry in the counties that are considered as the trendsetters and manufacturers of the clothes are considered.

The article [3] is devoted to the problem of formation of technological competencies of the students of specialty Garment Industry and Fashion Design in the college.

The paper [4] describes the experience of training costume designers, methodological base of design and art education in Ukraine.

In the publication [5] the problem of social up-and downgrading of apparel workers in Romania as a result of the expansion of global production networks is considered.

The research [6] is devoted to the problem of the impact of labor in the garment industry on the health of the workers.

The authors [7] analyzed the impact of a change in work posture from seated to stand-up on work-related musculoskeletal disorders among sewing-machine operators.

The prospects for the development of the garment industry and the professional education of the sewing profile are outlined in the article [8]. Various aspects of self-education of fashion industry specialists using ICT are systematized in the article [9].

The aim of the article. The aim of the article is to analyze the functions of the fashion industry workers in cutting of the garments in the conditions of existing and forecasted production. In this regard, the following tasks are set: the analysis of the prospects of the garment industry; the analysis of the functions of cutter and tailor at the cutting stage; the development of recommendations as to the content of training of the specialists in cutting in the conditions of modern and forecasted productions.

MATERIALS AND METHODS

For this scientific work, the methodology has been applied in accordance with [10]. The research can be attributed to the prognostic, classification ones.

In this study, the concept of "labor function" is established in accordance with the theory of labor law, in which the labor function is regarded as a system of working movements, receptions, and operations that are conditioned by the technological process of organization [11].

Labor functions have been analyzed from the point of view of the division of the production operation into phases, namely: preparatory, executive, and control and management functions, in accordance with the recommendations of the sociology of labor [12]. The labor operations for each phase of the operation are set in accordance with the classification, given in [13]. The current model of the content of labor is developed in accordance with the research of the Laboratory of valuation, labor organization and wages of the Central Research Institute of the Garment Industry, the results of which are set out in Sectoral element-wise time standards in accordance with the type of the work and the equipment when sewing the outerwear [14].

In this study, the operations of the group "many workers often do some work" are considered, since the types of the work, the most often executed by a large number of the workers, should form the basis, the "core" of the professional education.

The subject of the study is the cutting of the garment as one of the most complicated and often performed operations. Each type of the work has been considered for three types of production: 1) individual production of clothing; 2) industrial production of clothing; 3) simulated, forecasted production, equipped with modern and advanced technology that combines the industrial method of production with the individual cutting of the clothes. Methods of observation and analysis of scientific and normative literature are used in the research.

In order to predict the content of labor, the forecasts for the development of sewing equipment, materials and means of clothing design are used. In this study, an interscience method of extrapolation is used to predict the development of the fashion industry. This method is based on the assumption that certain trend, fixed in the past or present, will continue to operate in the future as the factors, causing it, will not change.

One of the types of forecasting of scientific and technological progress by the method of extrapolation, in particular, is the analysis of the patent information. In accordance with the method of forecasting the development of technology based on theoretical and information analysis of patents [15], the last 6-year period is considered, which is sometimes referred to as the basis time of the forecasts. The first year of the period is considered as the starting point for determination of the initial level. The number of patents issued during this year is considered as the base value and compared with the number of patents in the subsequent years. Depending on whether the number of

relevant patents increases or decreases, it is possible to make a conclusion as to the perspectives or hopelessness of the development of certain direction of the technology development. That is why the method of theoretical and information analysis of patents, adjusted to a period of up to 10 years, has been chosen in this study to forecast the innovative development of the garment industry.

RESULTS AND DISCUSSION

Forecast of Development of the Equipment in the Fashion Industry

The analysis of the trends of development of sewing equipment has revealed that the promising direction of development of the equipment for sewing of the garments is the development and implementation of programme-controlled sewing machines.

To validate this claim, a patent search has been conducted in accordance with the data, provided by European Patent Office – EPO Worldwide Patent Statistical Database (EPO PATSTAT), which contains patent database from 100+ countries of the World [16].

The search has been conducted within the Class D05 "Sewing, embroidering, tufting" in accordance with the following subclasses of machines according to the International Patent Classification:

D05B 19/00 – Programme-controlled sewing machines;

D05B 21/00 – Sewing machines with devices for automatically controlling movement of work-carrier relative to stitch-forming mechanism in order to obtain particular configuration of seam, e.g. programme-controlled for sewing collars, for attaching pockets.

In general, the EPO PATSTAT contains more than 15,000 patents of these subclasses that indicate the interest of the inventors to the development of the abovementioned types of machines. As can be seen from Fig. 1, from 2012 till 2018 we note a certain reduction in number of patents of subclass D05B 19/00 (from 27 to 26 units) with further growth to 40 patents in 2020. We also note a noticeable increase in the number of patents in subclass D05B 21/00 from 35 in 2011 to 103 units in 2020. This allows predicting the stable development in the segment of programme-controlled sewing machines, but significant innovations in the next 10-15 years are not expected.

In addition to individual computerized workplaces, the introduction of automated clothing production lines is an effective mean of improving the productivity and quality of the products.

Automated sewing line is a set of the units of technological equipment, manipulators (for example, for loading, installing, uploading, and assembling of semi-finished products), as well as means of control that perform cutting, sewing and assembling of garments in automatic mode. It is a production complex, controlled by the operator, where at the beginning of the process is the fabric, and at the end – finished product. Nowadays the automated sewing lines have limited use, mainly during the manufacture of large batch of rectangular products (for example, bed linen, bags, etc.).

Further study of the trends in the development of sewing equipment has been carried out by patent search in the subclass A41H 42/00 "Multi-step production lines for making clothes" in accordance with International Patent Classification. In general, the EPO PATSTAT contains 1,814 patents of subclass A41H 42/00. Starting from 2011 till 2020, there is a steady increase in the number of published patents: from 16 in 2011 to 288 in 2020 (Fig. 1). Thus, the analysis of patents has made it possible to predict the prospects of the development of automated multi-step production lines for making clothes.

In order to predict the development of methods for cutting textile materials, a partial working hypothesis has been formulated: the introduction of automated and computerized equipment for cutting is a perspective direction of cutting equipment development.

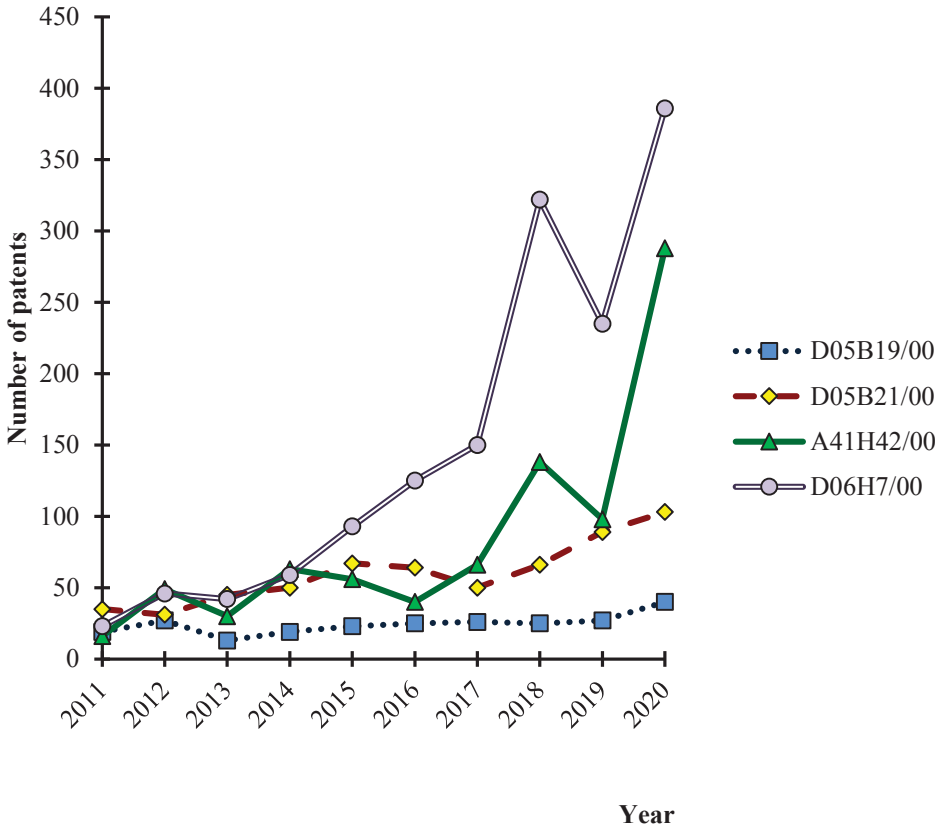

FIGURE 1. Number of patents on automated equipment of the fashion industry.

The search has been conducted within the subclass D06H 7/00 "Apparatus or processes for cutting, or otherwise severing, specially adapted for the cutting, or otherwise severing, of textile materials", using the keywords in the title or description: computer or automatic. There are 1,867 patents that have been found under this search terms.

The analysis of distribution of the number of inventions by years (Fig. 1) has showed a sharp increase (from 23 to 386) in the number of patents from 2011 till 2020. Thus, a partial hypothesis about the promising development of automated and computerized equipment for cutting textile materials has been fully confirmed. Based on the data obtained, it is possible to predict a sharp increase in the number of innovations in the segment of automated and computerized equipment for cutting.

Thus, on the basis of theoretical and information analysis of patents for the period of 2011 – 2020, it has been determined that in the next 10 – 15 years it would be expected to introduce such innovations in the development of sewing equipment:

- sustainable development of innovations in the segment of programme-controlled sewing machines;
- active development of innovations in the segment of multi-step production lines for making clothes;
- sharp increase in the number of innovations in the segment of automated and computerized equipment for cutting.

The determined perspectives of development of sewing equipment are the input factors of the prediction model of a specialist in the garment industry.

Functions of the Workers in Cutting of Fashion Products

The peculiarity of organization of cutting during the **individual production** is the necessity to make decisions about the sketch and the principal design of the product, about the additions and the method of obtaining the model

design by a cutter, agreeing this sketch with the customer. In case of mismatch of the sketch with a typical design, the consultation with a more qualified specialist is possible. The cutter carries out the measurements of the customer`s figure, cuts the main parts of the products and carries out fitting. Depending on the characteristics of the customer`s figure and the complexity of the style of clothing, the cutter uses the finished base design or makes the base of the design using the cutting system. Small derivative details are usually cut by the tailor.

Small enterprises that make ready-made clothes in small batches in accordance with corporate orders (for example, industrial overcoats) use a similar scheme of organization of cutting. The cutter or his representative determinates the dimensional signs, and the cutter makes a cut in accordance with the patterns, designed by a designer, taking into account the individual characteristics of the figures. Under such organization of cutting, the cutter should be able to determine the values of deviation of the customer`s figure from the typical one, and transform the design, created for the typical figure, into a design for an individual figure.

In case of **industrial production,** all constructive decisions regarding a particular model are made by the fashion designer, who reflects such decisions in the form of a technical description of the model and reference templates for all sizes and heights in accordance with the specifications. The cutters make the cuts. The sequence of work on cutting includes laying, decomposition of the templates, drawing the contours of the templates on the overlay, cutting. It should be noted that various methods of drawing the contours are used in the production: drawing the contours of the templates directly on the overlay in accordance with the prepared schemes of decomposition; preliminary drawing of decomposition of the templates on the paper or pattern-stencil; foil print of the contours. At the enterprises equipped with the Systems of Automated Design (CAD), the stencils are made using the special plotters. If the stencil is made using the perforation method (that is, by punching the holes along the contours of the parts), it is placed on the top of the overlay and carry the contours of the parts on the upper fabric by powdering the powder, usually chalk or blue. If the drawing of decomposition is drawn on the paper in real size, it is placed on the top of the overlay and cut together with the fabric. The process of cutting, depending on the equipment and the shape of the contours of parts, can consist of one or two stages: cutting out along the contours of the parts or dividing of the overlay into parts and further trimming in accordance with the templates.

In **forecasted production,** where the individual cutting using the CAD and automated cutting are used, the cutter must, after agreeing the 3D sketch with the customer [17], select the basic design from the database, make adjustments according to the individual characteristics of the figure, and develop the model design using the library of ready-made decisions for constructive and decorative elements. All actions on creation of the design of the product, starting with the determination of the dimensional signs, the creation of the basic design, modeling, designing of the templates, and the decomposition, are unified using the term “the program of cutting” in this research. In case if draft design of the model differs from the typical one and cannot be created on the basis of the available solutions for the parts of the clothes, the cutter creates new constructive and decorative elements or refers to more qualified specialist or designing organization. At present, the market for services for the development of the design and constructions of the clothes for ordering via the Internet using various CAD, namely Grafis, Julivi, Grazia, Komtens etc, is developing.

The results of the analysis of the content of labor when cutting the garment in case of modern and forecasted productions are combined into the model, presented in Table 1.

TABLE 1. The model of the content of labor of a cutter when cutting the garment in case of modern and forecasted productions

Type of production		
Individual	**Industrial**	**Prognostic model**
Preparatory phase		
Logical functions		
1. Determination of the purpose		
Getting the drawings of the parts and cutting the individual product in accordance with the sketch	Cutting of the product using the ready-made patterns	Getting the drawings of the parts and cutting the individual product in accordance with the sketch
2. Analysis of the situation		
Purpose of the product, properties of the materials, parameters of the figure, conformance of the shape with the typical basic functions	Familiarization with the technical conditions for cutting	Purpose of the product, properties of the materials, parameters of the figure, availability of similar designs in the database

TABLE 1. Continued

Type of production		
Individual	**Industrial**	**Prognostic model**
Logical functions		
3. Preparation of the program		
Selection of the method of obtainment of the basic design; modeling; specification of technological additions; determination of specification for details of cutting and for templates	Decomposition of the templates in accordance with the scheme of decomposition on the overlay	Selection of the design from the database; modeling; formation of the templates with technological additions; formation of specification for details of cutting and for templates
Executive phase		
Executive functions		
4. Measurement of dimensional signs; production of templates of the product details; preparation of materials; decomposition; chalking; cutting; fitting after processing by the tailor	4. Laying and cutting in accordance with the technical conditions	4. Automated measurement or selection from the database of dimensional signs; preparation of the drawings of the product details; preparation of materials; automated decomposition; launch of the cutting program; fitting after processing by the tailor
Transfer functions		
5. Compilation of the cut; moving the cut to the sewing room for processing	5. Numeration; compilation of the cut; moving the cut to the sewing room for processing	5. Compilation of the cut; moving the cut to the sewing room for processing
Control and management phase		
Registration functions		
6. Control over the quality of implementation of labor actions – measurements, preparation of the templates, decomposition, and cutting. Evaluation of the quality of fitting. Determination of deviations from the requirements to the quality of cutting and fitting	6. Control over the quality of laying, chalking, cutting. Determination of deviations from the requirements to the quality of execution and cutting	6. Control over the correctness of the choice of initial data and over the preparation of drawings; check of contingence of the cuts; control over the decomposition; control over the process of cutting. Evaluation of the quality of fitting during real fitting or on a virtual mannequin. Determination of deviations from the requirements to the quality of cutting and fitting
Logical functions		
7. Comparison of deviations found during the process of templates creation, cutting, and fitting, with the standards. Deciding on the need to adjust the design	7. Comparison of deviations found during the process of control with the technical conditions. Deciding on the need to adjust the conditions of cutting, discussing with a technologist or designer about the problems in cutting	7. Comparison of deviations found during the process of control with the technical conditions. Deciding on the need to adjust the design and (or) the program of cutting
Regulatory functions		
8. Management of the processes of design creation; adjusting the design of the product	8. Management of the processes of cutting; adjusting the settings of equipment for cutting; correct deviations from the program	8. Management of the processes of drawings creation and cutting; adjusting the design and (or) the program of cutting

CONCLUSIONS

The analysis of the perspectives of fashion industry has shown that both industrial and individual production of clothing in the medium term (5-10 years) would be equipped with advanced technology, systems of automated design, and would combine the industrial method of production with the individual cutting of the clothes. Under these conditions, the major changes in the content of the cutters` work would take place at the preparatory stage during the preparation of the working program and at the executive stage during the implementation of executive functions. The work at the control and management stages of modern and forecasted productions is different not in content but in the way of its execution. Due to the wide implementation of the CAD in the preparation of production and cutting, the cutter would need the knowledge and skills to use the professionally-oriented software.

The major changes in the content of the tailors` work would take place at the executive stage during the implementation of executive and transfer functions.

As a result of the analysis of scientific literature and normative and technical documentation regarding clothing production, the models of the content of labor of the cutters for three types of fashion production are prepared: for industrial, individual, and forecasted types of production. All labor functions are characterized in the context of structuring the production operation as to its phases: preparatory, executive, and control and management. It is grounded that during the forecasted production the major changes in the content of the cutters` work will take place at the preparatory stage during the preparation of the working program and at the executive stage during the implementation of executive functions. It is summarized that during the forecasted production of garments, the qualified workers will need the knowledge and skills on the use of new technologies and materials, computerized equipment, and professionally-oriented software.

The results of the research will be useful to specialists in the field of education and specialists of the personnel service of the enterprises of the fashion industry for substantiation of the content of training the specialists, during the recruitment process and during the equipping of the workers` workplaces.

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