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MODERN DIRECTIONS OF ECO-DESIGN IN THE FASHION INDUSTRY

The purpose. Determination of directions of eco-design used for designing of the products of the fashion industry, their formulation, and characteristics.

Methodology. Literary-analytical and visual-analytical methods, as well as system-structural analysis, are used.

Results. The activities and the products of modern brands of clothes and accessories in eco-style have been analyzed; the trends of ecological direction in the fashion industry and the latest developments in the field of production of eco-friendly textile have been researched. The directions of eco-design, which exist in the modern fashion industry, have been highlighted, in particular: clothes made from eco-materials; upcycling, trashion, zero waste cutting, creation of the clothes that have an extended period of moral agelessness. Each of the directions has been provided with a description of its features and the examples of its practical use in the modern fashion industry have been presented.

Scientific novelty consists in determination, description and systematization of directions of eco-design, according to which the eco-products are designed; it also consists in outlining of tendencies in their modern practical use.

Practical significance. The considered directions of eco-design can be used for the modern practice of designing and production of clothes and accessories, in the educational process devoted to modern directions in design, ecological tendencies in design of the clothes.

Key words: eco-design, upcycling, eco-fashion, eco-fabrics, design of the clothes, sustainable fashion, conscious fashion, trashion.

Introduction. The design as a creative activity, aimed at the development of the objects of material culture, began to be actively promoted by the manufacturers in the USA in the 1920s and 1930s. Design became one of the driving forces for the way out of the economic crisis of that time. As a social and cultural phenomenon, design was a mean of competition, which prevailed in the production and distribution areas. The primary task of the design was to provide new consumer qualities to already known things, mainly used for household purposes. That was achieved by improving their aesthetic and consumer qualities. As a result, the general level of consumption culture increased, the production increased and gradually turned into overproduction. Before the thing worked its full potential, it was replaced by a new product of industrial design; therefore,

useable things were landfilled, which was both harmful and dangerous from ecological and environmental perspectives.

The idea of *conscious production and consumption* originated in society in the 1960s, and when the need to protect the environment and human health from the influence of industrial pollutants matured in the 1970s, it responded with the emergence of *green* brands in the market. During the 1980s and 1990s, eco-products remained the commodities of limited demand, with slow-growing growth. Starting from the 2000s, the presence of such goods on the market began to grow faster and still as such.

In practice, the emergence of environmentally conscious direction in society and design in conditions of significant deterioration of the environment is logical, necessary and timely. The concepts of eco-

conscious development and conscious consumer are closely related to the protection of the environment from the negative effects of human actions. The search for new materials, new methods of natural dyeing of fabrics, the use of recycled fibers in weaving, the restoration of traditional occupations, the observation of ecological and ethical behavior, the use of organic products, clear, renewable energy and resources, the minimal impact of production on the environment – all these are manifestations of greening society.

Analysis of previous researches. Not only scientists but also public organizations pay great attention to the study of the fashion industry's impact on the ecology in Ukraine and in the world [4, 9]. In the same context, the concept of ecological design [6, 16] is considered, which promotes the ideas of environmentally conscious production and consumption.

During the life cycle, the products of the fashion industry affect the environment in one way or another and, depending on the characteristics of such effect, different options for solving the problem are explored. Thus, the author [5] proposes a theory of achieving the goals of eco-design by creating an alternative direction in design – *Emotionally Durable Design* – which reduces the consumption of resources by creating emotional bonds between humans and things, thus extending the term of operation of the things.

The analysis of the use of zero waste cutting [24] has shown that the transition to zero waste production requires changes in the field of specialist training to ensure the integration of product designing and cutting stages. The authors [14] propose to use the *creative cutting* as a mean of minimization of textile wastes generated during the production. Also, in the context of eco-design, the researches in the field of recycling, reuse of materials and products have been carried out, and upcycling as a successful combination of realization of the designer's

creative opportunities and activities in favor of ecology has been highlighted [26]. Although scientists pay considerable attention to environmental problems in the field of the fashion industry and ways to solve such problems, the directions of eco-design remain insufficiently researched.

Statement of the problem. The purpose of the work is to identify the directions of eco-design, which reflect the features of different approaches to the processes of designing and manufacturing of the products of the fashion industry.

Results of the research. According to the definition, provided by Sim Van der Ryn and Stuart Cowan, *eco-design* means any form of design that minimizes environmentally damaging impacts through the integration with wildlife processes [6, p. 12]. The term *eco-fashion* is referred to clothes, footwear, and accessories, the production, sale, and use of which have minimal (or, ideally, neutral or positive) impact on the environment, and which are created with respect for human rights. In practice, this implies continuous work on improvement of all stages of the product life cycle, including the production of the raw material and its further processing, construction and manufacturing, transportation and storage, sale and use, as well as the ability to repair, reuse or recycle the product in general or its individual components.

Since its creation, the clothes have continued to be the bearer of social and cultural achievements. The works of some designers are equated with masterpieces of the world culture. The realities of the modern stage of human development have brought a new component to the culture of design. The concept of environmental friendliness has been added to functionality, technological effectiveness, aesthetics and efficiency of the product [23]. The clothes can be determined as ecological ones, considering the following factors:

1. the origin of the material and the renewability of the resources, from which it is made;
2. the process of converting this material into fabric (the consumption of water and type of chemicals used);
3. the conditions, in which people work during its production, and how this process affects the environment;
4. the extended period of moral *agelessness* of the material and the product;
5. the product should have several life cycles or can be biologically degraded, etc. [20].

The design of products that comply with the principles of eco-design is based on rational balance between functional, aesthetics and environmental components. The integral components on which eco-friendly design is focused are: the development of new materials and technologies that do not have an adverse impact on the environment; the save of materials and resources; the alternative sources of energy; the focus on balancing the amount of resources needed for the production, its operation, and its durability.

To protect consumers from the harmful effects of textiles through the direct impact on the body or indirectly, through the negative impact on the environment, countries are developing standards for their certification. In Ukraine, there is DSTU (State Standards of Ukraine) ISO 14024:2002 *Environmental labels and declarations. Type I environmental labeling. Principles and procedures* [22]. Within the current standard, textiles are checked for compliance with SOU OEM 08.002.04.003:2016, which meets the ecological criteria for textiles, adopted by Commission Decision of 5 June 2014 for the award of the EU Ecolabel for textile products [24]. Starting from 2004, Ukrainian Center for Environmental Certification and Labeling has been a part of GEN (Global Ecovillage

Network) and has appropriate international accreditation.

Considering eco-design as an activity aimed at the development of objects of material culture in the field of fashion industry, which comply with the concept of environmental conscience, the following directions can be distinguished, namely: production of clothes, made from eco-materials, upcycling, trashion, zero waste cutting, creation of the clothes that have an extended period of moral agelessness, and so on.

Nowadays, the manufacture of products made from eco-materials is a developed direction, which is widely used in the fashion industry. This direction was the basis for the Luxury Eco collection of fashion clothes in 2002 that became a landmark in the process of greening the fashion industry. The collection was created by Linda Loudermilk [21], who designed for the first time and presented the collection of fashionable clothes that was completely made from eco-friendly materials and recycled fabrics. Natural fabrics, natural colors, handmade were the elements, on which the new direction was based.

Since the first collection of clothes made from eco-materials was presented, this direction has changed significantly. Certain materials that were considered as *eco* or harmless materials, with a careful analysis of the conditions of production and operation, showed their negative impact on the environment. For example, it has been found that pesticides are being used in excess for cotton growing, and further processing of fibers requires the use of thousands of liters of freshwater. Well-known material – microfiber – is a source of microplastics, which not only pollutes the water of the oceans, but also penetrates through the filters of sewage treatment plants to the water supply, and then into the human body. Despite this, the market of modern eco-materials has expanded significantly over the last decade, with the

development of safe dyes for fabrics and technologies that significantly reduce the use of water in dyeing.

Textile production actively uses such natural raw materials as flax, hemp, bamboo, nettles, and so on. In some cases, non-traditional natural materials are the basis for new eco-fabrics, for example, Swiss-Taiwanese textile material *Bananatex*, made from banana leaves [2], Italian fabric *Orange Fiber*, made from orange peels [12], German fabric *Qmilk*, made from casein [13], etc. Figure 1, a presents the models of women's dresses, made from Qmilk fabric. Also, the eco-fabrics, partly or wholly made from recycled plastic wastes, are popular in the textile market; the production of such fabrics greatly helps to reduce the amount of plastic wastes, which already exist.

Despite the diversity, the production of eco-fabrics remains more like a *niche* phenomenon in the fashion industry, rather than a common practice. The reasons for this are different: the complexity of processing and manufacturing technologies, the higher self-cost of materials, the competition from large corporations that produce materials by traditional methods, and so on. The world-famous mass-market brands H&M, Adidas, Zara, Nike, and so on are actively involved in the development of eco-direction. At the current stage, it is embodied in the creation of separate lines and collections of clothes, footwear, accessories, made from recycled plastic, organic cotton, etc.

The second direction of eco-design, which is called *zero waste*, is based on the concept of reducing the amount of textile wastes. It is characterized by the reduction or complete absence of textile wastes during the production of clothes and accessories. Zero waste cutting in the design of clothes was also used in ancient times. National clothes, Greek chitons, Japanese kimono, Indian sarees, Ukrainian skirts are great examples of such direction. The design, which makes it possible to cut without wastes, has begun to actively

integrate into modern production. The idea of zero waste cutting is that the patterns are put together like puzzles, in order to use the whole fabric and not to create wastes at this stage of production.

Modern designers use the principle of zero-waste cutting not only as the element of eco-consciousness but also as a separate approach to the creation of new forms in clothing. This trend has become quite common among Japanese designers of clothes, who have always "stand out from the crowd" by their original vision of forms. Such designers as Holly McQuillan, Maison Martin Margiela, Timo Rissanen, and others also apply zero waste principles in their designs. Figure 1, b presents the model of men's jacket, designed in accordance with zero waste principle. Researches, seminars, and exhibitions are devoted to the development of this direction. *YIELD: Making fashion without making waste* exhibition is regularly held in New York. Leading professional institutions, such as Parsons The New School of Design (New York, the USA), offer courses on zero waste tailoring. Such practice leads to the formation of an economic approach to the production of clothes (both from the financial and ecological points of view) from the beginning of the career of the major participants of the fashion industry [10]. Analytics predict that in the coming years, zero waste principle will be replaced by sub-zero waste principle (negative amount of wastes).

Upcycling is a popular direction of eco-design as well. It is a creative process of converting old or defecting things or materials into new ones, with or without preserving their roles. Upcycling has a positive impact on the environment, as it uses the things that have entered the global waste stream but does not exclude the need to use new raw material to create a new thing. Recycling means converting wastes into the raw material for new materials, with some possible loss of quality. Upcycling differs from recycling

because it does not provide for the industrial processing of things into the raw material. This direction of design also covers the transformation of textile wastes into new things. The developers of such direction are, above all, creative people and craftsmen. From the scraps of fabrics, modern craftsmen create not only tradition blankets and pillows in the patchwork technique, but also the collections of stylish clothes. The patchwork technique appeared long before the occurrence of environmental problems in the world. Some examples stored in different museums around the world date back to the beginning of our era.

Scientists have not come to unanimity as to the question of patchwork occurrence: whether it was a practical approach or the desire to decorate the clothes; but the modern society has provided it with additional ecological context. The models made in this technique are presented in the collections of well-known brands, such as Dolce&Gabbana, Junya Watanabe, Schiaparelli, and so on. Today, festivals of patchwork and upcycling are held in many countries of the world, for example, FESTIVAL Internacional Arte Textil, QuiltFest.in.ua, and so on.

Ksenia Schnaider, a well-known brand of clothes, is one of the supporters of upcycling direction among the representatives of Ukrainian fashion industry. For now, the brand has more than 40 retail stores, 80 % of sales are in Asia. The model Demi-Denims, designed by Ksenia Schnaider, was even copied by Mango mass-market. The founders of this brand pay considerable attention to the environmental component of their work; they use vintage jeans as the main raw material for the production.

During the season, their studio processes about 2,000 kg of denim, providing it with a "new life" [17]. Ukrainian brands that also specialize in creating clothes and accessories in this direction, are: KLAPTYK-fashion, UliUlia, REHASH, PAPINARUBASHKA,

MIYO, RCR Khomenko, Church of Upcycling, and so on. Figures 1, c, d present the designs of clothes, made in the upcycling direction.

Despite its popularity in society, it is difficult to combine upcycling with manufacturing on an industrial scale, because in most cases every product needs an individual solution.

Trashion was named in 2004 as a combination of words "trash" and "fashion". The art-couture models, created by American artist Ann Wizer from plastic garbage [18], were one of the first objects of this direction. Different wastes from the materials not originally intended for this purpose, for example, fishing nets, packages, newspapers, plastic tableware, wrappers, CDs, audio films, etc. are used for the creation of trashion products.

The use of non-traditional materials for the production of clothes, footwear, accessories, the appearance of which reflects the idea of protecting the environment from pollution, is the characteristic feature of trashion design. Figure 2, a presents the design of the dress, made in trashion direction.

Due to the specificity of the final product and the lack of the most of properties necessary for comfortable and long-lasting operation, trashion remains more demonstrative and artistic than utilitarian. The designs are mostly created for thematic exhibitions, competitions, fashion shows, and photo sessions.

Bags and some models of accessories and jewelry are the exceptions to this. For example, in Jakarta (Indonesia), the non-profit organization XSProject has organized the production and sale of bags, made from such wastes as old banners, wrappers, packaging, packages, etc., which allows people to have a job and reduces the amount of garbage in landfills [19]. Figures 2, b, c present the bag and earrings, made from old banners and metal bottle caps.



Figure 1. The designs of clothes, made in different directions of eco-design: a – models of women's dresses, made from Qmilk fabric [13]; b – model of men's jacket, designed by Timo Rissanen in accordance with "zero waste" principle [1]; c – model of women's jeans, designed by Ksenia Schnaider, upcycling [16]; d – model of women's dress, KLAPTYK-fashion brand, technique "patchwork" [15]



Figure 2. The designs of clothes and accessories, made in trashion direction: a – the design of the dress, made by Jane Tan from the wastes [9]; b – the backpack Modulab, made from banner [11]; c – earrings, made by Yoav Kotik from the beer caps [7]



Figure 3. The designs of tube skirts, presented in Burda Moden Magazine in different years: a – 2006; b – 2011; c – 2015; d – 2019 [3]

The fashion's impact on the environment also depends on the fact for how long the clothes are used. As a rule, when clothes are used on a daily basis for many years, they have a less negative impact than clothes that have been worn just once. This concept is fundamental for eco-design direction, which can be called "slow fashion" as opposed to "fast fashion". This category of clothes includes classic basic things, such as uniform blouses and shirts, tube skirt, trench coat, classic jeans, women's and men's classic suits, "little black dress", Chanel's jacket, etc., made from high quality materials, considering high standards of working conditions and appropriate level of wages. This direction is represented by the products, made by the world-famous brands of menswear, such as Eduard Dressler, Calvin Klein, Tom Ford, and so on. Among the women-oriented brands, it is possible to highlight Chanel, Versace, Armani, and so on. It should be noted that the vast majority of well-known brands offer the clothes, made in this direction, in almost every collection. This can be explained by the versatility and ease of combination with other details of the suit. Figure 3 presents the designs of tube skirts, that have been offered

in Burda Moden Magazine in different years and are a clear example of things that have an extended period of moral agelessness and use as they always remain fashionable, which reduces the negative impact on the environment.

The "fast-fashion" clothes are characterized by a season-by-season change in the dominant color of the collection, decoration, fabric texture and so on. With the release of the new seasonal collection, the previous one loses its relevance, so the lifetime of the collection's products is actually determined by the time before moral agelessness. The lifetime of classic basic items is mostly determined by physical wear and lasts much longer, thus causing less environmental damage. Sweden, the country-trendsetter of eco-fashion, makes focuses on such direction of eco-design in the further development of the fashion industry. Many Swedish manufacturers are working to increase the durability of manufactured clothes, despite the loss of some income [27]. The directions of eco-design, which demonstrate the variants of design of the modern eco-products, are provided in Figure 4.

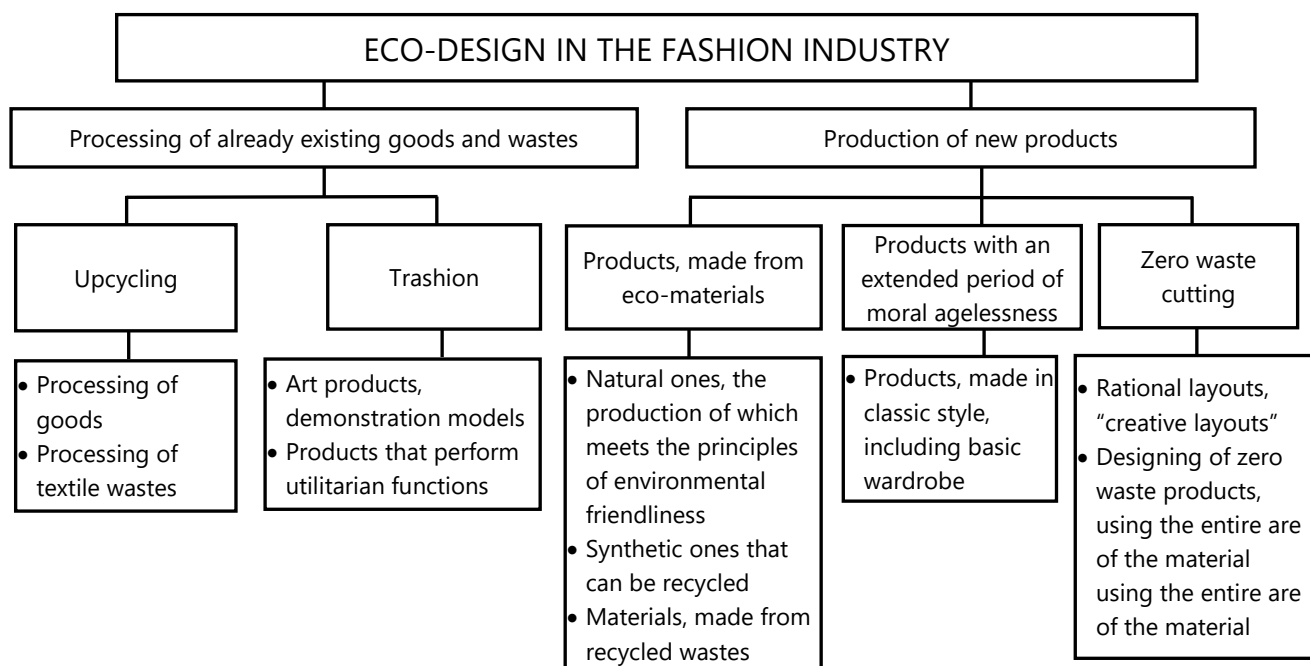


Figure 4. Directions of eco-design in the fashion industry

The main criterion according to which the directions of eco-design are grouped is the origin of materials used for the creation of new products. In essence, upcycling and trashion are recycling old used things or new things that have been disposed of for some reason. In other directions, new materials are used for the creation of products; eco-friendliness is achieved through the use of eco-fabrics, zero waste cutting or an extension of the period of moral agelessness. Some directions are involved in the reduction of the amount of existing wastes, while others are aimed at reducing the amount of future (potential) wastes and their safe utilization. Such formation of groups is rather conditional, since the abovementioned directions in eco-design often complement each other, for example, upcycling does not preclude the use of new materials in combination with the old ones, and eco-fabrics can be made from recycled wastes.

Conclusions. Eco-design is an important component of the solution for a global environmental problem; it takes into account the entire life cycle of the product and its potential impact on the environment. To find the solution, the specialists from different fields of science are integrated, in particular: ecologists, chemists, materials scientists, economists, designers, and other specialists. Eco-design projects are especially important to the fashion industry, as this

industry is among the top five dirtiest industries. At the same time, the fashion industry is a powerful platform for the dissemination of ecological ideas in society. Consumers embrace the ideas that fashion designers have in their collections very quickly.

Thanks to the interest of consumers, manufacturers, public organizations, as well as to the support from the government, new eco-design directions are actively developing: new brands that produce eco-products are creating; well known-brands are launching eco-friendly collections of clothes, footwear, and accessories; new technologies of creation and recycling of fabrics are developing; the range of raw materials used for production is expanding, and so on. Considerable attention is paid to the environmental education of young professionals; training on eco-design, grant programs, international and local competitions are offered, and so on.

Such directions in eco-design as the production of eco-products, upcycling, trashion, zero waste cutting, creation of the clothes that have an extended period of moral agelessness, etc. are the important components of the fashion industry. They reduce the amount of wastes that already exist, prevent the appearance of new wastes, ensure the safe production and utilization of materials, and thus have a positive impact on the environment.

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СУЧАСНІ НАПРЯМИ ЕКОДИЗАЙНУ В FASHION-ІНДУСТРІЇ

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Мета. Визначення напрямів екодизайну, що використовуються при дизайн-проектванні виробів фешн індустрії, їх формулювання та характеристика.

Методологія. Використано літературно-аналітичний, візуально-аналітичний методи та системно-структурний аналіз.

Результати. Проаналізовано діяльність та продукцію сучасних брендів одягу та аксесуарів в екостилі, досліджено тенденції екологічного напрямку в fashion-індустрії та новітні розробки в сфері виробництва eco-friendly текстилю. Виділено напрями екодизайну, що присутні в сучасній fashion-індустрії: одяг з еко-матеріалів, апсайклінг (upcycle), трешн (trashion), безвідходний крої (zero waste), створення речей, що мають

СОВРЕМЕННЫЕ НАПРАВЛЕНИЯ ЭКОДИЗАЙНА В FASHION-ИНДУСТРИИ

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Цель. Определение направлений экодизайна, используемых для дизайн-проектирования изделий модной индустрии, их формулировка и характеристики.

Методология. Использованы литературно-аналитический, визуально-аналитический методы и системно-структурный анализ.

Результаты. Проанализирована деятельность и продукция современных брендов одежды и аксессуаров в экостиле, исследованы тенденции экологического направления в fashion-индустрии и новейшие разработки в сфере производства eco-friendly текстиля. Выделены направления экодизайна, которые присутствуют в современной модной индустрии: одежда из эко-материалов, апсайклінг (upcycle), трешн (trashion), безотходный крої (zero waste), создание вещей, имеющих увеличенный срок морального нестарения. По

подовжений час морального нестаріння. По кожному з напрямів сформовано опис його характерних рис та надано приклади сучасного практичного застосування в fashion-індустрії.

Наукова новизна полягає у визначенні, описі та систематизації напрямів екодизайну, відповідно до яких проектується еко-вироби, в окресленні тенденцій їх сучасного практичного використання.

Практична значущість. Розглянуті напрями екодизайну можуть використовуватись для сучасної практики дизайну та виробництва одягу і аксесуарів, під час вивчення дисциплін, що пов'язані з сучасними напрямами в дизайні, екологічними тенденціями в проектуванні виробів.

Ключові слова: екодизайн, апсайклінг, екологічна мода, еко-тканини, проектування одягу, стійка мода, свідомо мода, trashion.

каждому из направлений сформировано описание его характерных черт и даны примеры современного практического применения в fashion-индустрии.

Научная новизна заключается в определении, описании и систематизации направлений экодизайна, согласно которым проектируются эко-изделия, в определении тенденций их современного практического использования.

Практическая значимость. Рассмотренные направления экодизайна могут использоваться для современной практики дизайна и производства одежды и аксессуаров, при изучении дисциплин, связанных с современными направлениями в дизайне, экологическими тенденциями в проектировании изделий.

Ключевые слова: экодизайн, апсайклінг, экологическая мода, эко-ткани, проектирование одежды, стойка мода, сознательная мода, trashion.

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