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CULTURE OF QUALITY OF THE EDUCATION IN LIGHTING DESIGN. PERSONALIZATION AND INDIVIDUALIZATION

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Abstract

The culture of quality of the education implies the existence of a synchronization leading to a state of joint work and a subsequent harmonization, which evokes the presence of a synergic interaction. On this basis, the culture of quality of the education in lighting design allows for the introduction of two consecutive approaches - personalization and individualisation of the professional development of students studying the specifics of lighting design. Personalization is recognized as a process that forms a set of educational elements designed for a student. Individualization refers to the process of adapting the personal set of elements to the specifics of the particular student. A priority of the professional education standard for good quality education in the field of lighting design is the "Student-centered Learning" (SCL) principle, implemented by the two approaches, in two successive stages. Stages allow for variability. This frame adequately reflects the professional development of the lighting designer as a subject of the contemporary higher education in light-based technical engineering and design.

The culture of quality of the education in lighting design also involves the evolution of the product lighting solutions designed for their targeted users. An essential element of the good quality lighting design is the personalization and individualisation of the lighting systems, implementing the Human-centered Lighting (HCL) principle. Personalization involves the "modeling" process of a set of light solutions, while the individualisation of the lighting systems allows for a "modulation" in the development of a particular solution. The semantic synergic bridge connecting the functionality to social features, the aesthetics to energy and environmental factors imply the presence of a philosophy that shapes the culture of the quality of the contemporary higher education in lighting design.

Keywords: Culture of Quality of the Education (CQoE), Synchronization, Harmonization, Education, Personalization, via Modelling, Individualization, via Modulation, Lighting Design, Semantic Synergy Bridge (SSB), Functionality, Aesthetics, Energy efficiency, Ecology, Creativity, Innovations, Intelligent lighting, Elegant metacommunication, Automotive Lighting Metasculpture, Metamob.

JEL Codes: I20

INTRODUCTION

The European quality standards for higher education are formulated in the process of the headway of the higher education. They give expression to modern understanding of the culture of quality of higher education. Quality assurance standards and guidelines in the European Higher Education Area (ESG) draw the attention to the need for a *fundamental change* in the learning and teaching approach: with focus to students (a); covering flexible training models (b); recognizing the competences acquired additionally besides to the formal curriculum (c), [1]. ESG Standard 3 presents "*Student-centered training, teaching and assessment*". In the spirit and the content of this standard, the quality of education in the field of lighting design is realized by conducting interdisciplinary training followed by the acquisition of the professional qualification "Lighting Designer" [4].

EXPOSITION

METHODOLOGY OF THE CULTURE OF QUALITY IN LIGHTING DESIGN. FROM "STUDENT-CENTERED LEARNING" (SCL) TO "HUMAN-CENTRIC LIGHTING" (HCL)

The culture of quality of the lighting design education implies *synchronization* with the achievement of a *state of joint work* and subsequent *harmonization* that allows for *synergy interaction*. Priority to the professional education standard for quality of the education in the field of lighting design is the *Student-centered Learning (SCL)* principle - an individualized training for each student. This principle follows the implementation of ESG Standard 3 [1]. The culture of quality of the lighting design education allows for two consecutive approaches to the professional and creative

development of students studying the fundamentals and specifics of lighting design: *personalization* and *individualization*.

Personalization recognises itself as a process that forms a set of educational elements *designed for a student*. The modeling approach applied to this set of elements should be in response to the modern necessities, closely following the experience of the past and the present. On the other hand, the individualization approach concerns rather the process of *adapting (modulation)* the personal set of elements to the specifics of the particular student. The *student-centered learning (SCL)* principle is achieved through the implementation of those *two approaches of modelling and modulation*, in two successive stages, as the stages themselves allow for variations. The quality culture of the lighting design education also affects the product lighting solutions designed for their direct users. An essential element of the good quality lighting design is the *personalization* and *individualization* of the lighting systems, known as "*Human-centric lighting*" (*HCL*) principle. The *SCL principle* alongside the *HCL principle* build up a framework that adequately reflects the professional development of the lighting designer as a subject of the contemporary education in light-based technical engineering and lighting design.

PERSONALIZATION IN LIGHTING DESIGN

The quality culture of lighting design education affects the light-based product solutions. An essential element of quality lighting design is the personalization and individualisation of lighting systems, implementing the *Human-centered Lighting (HCL)* principle. The personalization approach in lighting design is realized through *virtually limitless possibilities*, through the modeling of a set of elements: light-based technical equipment, meeting the contemporary quality requirements (a); appropriate light control devices (b); light solutions with appropriate aesthetic value (c); Internet-based interactive information exchange systems (d); hypothetical innovative ideas (e), (e.g. the so-called "*elegant light-based metacommunication*" (FIGURE 1, TABLE 1) in the context of the "*Automotive Lighting Metasculpture*" concept (*the metamob*) [15], others.

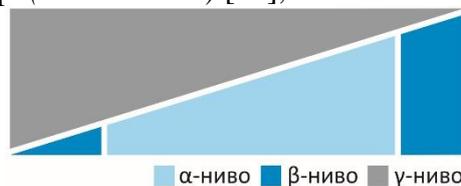


FIGURE 1. LEVELS OF LIGHTING MODELING: A-LEVEL (LIGHT COMFORT); B-LEVEL - SUBTLE LIGHT INFLUENCE (LIGHT CLOUD) OR OVERLIT ZONES (LIGHTS SPOTS); Г-LEVEL - CHAOTIC ORGANIZED LIGHT-BASED VOLUME-SPACE STRUCTURE (CHAOS OF RAYS); Δ-LEVEL (ENGAGED LIGHT, АНГАЖИРАНА СВЕТЛИНА), ELEGANT LIGHTING METACOMMUNICATION (ЕЛЕГАНТНА СВЕТЛИННА МЕТАКОМУНИКАЦИЯ) – THE EDGE BETWEEN A-LEVEL И Г-LEVEL.

TABLE 1

LEVELS OF LIGHT-BASED VOLUME-SPACE STRUCTURE (VSP)

LEVELS OF LIGHT-BASED SEMANTIC MODELING (VSP)

ALFA LEVEL	HARMONIOUS LIGHT-BASED ENVIRONMENT (LIGHT COMFORT). The alpha level represents (a) an illuminated composition (by the presence of reflected light generated from a side light source), (b) a light-emitting composition or (c) a complex light-based scheme composition (interaction of reflected light from a side light source and self-emitting light), which possesses individuality and semantics, the presence of a harmonious lighting environment. A distinctive presence of light semantics achieved by conventional light-based technical equipment.
BETA LEVEL	LIGHT SPOT OVERLIT / LIGHT CLOUD. A presence of so-called "Light spot" – overlit zone, "burning" the entire composition; a presence of light dazzle (psychological and/or physiological glare); "Light cloud" – a lack of distinctive light scheme presence, subtle light influence; visual difficulties in distinguishing volume and space. There is a presence of the semantics, but the lack of culture of quality lighting is dominating, (lack of quality lighting culture).
GAMMA LEVEL	CHAOS OF RAYS. The gamma level represents a chaotic lighting environment (" <i>chaos of rays</i> ") in which the structural and light-based scheme of the composition is not following the principles of harmony, unity and consistency of compositional elements, the chaotic behaviour is in possession; a presence of light pollution. There is a lack of light-based semantics (quality lighting culture poverty).
DELTA LEVEL	ENGAGED LIGHT (АНГАЖИРАНА СВЕТЛИНА). Delta level – the presence of the so-called " <i>engaged light</i> " building a light-based information field; light is information arrays carrier, a form of intelligent (elegant) light-based metacommunication интелегентна (елегантна) светлинна метакомуникация. A distinctive presence of light-based semantic field where the synchronization and the harmonization approach one another, (elegant metacommunication).

THE ELEGANT METACOMMUNICATION. A BRIEF RETROSPECTION

Bioluminescence in nature has inspired a number of connoisseurs of art. The diversity of several natural light phenomena is essential issue that modern science explains with the biochemical

evolution in the system of living organisms, due to which they manage to survive. Following the rhythm of natural conditions, lighting biomimetics finds its expression into the Automotive Lighting Sculpture concept (ALSc). [5,6,7,15]. The ALS concept’s evolution follows the philosophy found in the natural bioluminescence. It examines the automotive design history, including the manifestations of the traditional car tuning, but the main goal the ALS concept possesses is in support to the fundamnental philosophical ideas of "authentic creativity" and "semantics of light". In general, the ALS concept draws the attention to existential problems and explores them as a conceptual platform (a series of conceptual creative metaphores) that reveals hypothetical design solutions (TABLE 2), [15].

TABLE 2

RETROSPECTIVE TIME TRAJECTORY OF THE AUTOMOTIVE LIGHTING SCULPTURE CONCEPT (ALSC).

RETROSPECTIVE CONCEPTUAL TRAJECTORY

2007	A`KIMONO c	A`КИМОНО
2008	A`KIMONO LS 2.0 c	A`КИМОНО 2.0
2009	AUDIBLEYES ALS c	ОСЕЗАЕМИ ОЧИ
2010	ATOLLA ABLs c	АТОЛЛА (ATOLLA ABLs c)
2014	FEEARA ALMS c, Mm c	ФИАРА (FEEARA ALMS c, Mm c)



ABBREVIATION

c	concept	концепция
LS	lighting sculpture	светлинна скулптура
ALS	automotive lighting sculpture	автомобилна светлинна скулптура
ABLS	automotive bioluminescent sculpture	автомобилна биолуминесцентна скулптура
ALMS	automotive lighting metasculpture	автомобилна светлинна метаскулптура
Mm	metamob/metamobile	метамоб/метамобил

Source: www.dorteo.com

Abstract lighting metamorphoses not only have aesthetic potential and emotional impact, they also bring a higher level of awareness to the challenges of the age. Light installations with a seemingly unusual light-based and form-shaping scheme, often lead to the emergence of a number of functional, technical and technological novelties, not typical for the conventional understanding of the contemporary industry, but predictively reminding for its natural development. The Automotive Lighting Sculpture concept’s methodology is represented by an original irrational model, the so-called “*evolutionary semantic fractal*” (FIGURE 1), [15].

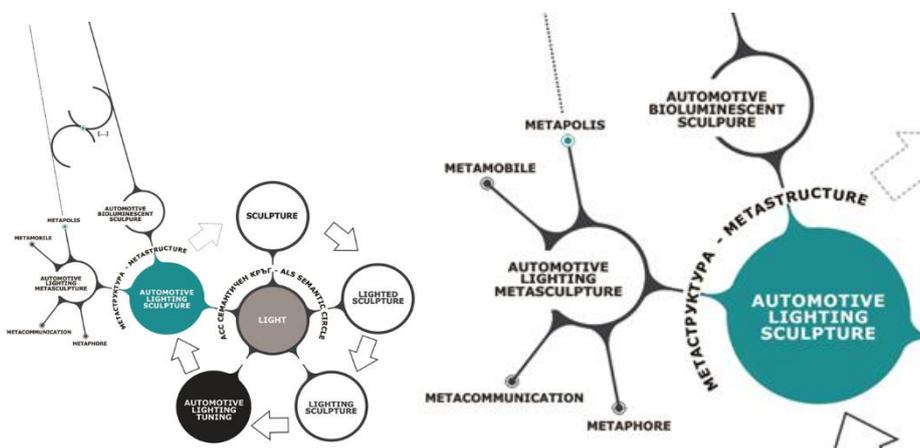


FIGURE 1. EVOLUTIONARY SEMANTIC FRACTAL.
INTERACTION BETWEEN SCULPTURE AND LIGHT [15]

INDIVIDUALIZATION IN LIGHTING DESIGN. ROAD MODULATION. EVERY STREET DESERVES INDIVIDUAL LIGHTING

Street lighting is a considerable investment and has significant operating costs, both for electricity, and for repair and maintenance. This implies adequate design, implementation and operation. Achieving the quoted principle *"EVERY STREET DESERVES INDIVIDUAL LIGHTING"* [9] does not necessarily mean that the main street should be brighter. Philosophy here is another - it is advisable for the street to be evaluated multifactorily. The current Bulgarian national standard *БДС EN 13201* includes: light-based technical requirements; choice of lighting situation; choice of lighting class; requirements for limiting light pollution. [9,16]. The final layout of the urban lighting environment should be assessed on the basis of the multifactorial assessment quoted above by building rational light-based gradation and differentiation from the local to the central parts of the settlements, especially the huge cities.

The interaction between street and automotive lighting is another intriguing issue that has been the focus of attention long ago. The reason for its importance lies in the fact that street lighting is a major cause of light pollution, while automotive lighting still maintains high levels of visual dazzle (the psychological and the physiological glare). Street and automotive lighting are still behaving as two individually developing, unconsciously separated light systems, although they are serving for one and the same goal [14] - ensuring visibility and security for road network participants. Autonomous management in vehicles is an *"internal change"* that has occurred in the age of Industry 4.0 (including IoT). This innovation is probably a step forward in solving the two problems (light pollution and glare). This internal change is expected to have an equivalent (adequate) *response from outside*. Light has the potential to adopt a new role and behavior to achieve the so-called *"elegant lighting metacommunication"* [15], in which elements of the automotive lighting alongside the street and road lighting network will follow a synchronized behavior seeking to achieve a synergetic interaction (harmonization).

INDIVIDUALIZED COMPOSING OF THE LIGHTING ENVIRONMENT

Man independently models the lighting environment with light devices containing Internet-based control modules. These modules communicate interactively with one another as well as with the operator, thus building the individualized light space in the integrated lighting environment. The minimum regulatory requirements followed unconditionally, create a standard platform for light conditions. The individualisation of the lighting environment implies the application of lighting systems and technologies to provide the individual light characteristic by: light distribution, brightness, distribution of brightness in space and in the visual field, color of light, dynamics of brightness and color, position of light sources, direction of light, others. TABLE 3 specifies exemplary recommended methods for the lighting individualisation approach, incl. some energy efficiency aspects.

RECOMMENDED APPROACHES FOR LIGHTING INDIVIDUALIZATION

LIGHTING INDIVIDUALIZATION APPROACHES	
LIGHTING ENVIRONMENT	Multifunctional and multi-component light systems
SETUP	Local functional lighting set up
LEVELS OF LIGHTING	Maintenance of the required level of illumination through the entire lifetime of the lighting systems
ORIENTATION OF WORKING PLACES	Adequate orientation of the working places with regard to luminaires and openings for natural daylight (windows).
BENEFITS AND USE	Complete use of the opportunities that light-emitting diodes and LED luminaires provide.
AGE INDIVIDUALIZATION OF LIGHTING WITH COMPENSATORY MEASURES [17]	
SPECIFIC NORMALIZATION	Specific normalization of lighting systems for different age groups.
SOCIALIZATION	Neuro-physical and individual cultural development in the socialization of adults.

CULTURE OF QUALITY OF LIGHT DESIGN TRAINING. FORECAST

The development of light-based technics and technologies creates conditions for the lighting individualization. The individual approach to lighting allows for the realization of lighting, adapted to the nature of the visual tasks, the rhythm of natural daylight and adapted to the observer with his/her individual specifics, incl. age peculiarities. The individualization of modern lighting is a complex task - it is not mandatory, but rather recommended where the conditions of realization allow.

Individualisation is an intriguing perspective in the development of contemporary lighting. The tendencies show that LED technology in Industry 4.0 and the Internet of Things (IoT) will be leading by the year of 2025. The Internet of Things and Industry 4.0 are not new technological solutions. The synergic interaction is achieved due to the technical devices that are the dynamically adjusting and working in the same time with a practically unlimited set of data, without human intervention. The semantic synergic bridge, linking high-tech to social features, aesthetics to energy and environmental factors, imply the presence of a philosophy that shapes the quality culture of contemporary higher education in lighting design.

CONCLUSION

European quality standards for higher education focus the attention on the necessity for a fundamental change in the learning and teaching approach. This change affects mainly the students, with the implementation of flexible training models recognizing competences acquired outside the formal educational curriculum. The culture of quality of the education implies the existence of a *synchronization* with the achievement of a state of *joint work* and subsequent *harmonization*, which allows the achievement of a *synergetic interaction*. On this basis, the culture of quality of the education in lighting design allows the introduction of two consecutive approaches - *personalization (modeling)* and *individualisation (modulation)* of the lighting environment.

The personalization of the lighting devices is an intriguing subject for research. In the conditions of a progressive technological transition, it allows the emergence of practically unlimited possibilities. Light-based semantic modeling formulates the so-called "*elegant lighting metacommunication*" as an alternative to the interaction between street (road) and automotive (transportation) lighting, as well as "*automotive lighting metasculpture*" (*the metamob*) as a hypothetical successor of the present vehicles, with the introduction of a new generation intelligent lighting - the emergence of the so-called "*engaged light*" and respectively the "*light-based semantic field*".

Visual culture is cultivated through the realization of an adequate lighting environment. The level of intellectual development of the way the light is treated and used dictates the course of human civilization's development as well as the way in which the international and global challenges are solved. Forecasts show that lighting will continue its dynamic development, as the LED technology alongside with in Industry 4.0 and the Internet of Things (IOT) will be leading until 2025. This framework implies the presence of a philosophy that shapes the quality culture of contemporary higher education in lighting design. Light is life, light culture a priori.

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