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Zhukova Yanina,
Lecturer at the Department of Management and Finance,
ESI "Ukrainian State University of Chemical Technology"
Ukrainian State University of Science and Technology
orcid.org/0000-0001-5021-9623
yaninazhukova@gmail.com

CULTURAL DEVELOPMENT OF FASHION INNOVATIONS IN UKRAINE AND THE WORLD

The ongoing military aggression on the territory of Ukraine actualizes the issue of cultural development of fashion innovations in Ukraine and the world. At this time, while Ukraine's military experience influences the formation of an innovative culture within local borders, on a global scale, there is a cultural development of fashion innovations, which has launched large-scale socio-cultural transformational changes, which are the purpose of this article to explore. Textile fashion innovations in the field of culture evolve over time, embodying eras and human needs. Today, these are artificial intelligence (AI), the Internet of Things (IoT), e-commerce and new technologies for creating textiles, as cultural fashion innovations – 3D, 4D printing, nanotechnology (NNI), smart clothing: wearable computers; electronic textiles; biofabrication, etc. The analyzed modern new technologies for creating textiles and clothing have a number of advantages compared to traditional production processes. This is a fast design process, timeliness and reduction of costs for working with inventory, warehousing, packaging and transportation. They allow you to view the seasonal cycles of creating clothes, the calendar of their delivery and develop new formats for the presentation of new products. In the near future, with the help of a gadget, anyone will be able to create the clothes they need anywhere and at any time 24/7. The technology of creating clothes in the near future will become a personal gadget and will appear in every home, like a mobile phone or tablet. Their rapid development follows the path of independence from sewing industries. Before the full-scale invasion, Ukraine began to actively develop the market of cultural fashion innovations, not only in its own country, but also abroad. After all, the innovative potential of fashion as a cultural practice is one of the critically important dimensions of socio-cultural and economic development and recovery of both Ukraine and other countries of the world.

Key words: cultural fashion innovations, new technologies, culture of innovations.

Жукова Яніна Олександрівна,
викладачка кафедри менеджменту та фінансів
ННІ «Український державний хіміко-технологічний університет»
Українського державного університету науки і технологій
yaninazhukova@gmail.com
orcid.org/0000-0001-5021-9623

КУЛЬТУРНИЙ РОЗВИТОК МОДНИХ ІННОВАЦІЇ В УКРАЇНІ ТА СВІТІ

Тривала військова агресія на території України актуалізує питання культурного розвитку модних інновацій в Україні та світі. У цей час, поки військовий досвід України впливає на формування інноваційної культури в локальних межах, у глобальному масштабі відбувається культурний розвиток модних інновацій, який запустив масштабні соціокультурні трансформаційні зміни, дослідити які є метою цієї статті. Текстильні модні інновації в полі культури розвиваються із часом, втілюючи епохи та людські потреби. Сьогодні це штучний інтелект (AI), інтернет речей (IoT), електронна комерція та нові технології створення текстилю, як-от культурні модні інновації – 3D, 4D-друк, нанотехнології (NNI), розумний одяг: комп'ютери, які можна носити; електронний текстиль; біофабрикація тощо. Проаналізовані сучасні нові технології створення текстилю та одягу мають низку переваг порівняно з традиційними процесами виробництва. Це швидкий процес проєктування, своєчасність і скорочення витрат на роботу з інвентарем, складуванням, пакуванням і транспортуванням. Вони дають змогу переглянути сезонні цикли створення одягу, календар його доставки та розробити нові формати для презентації новинок. Найближчим часом за допомогою гаджета будь-яка

людина зможе створювати собі необхідний одяг у будь-якому місці та час 24/7. Технологія створення одягу в найближчому майбутньому стане персональним гаджетом і з'явиться в кожному домі, як мобільний телефон або планшет. Їх бурхливий розвиток іде шляхом незалежності від швейних виробництв. Україна до повномасштабного вторгнення почала активно розвивати ринок культурних модних інновацій, не лише в своїй країні, а й за кордоном, адже інноваційний потенціал моди, як культурної практики, є одним із критично важливих вимірів соціокультурного та економічного розвитку та відновлення як України, так й інших країн світу.

Ключові слова: культурні модні інновації, нові технології, інноваційна культура.

The ongoing military aggression on the territory of Ukraine actualizes the issue of cultural development of fashion innovations in Ukraine and the world. Our country not only heroically resists the occupiers, but also simultaneously faces tough challenges of restoration, rehabilitation, memory preservation, protection of Ukrainian cultural traditions, etc. Today, "the change of modern worldview paradigms necessitates the search for the latest educational and research strategies in the field of culture and the formation of new prospects for the development of the society of the future, the emergence of the latest sociocultural models of its functioning" (Ovcharuk, 2024, p. 2). At this time, while Ukraine's military experience affects the formation of an innovative culture within local borders, on a global scale. There is a cultural development of fashion innovations in the world, which has launched large-scale socio-cultural transformational changes, which are **the purpose of this article** to explore.

The emergence of innovative theories in the nineteenth century in scientific cultural studies are associated with the changes and interactions that took place in the socio-cultural environment of that time. This was due to the infiltration of European habits into traditional African and Izian societies. At the beginning of the twentieth century, M. Kondratiev began to study the patterns of cultural and economic innovations. He discovered the existence of "big cycles" or "long waves" that are formed from each basic innovation or innovation and represent a set of changing secondary innovations. The term "innovation" was coined by Joseph Schumpeter in order to analyze economic changes in the entrepreneurial eenvironment. The issues of innovation were widely studied by W. Sombart, W. Mitscherlich, G. Mensch, S. Tsuru, E. Mansfield, O. Kruglikov, K. Knight, P. Lelon, B. Twiss, R. Drucker, M. Lapin. Particular attention should be paid to the works of Ukrainian scientists N. Shust and N. Filyuk, who studied innovations in the system of Ukrainian higher education. V. Goncharov, O. Ovcharuk raised, in particular, the issue of introducing innovative methods in the field of culture.

Historically, in global terms, the cultural development of textiles, as a fashion innovation, is always depends on changes in science, industry, policy, philosophy, religion, culture, art, etc. The basic materials needed to construct e-textiles, conductive threads and fabrics have been around for over 1000 years. Thus, "traditions ensure the sustainable reproduction of cultural experience, while innovations are mechanisms for the formation of new cultural models of various levels, which create prerequisites for a number of socio-cultural changes" (Goncharov, 2014, p. 75). In particular, artisans have been wrapping fine metal foils, most often gold and silver, around fabric threads for centuries (Patwary, 2015).

Textile fashion innovations in the field of culture evolve over time, embodying eras and human needs. The history of the suit and textile defines its functions: esthetic, utilitarian and designation of class differences. Artificial Intelligence (AI), internet of things (IoT), e-commerce and new technologies of textile as fashion innovation creation are influenced new requirements of the rapid development and the growing value (*Francis Bitonti*, n.d.). The textile, suit and clothes began to get new functions which have never been earlier in the history having considerably expanded the functional value today (*Technology | Tamicare Copy*, n.d.). Today, their innovative components "become the determining formative factors of transformation and formation of a new socio-cultural reality" (Goncharov, 2014, p. 75). New textile creation technologies are 3D, 4D printing (*CGTRader – 3D Model Store*, n.d.-b), nanotechnologies (NNI), smart clothes: the wearable computing and e-textile, biofabrication (Mike, 2025), etc promoted this (Čiarnienė & Vienažindienė, 2014), (Cvetković, 2018).

According to "The Global Market for Electronic Textiles (e-Textiles) and Smart Clothing to 2027" report:

"The development of high value-added products such as smart fabrics and clothing, wearable consumer and medical devices and protective textiles has increased rapidly in the last decade. Recent advances in stimuli-responsive surfaces and interfaces, sensors and actuators, flexible electronics, nanocoatings and conductive nanomaterials has led to the development of a new generation of smart and adaptive electronic fibers, yarns and fabrics for application in E-textiles" (*Textile Industry 2025*, n.d.).

The bulk of smart textile applications are concentrated in areas: protection & defense, industrial and technical applications (transportation, architecture), aerospace (Watkins et al. 2018), medical & healthcare, sports & fitness (Lynn et al. 2018), beauty & art (fashion, entertainment). Amid the COVID-19 crisis, the global market for Smart Textiles estimated at US$2.5 Billion in the year 2020, is projected to reach a revised size of US$12.1 Billion by 2027, growing at a CAGR of 25.6 % over the analysis period 2020–2027. Competitors identified in this market include, among others: DowDuPont, Gentherm, Google, Koninklijke Ten Cate BV, Ohmatex A/S, Schoeller Textile AG, Texas Instruments, Textronics, BioSerenity SAS, Clim8, Chronolife, Conductive Transfers, Descente Ltd., Devan Chemicals, ect (*Textile Industry 2025*, n.d.).

The companies developing e-textiles for the emerging healthcare market are: Body Guide (2024)* USA (*Peripheral Edema Monitoring – Bodiguide Inc.*, 2024), VTT Technical Research Center of Finland (2016) (Tuomaala, 2024), (Kemppainen & Rönkä (2015), (Moraitou et al., 2017), Ohio State University's Electro Science Laboratory (2017) USA, Maxim Integrated (2019) USA, etc. Patient care: shirt, blanket, bandage, knitted hat, pants, etc. Advances in technology and textiles form the basis for a new interaction with clothing. Such technologies make it possible to develop clothing that not only measures the bodily functions and performance of the body, but also helps the owner to improve these indicators.

Smart Clothers and the Wearable Computing. The researchers from the University of South Carolina created the t-shirt that can be used as a ultra powerful battery but still retain all the normal properties of a conventional shirt. This type of flexible battery is a new way to keep all of our mobile gadgets charged while we are walking (Bao & Li, 2012). Many companies have developed the e-textile, smart clothes, the footwear and the wearable computing items (*Textile Industry 2025*, n.d.). They are: Hexoskin (2012) Canada, Wearable X (2017) Australia, Spinali Design (2018) France, Carlings (2019) Norge, Louis Vuitton 2020) France, Komodo Technologies (2018) Canada, Sensoria (2015) USA, Samsung 2015) South Korea, ASRD (2008) Canada, SCOTTeVEST (2019) USA, Levi's (2017) USA, etc. Ukraine continues to actively develop the e-textile market, not only in its country, but also abroad. Ukrainian internationally recognized e-textile developments include: Enable-Talk project (2012) Ukraine (*ENABLETALK GLOVES – Institute of Aerospace Technology*, n.d.), UniExo (2016) Ukraine, OptMax&SnowBears (2019) Ukraine.

NNI. Nano-tech turns clothes into personal A/Cs and heaters. Clima Ware is a line of jackets, shoes, helmets, and other equipment transforming them in accordance with the personal demands into the personal heaters or A/Cs. The Bolt Threads collaborated with Stella McCartney (2018) USA/UK. The brands using NNI presents new textile and items of clothes: Dhama Innovations (2016) India (*Dhama INNOVATIONS – Revolutionizing Thermal Comfort*, n.d.), Klymit (2018) USA, North Face and Spiber (2016) USA/Japan, GoGoNano (2013) Estonia (Reinjärv, 2025b), Sonovia (2016) Israel, etc. The companies representing heated clothes and working heated clothes are: Metabo (2015) Germany, Makita (2015) Japane, etc.

The 3D, 4D technologies of printing textiles and clothing becomes universal and portable in use very fast. 3D modeling of a person's body doesn't allows to depend on of the size available, nonstandard figure. Many companies have already evaluated the possibilities of 3D printing worldwide. They are: Danit Peleg (2015) Israel (*Danit Peleg – 3D Printed Fashion Lab*, n.d.), Ministry of Supply (2013) Taiwan, Michael Schmidt (2013) USA (*Michael Schmidt Studios*, n.d.), ThreeASFOUR (2018) Cuba, Mikaella Jans van Vuyuren (2014) South Africa, Anouk Wirepprecht (2015) Denmark, Iris van Herpen (2008) Holland, Neri Oxman (2012) UK, Victoria Secret's (2013) USA, Gucci (2018) Italy, Nervous System (2014) USA,

Eden Saadon (2017) Israel (*Eden Saadon | 3Dlace | לארשי*, n.d.), Under Armour (2016) USA, IGUAN-EYE (2017) Portugal, Adidas (2015) Germany, New Balance (2016) USA, Reebok (2018) USA, Nike (2013), Shami Oshun (2017) USA, Intriguity CAD on Demand (2008) India, Handre de la Rey (2017) South Africa (De La Rey, 2025), Luxexcel (2009) USA, etc.

The Biofabrication (Groll et al., 2016), (Yang et al., 2017) today continues to develop and expand, because "culture is created by innovations and transformations, but this happens in the interests of specific social traditions, stable order and inviolable values" (Goncharov, 2014, p. 75). Appearing of new technologies of creation of environmentally friendly textile and clothes, allows to process waste and salvage into new materials.

What in turn, gives the chance to a person, without killing animals, to globally reconsider the relations with the environment and consumption, (Meadow, 2025), (*Francis Bitonti*, n.d.-b). The number of developments in this market is constantly growing: Symbiotic A (2008) Australia, Modern Meadow (2011) USA, Cerebella Design (2013) USA, collaborations in USA at 2014: Inca's Secret, Cytocouture, Gaia, C. elegant, Hijackers, Epic, Marrow and Thread (*Research on the Runway: Drexel Fashion Designers Team up With Scientists for Descience Competition*, 2023); MIT Media Lab. Tangible Media Group. (2015) USA, Blast studio (2020) UK, Grow bio (2020) USA (Grow.bio, 2025), Ecovative design (2020) USA (*We Grow Better Materials*, n.d.), etc.

The Digital Textile. In the paradigm of cultural experience, textiles and fashion have always been inseparable among "digital culture research, the results of which are integrated into sectors of cultural industries, are the most important feature of modern research strategies" (Ovcharuk, 2024, p. 8). As an alternative to fast fashion, digital textiles are actively developing today. Digital textiles reduce sewing overproduction because they are created and exist only digitally. Digital fashion and Digital Couture are on the rise: Carlings (2018) USA (*Carlings – Carlings først ute med digital mote.* n.d.), The Fabricant (2018) Netherlands, Happy99 (2019) USA (Happy99, n.d.), TributeBrand (2020), IL3X (2020), etc. Ukrainian achievements in this area include: Dress-X (2020) Ukraine (*DRESSX.com – the World's Leader in AI, AR, and Avatar Fashion Technologies.*, n.d.), Waone (2020) Ukraine (*Waone Dress Jump Through*, n.d.), KseniaSchnaider (2020) Ukraine (*Ksenia Schnaider*, n.d.), etc.

Even before the full-scale invasion, Ukraine began to actively develop the e-textile market not only in its own country, but also abroad. Through this activity directly "priority areas for the development of culture and the formation of the country's cultural image are determined, dynamics and innovative developments in the field of culture and creative industries are ensured, which significantly affects the state of the country's creative economy" (Ovcharuk, 2024, p. 2). Ukrainian internationally recognized e-textile developments include: EnableTalk project (Ukraine, 2012), OptMax & SnowBears (Ukraine, 2019). Fast-growing innovative wearables include exoskeletons that are produced globally and in Ukraine, in particular: UniExo (Ukraine, 2016), Auxivo AG (Ukraine, 2019), German Bionic (Germany, 2023), Mehlen Protection (Europe, 2024). Exoskeletons form a new experience of an innovative culture of inclusion and recovery of military and civilians after severe injuries.

Conclutions. The dependence of a person on the gadget, is directly affects new technologies of textile, suit, and clothes creation nowadays. They have to be not only convenient, comfortable, but also correspond to the pace of the changes happening in the world.

The analyzed modern new textile and clothes creation technologies are: smart clothes: the wearable computing and e-textile, NNI, 3D, 4D printing, biofabrication, etc. has poses a number of advantages compared to traditional manufacturing processes. It is fast design process, timeliness and costs reducing dealing with inventory, warehousing, packaging, and transportation. They allow to review the seasonal cycles of creating clothes, the calendar of their delivery and develop new formats for the presentation of new clothes.

The production of new textile and clothes is developing by the countries such as Australia, Belgium, Canada, China, Denmark, Estonia, Europe, Japan, Holland, India, Israel, Italy, Netherlands, Portugal, South Africa, Switzerland, Thailand, UK, Ukraine, USA, etc.

In the nearest future, using the gadget, anyone can create for themselves the necessary clothes at any place and time 24/7. Gadgets make these clothes trendy and fashionable. It allows a person at time necessary for him to independently create

clothes, suit and textile, saving time and forces for the exhausting choice and fitting. The technology of creating clothes, in the nearest future, will become a personal gadget and will appear at every home, like a mobile phone or tablet. Their rapid development goes on the way of independence of sewing productions.

After the victory, our country will face new challenges that we cannot even predict today, but the development of innovation potential as a fashionable cultural practice is determined by existing and will be determined by future cultural conditions. After all, it is one of the critically important dimensions of socio-cultural and economic development and recovery of both Ukraine and other countries of the world.

*The date in parentheses records the year of creation of the analyzed innovation.

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