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Design thinking: from the scientist engineer to the philosopher

Дизайн-мислення: від інженера-вченого до інженера-філософа

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Abstract

This article examines design thinking as a novel project paradigm aligned with the polyparadigmatic nature of contemporary philosophical knowledge. It explores design thinking as an innovative approach that rejects the absolutization of a single methodology and analyzes the contradictions of technical creativity within the design thinking context. The phenomenon of design thinking is considered based on complexity theory, transhumanism, transversality of modern scientific knowledge, and the principles of transformation and technologization of modern society. The article traces the formation of design thinking in the context of post-non-classical science. It also analyzes engineering as technical creativity based on two figures: the engineer-scientist and the engineer-artist / designer. The study notes that technical creativity can unfold in different dimensions, such as ignoring potential consequences to achieve goals or focusing on interaction with the world and the communicative community. Technical creativity is seen as an innovative design-thinking component and a

Анотація

Ця стаття розглядає дизайн-мислення як нову парадигму проєкту, узгоджену з поліпарадигмальною природою сучасного філософського знання. Вона досліджує дизайн-мислення як інноваційний підхід, що відкидає абсолютизацію однієї методології, та аналізує суперечності технічної творчості в контексті дизайн-мислення. Феномен дизайн-мислення розглядається на основі теорії складності, трансгуманізму, трансверсальності сучасних наукових знань, а також принципів трансформації та технологізації сучасного суспільства. У статті простежується формування дизайн-мислення в контексті постнекласичної науки. Також аналізується інженерія як технічна творчість на основі двох постатей: інженера-науковця та інженера-художника / дизайнера. Дослідження зазначає, що технічна творчість може розгортатися у різних вимірах, таких як ігнорування потенційних наслідків для досягнення цілей або зосередження на взаємодії зі світом і комунікативною спільнотою. Технічна творчість розглядається як інноваційний

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factor transforming the human doer from a scientist-engineer to a philosopher-engineer.

Keywords: creative ability in technology, design and technology, engineering, philosophy, science.

компонент дизайн-мислення та фактор, що перетворює людину-виконавця з науковця-інженера на філософа-інженера.

Ключові слова: дизайн і технології, інженерна справа, наука, творчі здібності в техніці, філософія.

Introduction

Determining the global prospects for the existence of mankind is the marker that demonstrates both the current state of the global community, which is in the situation of the emergence of new opportunities that are still unknown to man, and a clear risk as a consequence of an unweighted scientific policy in relation to alive. This stipulates questions about the formation of the new interaction system between man and nature, man and society, and articulates issues of anthropogenic and environmental challenges that are generated by thinking focused exclusively on the idea of transforming nature / the world. In modern scientific discourse, the main attention is paid to the problems of further development of the social community at the global level in the plane of the concepts of transhumanism and posthumanism, modern technological innovations. The technical and technological component of human activity is not an external factor, but acts as a new dimension of existence. The figure of a human doer as a human engineer acquires a new meaning. Questions arise related to possible sociocultural changes affecting modern transformation processes. New projections and possibilities for constructing the desired changes, including social ones, arise. This corresponds to the situation of post-non-classical science, which proclaims a new methodology. Modern post-non-classical discourse is based on plurality, alternativeness, polyvariance, which denies the possibility of monological development of scientific knowledge, includes paradigms that intersect and interact like a rhizome, and form new methodological possibilities. Post-classical science in the situation of Industrial Revolution 4.0 receives a new configuration, becomes a metaparadigm. This provokes new approaches to understanding the figure of the human creator as a human designer and engineering thinking, which is gradually being replaced by design thinking. The specificity of the modern post-non-classical scientific picture of the world is the fusion of scientific, technical and social-humanitarian knowledge, which requires justification in the context of active human activity, thereby focusing on the need to change public consciousness, stipulating a new approach to the concepts of “engineering activity”, “engineering thinking”, “technological creativity”.

The aim of the article is researching design thinking, firstly, as a multidimensional phenomenon that acquires fundamental importance in a situation of the cognitive paradigm changing, which is associated with technological shifts in the context of the Industrial Revolution 4.0. Secondly, as an innovative approach that denies the absolutization of a single methodology, deepens the philosophical reduction and forms the foundations of critical comprehension within the framework of the transhumanical concept of scientific knowledge. This approach allows us to talk about the transformation of the engineer’s figure: from engineer-scientist to engineer-philosopher. Thirdly, as a methodology for the implementation of technical creativity, one of the aspects of which is the formation of responsible engineering activities.

Literature review

Representations of the design theory application include: the concept of a zero-waste society (Murray, 2002), the cradle-to-cradle society project proposed by the architect U. McDonough and the chemist M. Braungart (McDonough & Braungart, 2002), the project “Technologies and Social Actions” (TSA), where the possibilities of applying modern technologies focused on social transformations based on the principle of social justice are explored (Walker & Dearden, 2021) and others. These works emphasize the empirical importance of the application of design theory, which allows us to approach the reasoned analysis of social processes, the process of technical creativity and the situation of a person who is at the intersection of rapid changes. Thus, the researchers in the study “Posthuman Freedom as the Righto Unlimited Pleasure” (Meliakova et al., 2021) articulate the question of post-modernity and post-post-modernity. They emphasize the need to rethink the deep issues of human existence and comprehend the scenarios for the further existence of mankind, which acquires a new formulation in the context of design thinking as a new strategy. It is about a paradigm shift, about the formation of flexible approaches that can take into account the complexity of social systems. Thus, the report of the World Economic Forum “The Future of Jobs Report 2020” (World Economic Future, 2020) provides skills that, according to researchers, will be decisive for

humans in 2025. These skills (analytical thinking and innovation, complex problem solving, critical thinking and analysis, creativity, originality and initiative, design of technologies and programming, etc.) demonstrate not only a change in the scientific paradigm from monologism to polylogism, but also argue the significance of the figure of the design engineer.

J. Johnson (2010) suggests that design remains within aesthetic boundaries, despite the systemic nature of social reality. He emphasizes that designers study complex systems, while scientists do not take into account the innovative opportunities that design can provide as a methodological approach. Design, according to the scientist, is a methodology of coordination between the formulation of the problem and the development of a solution. This idea is important in the context of our research, because it allows us to consider design thinking as a factor in the transformation of the figure of an engineer: from an engineer-scientist to an engineer-philosopher. Design, according to Vilem Flusser (Flusser, 1999), is one of the main elements of modern culture, because it has a direct impact on the human being in the community. The philosophy of design allows isyou to eliminate the contradictions between scientific and technical development, transforming the material world, and the situation of a person whose way of thinking is undergoing significant changes. The importance of design philosophy as a more powerful methodology than that provided by design theory is argued. In J. Jewitt's study "Screens and the Social Landscape" (Jewitt, 2006), design theory is considered in the context of an interdisciplinary approach. The development of new approaches to the theory of complexity and the possibilities of its application to design theory is emphasized by J. Johnson in the scientific work "Comprehension of complexity in design" (Johnson, 2010). Analysis of the literature suggests that design theory can be understood as a methodological platform that focuses on a new format of technological / innovative activities. The application of the concept of "design thinking" in modern post-non-classical discourse complements the innovative matrix of design philosophy.

Methodology

The study has a theoretical character and is aimed at analyzing the phenomenon of design thinking. The authors applied an interdisciplinary approach, which allowed us to take a comprehensive examination to this topic. This made it possible, firstly, to consider design thinking as an innovative project, secondly, to explore technical creativity in the projections of design thinking and the transformation of the figure of an engineer-scientist. The polyparadigmality of scientific and philosophical knowledge is the main methodological guideline that provided the authors with flexibility and breadth of views in the study. During the study, the following principles were used: transhumanitarianism (the need to take into account the humanitarian aspect), transversality (the impossibility of using a single methodology in the context of overcoming scientific monoparadigma), transformation (the state of constant changes in the social system) and technologization (technology as a factor in the transformation of the social system). To achieve the set goal, the following methods were applied: cognitivist, phenomenological, postmodern deconstruction and the method of anthropological reduction. The cognitive method made it possible to explore the requirements for the processes of thinking and cognition in the context of society's requests for the creation of innovative ideas and solutions, and to focus on the concept of "design thinking". The application of the phenomenological method helped to explore the design thinking phenomenon in the plurality of its interpretations, taking into account the specifics of scientific directions. The method of postmodern deconstruction was used to interpret the figure of the engineer-scientist and the engineer-philosopher. The use of the anthropological reduction method is justified by the existing technical and technological transformations that exert significant pressure on the human situation.

Results and discussion

The unity of the diverse, forming integrity and adaptation, highlights the need for design thinking as a project paradigm that overcomes scientific solution limitations. This corresponds to the polyparadigm of modern philosophical knowledge. Design thinking in modern scientific discourse is a project paradigm that can overcome the limitations and monologic of scientific solutions. Social, anthropological and ecological challenges require innovative approaches to solving existing contradictions, which makes us turn to the problem of engineering activity.

Human history reflects the growth of technical power, constructing and manipulating the world, with a risk of becoming exclusively technological, embodying the ideal of Homo Faber.

Engineering is essential for society's development and serves as a transversal practice that transcends limits and transforms strategies. Engineering activities that were carried out within the framework of classical and non-classical science focused on progress, and achieved significant success in the process of creating a world for humans, which can be interpreted in the context of David Deutsch's study "The Beginning ofInfinity: Explanations that Transform the World" (Deutsch, 2012). The researcher emphasizes and absolutizes the gnosiological optimism of science, and, accordingly, of man, because everything that corresponds to the laws of nature, the latter is able to know, subject to the appropriate level of knowledge.Science receives a new level of power like "God did not create the Universe" (Hawking, 2019, p. 45), which requires an appropriate attitude towards both the scientist and the engineer, who is the Demiurge, whose activity is a kind of interpretation of the state of science of a certain era, allowing us to talk about the presence of an engineer-scientist figure.

For classical and non-classical science, the main task was to comprehend the existence of objective reality and was based on an analytical approach, which corresponded to the thinking system of a human engineer, capable of realizing a clear algorithm in explaining and applying the appropriate scientific tools to create certain objects/ techniques. This led to a clear specialization that eliminated the possibility of a holistic worldview. Thus, within the framework of the CDIO™ initiative (an innovative educational program for training engineers of the new generation), it is noted that the main task in the formation of engineering thinking is the inclusion of a humanitarian component, which allows combining theory and practice, creating an appropriate platform for the implementation of engineering activities (Conceve Design Implevent Operate, n.d.).Strict specialization, according to experts, is a factor that negatively affects the implementation of engineering activities. Therefore, the successful application of design thinking is not possible without the integration of technological and humanitarian knowledge. Let us present a picture illustrating the relevance of the design philosophy methodology.

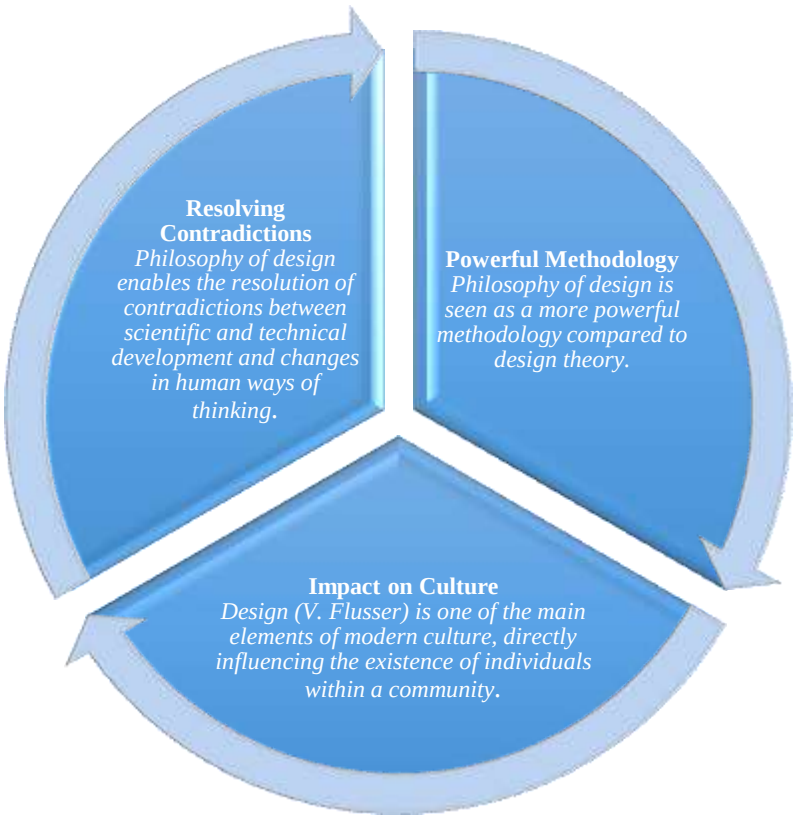

Figure 1. Key Aspects of the Philosophy of Design.

The essence of things surrounding a person is not open to him. This cognition cannot occur without taking into account all possible circumstances and events, that is, *systems thinking / engineering thinking* about the unity of the world. The process of comprehending the circumstances of life is associated with the construction of *ideas / technological creativity*, on the basis of which a person acts as an "architect" of the

world. Under these conditions, a person is able to comprehend the world in the context of truly caring about the problem of life. The complementarity of the world as a system and man as a component of this system is articulated. The emphasis on the human engineer in the context of the above imperatives allows us to address the problem of the latter's self-identification according to such criteria as "self-awareness / self-determination", "value orientations, worldview guidelines", "active activity / technological creativity". These criteria form a matrix that determines the direction of engineering activity, which most often illustrates the exhypothesis effect, that is, it takes into account only hypothetical negative effects, including social projects for the existence of mankind.

The artificial world as a world created by human activity is a specific chronotope, the existence of which is impossible not only without engineering activity, but also economic rationality and the psychology of thinking, which Herbert Simon (1996) emphasizes in his study "The Science of the Artificial." To understand the existing contradictions, he proposes to use the concepts of "native sciences" (natural sciences, biological sciences, chemical sciences, etc.) and "artificial sciences" (architecture, art history, medical sciences, etc.). Thus, "artificial sciences" are always in danger of disappearing / dissolving. This is due to the fact that the boundary separating the outer and inner, artificial and natural, is quite thin and changeable. At the same time, the "artificial" acts as a kind of interface / surface/ communication channel, thanks to which information is exchanged in the system, which is the environment. In this regard, the interface is also understood as a set of rules and norms that define these interactions.

"Artificial sciences" define social planning / creation of social projects, which cannot occur without taking into account such constants as "complexity" and "hierarchical systems". For a researcher, engineering activity is a representation of "artificial science", the main task of which is to create a correspondence between internal and external, that is, to achieve harmony between resources / knowledge and the possibilities of their implementation / realization.

An engineer-scientist whose activity is responsible for the creation of the artificial world acts as a designer-practical, responsible for the coordination of external and internal. In this sense, we can talk about the fusion of the content of these concepts and a successful combination with the content of the concept of design, which belongs to a different epistemic culture, but plays an important role in the creation of a new semantic ability (tags). This, in turn, makes it possible to expand the horizon of understanding the socially significant mission of an engineer – from a artisan and creative inventor to an "independent curator," that is, an engineer-philosopher. Note that the critical thinking of such a specialist, or in a broader sense, design thinking, is determined by the presence of three main criteria: communication skills, organizational ability and alternativeness of rationality forms. In other words, the formula of economic rationality (Simon, 1996), which is commonly used by engineers in their activity, saturates with humanistic meanings.

At the same time, the multiplicity of engineering principles and practices defines the new philosophy of design thinking. Since design is a response to the transformation processes of modern society and requires a new approach to both special sciences and specialization in the context of engineering activities. First, the design certifies the level and capabilities of technological intervention; secondly, design is a project activity (Walker & Dearden, 2021). And in the first and second cases we are talking about the system "society – technology – people". From this perspective the built product is seen to demonstrate (or prove) the intellectual and 'reasoned' control of the design process by the designer, the responses of the user, and the economic, intellectual or professional success of the product" (Rendell & Rawes, 2007, p. 1). This indicates the formation of design thinking that can embrace the creation of a new plane of interaction, combining scientific activities and engineering activities based not only on the requirements to meet the needs of society, but also on a responsible attitude towards the consequences of this activity.

For example, design thinking is applied in the healthcare sector for a deeper understanding of the needs of patients and medical professionals, implemented in educational programs, and actively introduced in the fields of ecology and social innovation. For instance, design thinking has been used to develop environmentally friendly transportation solutions. A good example of design thinking in action is the "smart city" projects, where technical solutions (such as public transportation systems, etc.) are combined with the needs of the city's residents (considering their experiences, social inclusivity, etc.). This approach allows the integration of science and technology into everyday life, taking into account humanitarian and social aspects.

This allows us to assert that the worldview component of philosophy, as well as its therapeutic function, provide interdisciplinary support. This fastening protects the human creator from the temptation to "have" (Flusser, 1999). In particular, the designer-scientist at Goldsmiths College, University of London, director of the project "Design Synergy in the 21st Century", draws attention to this. John Wood (2007) notes the importance of building a new engagement platform that responds to an interdisciplinary approach, on the creation of not "superficial" bridges between scientists such as art historians and computer scientists or persons of scientific and technical and socio-humanitarian knowledge, personifying different "languages" of cultures in the formation of abyssal connections. Design thinking becomes the principle of overcoming the limitations of functional rationality introduced by the Enlightenment era. Only under this condition, the scientist emphasizes, will there be no losers in the "nature – man – society" system, because the created matrix will be specified by the parameters "win – win – win – win –", after all, with the coordinated interaction of these components, provided that their needs are taken into account, the result of the interaction will be greater than the effectiveness of meeting the needs of only one of them. We can observe the inconsistency of their interaction as ecological and anthropological crises.

It's about designing for the planet, designing for health, designing for social impact, designing for a biological future, etc. These projects are both short-term and long-term, the main task of which is a combination of technology, aesthetics and business factors that are concentrated around the person, that is, they are human-oriented. This is precisely what is noted in the regulations of the Stanford University School of Engineering.

The mission of the Design (formerly Product Design) program is to graduate designers who can synthesize technology, aesthetics, and business factors in service of human need. Students emerge with both a strong engineering depth and technical know-how, as well as creative, visual thinking abilities and a deeply human-centered orientation to problem-solving. Their ability to seamlessly integrate across these two **"**right brain / left-brain**"** ways of thinking empowers them to make and build products, services, and experiences with transformative potential in service of people and planet (Stanford University, n.d.**).**

There is a transformation of engineering thinking into design thinking.

Design thinking makes it possible to combine technological thinking as an activity and technological thinking as an art in the plane of post-non-classical science. A new field of interaction is being created, where practices of transgression are formed (overcoming the opposition "possible – impossible") as linear thinking, which allows us to talk about the actualization of the principle of transversality, implemented by design thinking. The designer is understood as the architect of new actions; accordingly, design thinking acts as a projection, the ability to identify new perspectives. Now to act / create is to design, but in violation of systematic hypotheses and ordered procedures. A new image of a human engineer emerges, whose thinking, as it were, through-and-through, embraces and permeates the scrupulousness of the scientific engineer, while simultaneously adding the eccentricity of the artist. There is a change in a person's self-identification.

The application of design thinking is associated with existing contradictions, problematic situations, hidden tasks that require a new vision, a kind of deconstruction. Design thinking is aimed at activating the person, forming the need to take responsibility for the chosen decisions, developing critical and independent thinking, able to accept different points of view / argumentation, thereby strengthening the ability to communicate. This thinking creates common coordinates, a single plane, which helps to give an innovative project a solution to existing problems, indicates multivariate actions aimed at overcoming blind spots/cognitive distortions, which contributes to the formation of an innovative mental map. Design thinking involves "if-then" implication, which creates the illusion of linear thinking, but in fact acts as a driving force for the formation of hypotheses that form a certain rhizome.

Bill Burnett and Dave Evans, in their study "Designing Your Life" (Burnett & Evans, 2016), explain the stages of implementing design thinking as principles (empathy/immersion, problem definition / focus, idea generation / creation, and prototyping) and suggest applying these principles in everyday life. This approach goes beyond purely cognitive conceptualization. The question arises regarding the relationship between design thinking and engineering activities.

Thus, design thinking forms a new approach to engineering activities. The application of design thinking allows not only to overcome the schematic and rigid nature of technological actions but also to create new

opportunities for creative thinking. It is about adapting to the complex challenges that define the realities of the present.

In the modern post-non-classical scientific discourse, the importance of applying concepts such as “justice”, “intellectual perseverance”, “intellectual honesty”, and “intellectual humility” (Niewoehner, 2006, p. 3) is emphasized. According to Robert J. Niewoehner. (2006), the inclusion of the emotional dimension will help avoid ego- and socio-centrism in the practice of engineering activities.

We are talking about the formation of new relevant competencies that create an “updated” cognitive map and meet the modern trends of the society that is undergoing transformational changes. A peculiar cognitive map is formed. Thus, Richard Slimbach emphasizes that the ability to adapt to changes is possible when there are competences, which are divided into six categories: perspective consciousness combining critical thinking and emotional intelligence; ethnographic skills as a manifestation of intercultural interaction; global awareness as a possibility of systemic thinking about the existence of mankind; studying the world as an awareness of the unified history of mankind; foreign language proficiency and affective development (sincerity, gentleness, fairness, etc.) (Slimbach, 2005).

This specific situation indicates a change in the image of a scientist, researcher, engineer, artist, responding to the phenomenon of lateral thinking, overcoming the absolutization of instrumental reason. This thinking is understood as a creative approach to resolving existing contradictions in the process of improving existing techniques and technologies and is a component of design thinking. The significance of non-standard thinking, which is included in the configuration of design thinking in the situation of the new communication landscape formation, allowing to take into account the whole system of interactions, is articulated.

Engineering as technological creativity is imprinted in human nature, however, this creativity can have different manifestations, forming an engineer-scientist, which strives to constantly transform the world based on the application of a clear scientific paradigm and technology without regard to the possible consequences and an engineer-artist / designer focused on interaction with the world and the communication community, and finds its expression in design thinking.

Rather, technology design and use become blurred as forms of bricolage and improvisation which bring together diverse materials and people in flexible arrangements to get things done. This further suggests that more open-ended design approaches and methods are required which can take account of the complex and dynamic interrelationships between people, organisations (both formal and informal) and technologies (Walker & Dearden, 2021).

This, of course, requires the use of complex systems methodology to include the entire multiplicity of existing components, such as nature, planet, man, society and the entire multiplicity of their actions and interactions.

A new matrix is formed where the activities of a human engineer unfold, the flexible configuration of which allows not only to create a project, but also to take into account all possible variables. Thus, J. Wood (2007) in his study illustrates design thinking based on criteria such as movement and action (focus on achieving specific results); communication (creation of new meanings, meanings aimed at improving co-action in resolving contradictions / creating projects); comprehension and representation (anticipating possibilities and proposing alternatives); new knowledge (construction of new mental maps based on innovative approaches). The main task is to construct the right questions that will answer the query regarding the aspirations of man and humanity. We are talking about the possibilities of project activity of a modern person. If the construction of a new reality is already technically feasible, then a person not only must adapt to these changes, but also meet the existing challenges, including technological ones, but think differently, be able to carry out his own projects of finding himself.

Design thinking is a process of co-creation, where the depersonalization of homofaber is overcome, meeting the needs of communicative philosophy. Thus, François L’Yvonnet refers to the figure of the philosopher-engineer to resolve existing contradictions. “The engineer-philosopher is a man of action: far from the figure of the cabinet man, the dreamer, or the academic” (L’Yvonnet, 2023). An engineer-philosopher is a person who is not only aware of the existing risks and dangers of the modern world, but also responsible for his own actions. It proclaims the possibility of constructive dialogue, the discourse of the scientific

community in a situation where technology, rather than culture, determines social. The question arises: is man a creator or a result of creation, causing new paradoxes of being, which indicates a new anthropological challenge. Design thinking is an action, a strategy for realizing a vision, an image of the future. Design thinking testifies to the extension of the horizons of human consciousness, because the rigid system of imperatives is experiencing destruction. Let us present a picture illustrates the evolution of engineering thinking in the era of design.

Figure 2. Evolution of the Engineer's Role: from Engineer-Scientist to Engineer-Philosopher.

The center of design thinking is a person, and this forces us to turn to the deep meaning of this methodology: is design thinking a new dimension of the anthropocentric approach or a strengthening of the human-oriented paradigm? The solution to this dilemma is of undoubted importance for understanding the situation of modern society: the society of consumption versus a society of sustainable development. In both cases, the main doer is a human engineer, but the main difference lies precisely in understanding the consequences of actions in the coordinate system of "subject – subject" relations or "subject – object" relations.

So, a new thought trend is formed – design thinking, the task of which is to eliminate rigid boundaries. This testifies to the transformations affecting the cognitive and design activity of human, actualizing the requirement in the philosophical substantiation. What we are witnessing today: the existing environmental and anthropological risks are a consequence of precisely the consumer, utilitarian attitude towards the environment, supported by the ethics of consumption. Reorientation, the transition from goal-rational action, characteristic for a human engineer, to the value-rational action, characteristic for engineer-philosopher creates new opportunities for reconciling existing contradictions. Deserves special attention: firstly, updating a creative rather than analytical approach to solving assigned problems; secondly, the innovativeness of solutions includes an emotional component combined with the desire to go beyond established boundaries.

Design thinking expands horizons, viewing challenges as opportunities and creating a unified research field, drawing specialists from various industries. The application of design thinking opens up new opportunities for a systemic vision of the existing risks to the future existence of humanity and for the justification of projects aimed at eliminating the gap between the human and non-human, the natural and the artificial. Understanding design thinking as cross-cutting thinking indicates its transversal nature, meeting the needs of the modern world.

Conclusions

The study reveals the role of design thinking as an innovative / transversal methodology, which acts as a platform that provides a systemic vision and a creative approach to solving complex social, technological and environmental problems. Design thinking is considered as a tool for transforming scientific discourse,

which is finally able to overcome the limitations of the monologue approach that meets the needs of the modern scientific community and society as a whole.

The unique contribution of the study lies in highlighting design thinking as a multidimensional phenomenon, combining scientific, technological, and social modes. This allows us to focus on the formation of creative and more responsible approaches to understanding engineering activities in the context of transforming the figure of the human-engineer: from engineer-scientist to engineer-philosopher. An appeal to the phenomenon of design thinking in the educational process, in particular in the training of modern engineers, will strengthen the humanitarian component of their training, which is a request of society, which is in a situation of social transformations and strengthening of human interaction with technological systems.

The application of the design thinking methodology can be useful in many fields of knowledge, including social sciences and humanities, aimed at researching social transformations and changes in the human condition; in education for the preparation of professionals capable of critical rationality; and in engineering and technical disciplines, where the application of design thinking will promote the integration of the humanitarian principle into technical education and reinforce the principle of engineer-scientist responsibility. The study of design thinking is directly significant for enhancing the argumentation of the scientist's ethics in the context of the philosophy of science.

The study deepens the understanding of the interdisciplinary nature of design thinking, which is important for contemporary philosophy and science. Design thinking forms a new space in which there is a mutual coordination of the economic, technological, social and humanistic meanings of the human creator, which meets the principle of the human dimension of modern post-non-classical science and enhances the transhumanization of the latter. Design thinking recognizes, firstly, the possible consequences of the nature transformation by a human doer / human engineer; secondly, it recognizes the many global problems of our time and the impossibility of solving these problems on the basis of a single methodology; thirdly, it recognizes the importance of the humanitarian component in resolving existing contradictions between the co-being of man and nature. Design thinking is not only the creation of prototypes, not only a focus on economic benefit and taking into account the wishes of the person himself, his requests and needs, which are changing in the modern technologized world, but also the formation of a sense of responsibility. We are talking about a new level of communication that meets the needs of modern society.

The prospects for further research on this topic can be seen in the detailed study of the following aspects, which require deeper analysis:

Firstly, in the context of the transhumanitarization of modern science, the application of the design thinking methodology will allow for a more detailed exploration of the convergence between economic, technological, and social systems.

Secondly, the application of the design thinking methodology enables a focus on the issue of multidisciplinarity, which primarily requires the involvement of experts from various scientific fields and the justification of new ways of integrating scientists to solve complex issues. Special attention should be paid to the formation of responsibility within the framework of design thinking, which will contribute to clarifying the ethics of the scientist.

Thirdly, studying the specific mechanisms for implementing design thinking in the fields of engineering and technology opens new opportunities for the development of approaches to solving modern ecological and anthropogenic problems, which are the result of engineer-scientist activities. Conducting empirical research will allow for a more detailed determination of the impact of design thinking on engineering activities.

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