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DESIGN PHILOSOPHY: DIGITAL TECHNOLOGIES

Textbook on general education discipline
"Philosophy and Methodology of Science"

for students, listeners mastering the content
educational program of higher education
in all specialties of full-time and part-time forms of education

E-learning material

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The textbook complements the lecture material with topical issues of design philosophy and digital technologies. The material belongs to the section "Philosophy of natural science and technology" of the course of lectures on the philosophy and methodology of science. The natural-science aspects of human consciousness and technological trends in the evolution of convergent structures of digital ecosystems are described. The evolution of system computing technology is analyzed.

INTRODUCTION

The textbook is intended for undergraduates. Based on the profile of a technical university, the textbook describes the methodology of sociotechnical activities of an engineer, designer, designer and architect. Particular attention is paid to digital technologies of virtual, augmented, mixed reality and immersive technologies. This emphasis is driven by the Industry 4.0 strategy, shaped by the achievements of the fourth industrial revolution and the digital platform economy. As a result, there are changes in professional competencies, and the role of philosophy and methodology in the formation of a new image of professional activity in the smart industry space is growing.

The subject is read to undergraduates in order to provide methodological assistance in writing a master's thesis in a technical specialty and in a subsequent candidate's dissertation in a technical specialty. For constructors and designers, the course also offers methodological assistance related to modeling and heuristic search techniques. In the course of lectures, undergraduates will receive not only methodological recommendations, but will also be familiar with the main trends in the dynamics of social processes in order to know the strategies of scientific and technological progress in relation to nature, man, social reality, and the economy.

1 Philosophy of industrial technology and machine technology

The first industrial revolution gave impetus to the formation of industrial infrastructure and communications. In the 18th century, higher polytechnic schools began to open, in which they began to train technical specialists with higher education, as well as technologists with higher education. As a result, industrial technologies have become the subject of philosophical reflection and teaching. An important role was played by the book by I. Beckman "Guide to Technology, or Knowledge of Crafts, Factories and Manufactories", as well as the teaching activities of F. Relo and A. Ridler.

With the formation of a fleet of industrial machines, the subject field of the philosophy of machine technology arose. One of the first to introduce the term "philosophy of technology" in German was E. Kapp in the 70s of the 19th century. He proceeded from the anthropological interpretation of the essence of technical devices as an artificially created continuation of the human body, his arms and legs.

A systematic study of the social role of industrial technologies in a market economy society was carried out by K. Marx in a fundamental study called "Capital". He showed how, within the framework of the market economy of England, there was a transition from handicraft to manufacturing production, and what reasons played a key role in the mechanization of technological processes. The reason was surplus value, which involved the combination of labor power with the mechanical power of industrial equipment. This symbiosis gave an increase in labor productivity and at the same time devalued the role of the labor force. The Luddites responded to this threat by destroying industrial equipment, but were punished for their illegal actions.

The second industrial revolution made it possible to introduce new sources of energy (electricity, diesel) into the space of industrial culture. The electrification of transport communications, industry and urban space has begun.

New technologies have created a new way of working and everyday life. The technical component of technological processes has diversified.

An important role in understanding the phenomenon of technology since 1856 was played by the Union of German Engineers, which united engineers inclined to reflection. F. Dessauer became one of the classical representatives of the philosophy of technology in this Union. In the second half of the 20th century, on the basis of the Union of German Engineers, a community of German engineers emerged, inclined towards philosophical reflection (H. Beck, H. Lenk, F. Rapp, A. Ropol, A. Huning).

In addition to engineers, O. Spengler, K. Jaspers, E. Husserl and M. Heidegger were engaged in understanding the phenomenon of industrial machine technology in Germany. Their philosophical essays are dominated by a critical attitude towards the industrialization of European civilization. Philosophy of F. Nietzsche became a separate topic of discussions about the role of technology in society. The theme of nihilism was too clearly visible in it. Therefore, many thinkers distanced themselves from it, which they wrote about in special articles. F. Marcuse considers technology to be one of the fundamental reasons for the formation of a one-dimensional man. Critical analysis of technology was characteristic of the works of E. Fromm.

Z. Freud directly linked industrialization with a new social force in the form of a crowd prone to destructive actions. K.G. Jung also saw the strong influence of the industrial components of civilization on the transformation of the public consciousness of Europeans. The position of the negative impact of industrial culture on the social structure of European society was substantiated by the Spanish philosopher J. Ortega y Gasset.

In the Russian Empire, N. Berdyaev, A. Pavlovsky, P. Engelmeyer were engaged in philosophical understanding of the phenomenon of industrial machine technology. N. Berdyaev considered machine technology to be a sign of the last stage in the development of culture, when it loses its organic basis and passes to a mechanistic basis.

In the USA, a positive attitude towards industrial culture was formed by the philosophy of O. Comte's positivism. Applied passion for science and technology was typical even for the priests of the Protestant and Catholic communities. The main emphasis in the consideration of industrial culture was placed on industrial technologies, since the effectiveness of commercial projects was associated with them, which banks paid careful attention to when considering issues of providing credit resources. One example of the development of industrial technology was created by G. Ford, who began to use conveyor technology in automotive production.

Rising to the level of philosophical generalization, T. Veblen substantiated the thesis of industrial activity as a new institutional environment. In this institutional environment, he assigned a key role to technical specialists. This is how the theory of technocracy appeared. In order for technicians to be able to make managerial decisions professionally, they had to professionally meet the criteria of industrial management. This management involves the effective management of the company, taking into account obligations to investors, banks, tax deductions and payroll.

This also includes depreciation (expenses for current repairs) and technological modernization of production processes.

The conveyor streamlined the sequence of operations and actions within the technological process. This basis made it possible to consider each individual operation as a physical function not only of a person, but also of a technical device. As a result, the era of robotization of conveyor operations began. However, the high maintenance costs of robotic complexes have constrained the use of robots by industrial companies.

In the twentieth century, technology began to be used in almost all spheres of human activity. It has become a component of consumer goods (cars, washing machines, televisions, dishwashing machines, refrigerators, telephones). As a consumer product, technology has become integrated with design. Issues of ecology, ergonomics, safety, recycling of equipment began to be discussed. In a professional context, the ethics of engineering began to play an important role.

At the level of world dynamics, the Club of Rome initiated the practice of reports on the actual topic of borders regarding the harmless industrial development of mankind. This was an obvious emphasis on the fact that classical industrial technologies cannot remain the economic basis of a market economy. The search for more advanced technological modifications and energy alternatives began.

2 Philosophy of digital industrial technologies and information society

In the second half of the twentieth century, the attention of researchers focused on the phenomenon of the information society. This attention was determined in the market economy of interest in new sources of profit through the provision of information services and advertising. The basic needs of the middle class in the Western world for food, drink, automobiles, household appliances, and tourism were satisfied. A new level of needs was discovered in communication, first of all, in communication. This transition was facilitated by the third industrial revolution, which gave impetus to the development of computer technology. Initially, these technologies were not integrated with each other in the network. They also were not integrated with other technical devices of information and telephone and written communication.

The situation began to change in the second half of the twentieth century, when the concept of "information society" began to be actively discussed (F. Castells, E. Masuda). It followed from it that in the space of society the share of industry and agriculture is declining, and the role of information and knowledge is growing (D. Bell). But these intellectual reflections had no effect on the dynamics of industrial society. The turning point occurred when large telecommunications companies entered the information services market, as well as the transformation of telephone communication technologies. It has become mobile (mobile phone devices). Another step was the formation by transnational corporations of the space of social digital networks. There was a demand for software and hardware. Companies are facing the problem of information impasse. They needed automated data processing and decision-making complexes. These tasks became the basis for the development of technical cybernetics. One of its most important principles, discovered by N. Wiener, was the principle of feedback.

As soon as there was a tendency to understand technology and technology as a natural extension of the functions of the human brain, philosophy, together with the cognitive sciences, focused on the study of consciousness and the development of the theory of artificial intelligence. Logic in its mathematical modification was taken as a basis. This topic has become the subject of study of representatives of analytical philosophy, who were influenced by the works of G. Frege, R. Carnap, O. Neurath, B. Russell, L. Wittgenstein.

Under the tasks of software methodology, a formal apparatus of mathematical logic was developed, which, in combination with the theory of communication developed by K. Shannon, formed the basis of informatics (information theory). A. Turing, in the form of a test, was one of the first to define a computer program with the functions of the human brain. The test says that if a computer program responds adequately to questions, then it is artificial intelligence. It was the feedback principle that became the main way to test computer programs for the ability to imitate the logical functions of human thinking. The concepts of weak and strong artificial intelligence were introduced into everyday life.

As long as simulation scientists have worked with the syntax of logical thinking, they have not encountered the problems they have encountered in the field of semantics of logical thinking. This problem came to be referred to as qualia or the hard problem of consciousness (Chalmers). However, from a pragmatic point of view, computer programs have reached a fairly high level of implementation of the feedback principle. This is demonstrated by neural and expert systems that are integrated with deep machine technologies.

As a result, a methodology for self-learning of computer programs was implemented. They began to play an important role in the dialogue with users of information services. Based on them, robotics was developed.

Another direction in the development of artificial intelligence has become the convergence of all technological processes and technical devices based on digital platforms. An era without a barrier digital environment has begun. Technical devices have become devices. These developments began to be formulated as the fourth industrial revolution. The main components of this transformation called "Industry 4.0" are Big Data, the Internet of Things, cyber-physical systems, and additive technologies. As a result of digital modernization, industry, energy, logistics, marketing, trade, and the financial sector have become part of national social ecosystems. Digital generations have formed, which, under the conditions of physical restrictions created by the pandemic, have changed the formats of professional activity. Designers and programmers switched to computer modeling techniques and remote forms of labor organization. In professional activities, the methodology of digital twins is used.

Another direction in the development of artificial intelligence technologies has become human-machine systems, in which interfaces play an important role. A trend in the development of neural interfaces has been formed. They are relevant for the restoration of coordination (medicine), for the interaction of the operator with the artificial neural periphery of sensors, sensors and cameras. This peripheral, around the clock, provides control of the state of technological processes, as well as the environment.

The game industry, with its concept of possible worlds, has actualized the active use of virtual and augmented reality technologies. For these technologies, the hardware has been developed in the form of a headset of special glasses, joysticks, trackers and exoskeletons. All these technological components are implemented on the platforms of the digital metaverses.

The barrier-free environment in the information space has created opportunities not only for legal, but also for illegal business. Cybercrime is growing rapidly. Social engineering specializes in this type of crime. She combines professional skills in hacking security systems with a good knowledge of the age and gender characteristics of people's psychology. Among the criminal technologies, phishing and vishing have become widespread. Manipulation of individual and public consciousness has become part of criminal schemes. As a result, the role of legal instruments for regulating the information space is growing, as well as the importance of specialists in the field of cyber security.

3 Virtual reality as a space for professional activity of a designer

Virtual reality is constructed by visualization technologies. They involve the use of computers. The idea of visualization was formulated by Richard Hemming. Visualization has become the natural way of data. It has developed as a scientific discipline. With its development came the understanding that the more fully a person can immerse himself in the model of the phenomenon or process under study, the more natural apparatus he uses to manipulate the data of this model, the better he understands the essence of what is happening. As a result, the term virtual reality appeared, and an understanding of the virtual environment was formed.

The concept of artificial reality was introduced by Myron Kruger in the late 60s of the twentieth century. In 1989, J. Lanier coined the term "virtual reality". The virtual environment is based on the creation of computer images, sounds, as well as imitations of tactile, tactile, temperature, vibration sensations. These are olfactory simulation devices. There are projects and test implementations with connection to the human nervous system. These are brain interfaces that affect not only the human senses, but also directly on the nerve endings. The virtual environment completely separates the user from real reality using a VR helmet, headphones, joysticks, controllers, gloves, and other devices and replaces it with a simulation.

Virtual reality is defined as an interactive 3D graphic scene using a specialized display technology that immerses the user in real time in the created world, with direct manipulation of objects in the model space. One of the applications of virtual reality allows you to maintain interactive interaction with a high degree of immersion at the same time for a large audience. Developed distributed multi-user virtual reality systems used to organize international seminars and conferences.

A virtual reality application is a hardware and software complex that provides user immersion in a virtual environment. The first pre-computer simulations appeared in 1928. Edwin Link created a flight simulator. The technical implementation of virtual reality has changed following the development of computers and display means. Experimental applications have been replaced by complex software and hardware systems for military, industrial and research tasks. At first it was an expensive stereoscopic setup for highly specialized applications. The growth of GPU performance has ensured the transition of virtual reality technology into a mass niche.

VR technologies are at the stage of attracting investors. This is the phase of overcoming deficiencies that may alienate potential investors. Each technological innovation goes through several stages in the process of reaching maturity. This is the technological trigger stage. It is updated with the first publications about the new technology.It becomes the subject of wide discussion in the community. In the disillusioning phase, the shortcomings of the technology are identified and the community is frustrated with the new technology. At the stage of overcoming the shortcomings, the main shortcomings are eliminated, interest slowly returns, and use in commercial projects begins.

A productivity plateau marks the onset of technology maturity. The community takes the technology for granted, recognizing its advantages and limitations. Although the shortcomings of VR technology have not yet been fully overcome, there are many examples of the use of virtual reality. These are a variety of training systems designed to teach driving skills and aircraft control. This is the management and study of both civil and military equipment, including remote control of technical means. This is the conduct of surgical operations, the development of practical skills with medical instruments at dentists.

These are car simulators; systems for creating virtual simulators; management of various technological processes, including joint work in a team: training of crews of fishing vessels, maintenance of railway stations, nuclear power plants. The virtual environment is the ideal learning environment. The layout of virtual environment systems together with various elements of simulators (hydraulic seats, dynamic platforms, feedback control systems) allows you to build simulators and attractions with a high immersion coefficient (immersive). A special role is assigned to such a class of training systems as virtual laboratories. A virtual laboratory is a software package in which experiments can be reproduced that in real life are possible only in laboratory conditions.

The use of such virtual laboratories allows users (students) to study remotely and at any time. This software allows you to reduce the cost of real laboratory resources, as well as reduce the risk of negative consequences as a result of an unsuccessful experiment or improper use of equipment, reagents, materials in the learning process.

A virtual lab can also be defined as an artificial environment created on a computer that allows users to experience a real experiment. The most effective approach in the educational process of teaching a laboratory workshop can be attributed to a combination of classes or independent work that alternates theoretical skills, the use of virtual technologies with the subsequent consolidation of the acquired skills and abilities in real laboratories.

This combined approach allows students to familiarize themselves with the theoretical material, the procedure and the specifics of performing experiments on complex equipment in advance.

The problems of maintaining the material and technical base and the implementation of experiments, lack of equipment, the danger of experiments can be solved with the active introduction of virtual technologies into the educational process. Students and teachers find virtual simulations attractive because they are portable, easy to use, and highly efficient. Users also note the disadvantages of such solutions, which are limited freedom of action, poor manual response, and the lack of the possibility of practicing on real equipment in the process.

The virtual laboratory makes it easy to include game elements in the learning process, as a way to maintain attention and make the process of studying the material not only informative, but also exciting, eliminating routine memorization. Simulations can be either a desktop or web server solution - desktop applications can host more content, provide improved realism and use all the latest technologies. But virtual laboratories located on the network, due to technological features, have a less realistic visual component. At the same time, they have the advantage of constant updates and additions, ease of installation, cross-platform, and the ability to access from anywhere and anytime.

Virtual simulators allow you to increase involvement in training and preparedness of specialists, improve the visual perception of the technical process, reduce organization costs; scalability of the learning process, impartial assessment of activities, ensuring collective educational and methodological work. The largest amount of research is related to the simulation of engineering experiments and experiments.

Virtually nowhere is new powerful cross-platform game engines used to achieve realism, as well as more accurately reproduce experiences. The game engine is the central software component of computer and video games and other interactive applications with real-time graphics processing. It provides core technology, simplifies development, and often allows the game to run on multiple platforms. It is not suggested to use additional equipment (for example, virtual reality helmets and non-contact manipulation devices) that allow you to get a more complete immersive effect.

Each laboratory is made for a specific experiment there is no possibility of moving around the virtual laboratory. In each specific screen, there are only those objects with which there is an interaction, which in some way worsens the perception of a holistic picture of the functioning of the entire laboratory. The product has the ability to make a bad experience, but it will be possible to do this only with the help of pointless clicking on touchpoints. Of the advantages of the laboratory, one can name a huge amount of methodological material. Each experience or action is described fairly accurately, with a glossary and a general description. It is implemented in 3D and uses low-poly graphics.

Virtual reality (hereinafter referred to as VR) is interpreted in many different ways. The number of interpretations is explained directly by the context of the use of this term, as well as by the fact that these technologies are constantly evolving and undergoing changes. VR has specific properties. Generative suggests that subjective reality is generated by psychic reality, and therefore is virtual reality. Autonomy means that virtual reality exists outside of time and space and therefore has its own time and space. Interactivity makes virtual reality in demand. It always remains independent, even when interacting with other realities and the user is a full-fledged participant in the events, completely immersed in the process. All VR events take place at a given moment in time.

Known for VR without immersion; VR with collaborative infrastructure; VR with the effect of total immersion. Immersive virtual reality requires a sufficiently productive technology that can quickly recognize the actions of the subject and respond to them in real time. This is a realistic, detailed simulation of the world with an efficient representation of objects in a virtual environment. This is special equipment, including the latest immersive devices. One of the most important properties of virtual reality is the degree of immersion of the subject in the virtual world, which is achieved by generating the maximum similarity of the latter with the real world using simulation.

The advantage of simulation over simulation is the copying of objects and events at the model level. Virtual reality simulates something that does not exist in reality. Immersion in certain artificially synthesized conditions of virtual reality is called an immersive environment. Immersive environments have properties. Redundancy allows for multiple relationships with the environment. Observation manifests itself in the process of constructing reality. The environment can only be that which is observable, even if it is present in physical reality. Construction reflects accessibility to cognitive experience. It characterizes a certain degree of readiness of the subject to be included in the environment. A rich environment provides a wide range of influences on the user through the multi variance of relationships.

The immersive environment has its own independent history, independent of the external environment. It can easily take and maintain the stability of forms due to the diversity of content. It has local self-organization and temporal qualities of all elements of the environment. Extrasubjective spatial localization involves placement independently of the subject. Vector reflects the directional learning effect in a certain range of tasks. Integrity means the unity of the environment with the properties of the subject, in which the subject perceives the environment as a world of activity. Motive reflects the possibilities of the environment to influence the user's motivation. Interactivity captures the extent to which the user is able to participate in changing and shaping the established environment in real time.

Immersive reflects the ability of the environment to involve the user and orient him in the system of relations determined by the content of the environment. Presence expresses the feeling of being in a certain environment. It defines internal, subjective components. The components of the phenomenon of presence are considered to be involvement and immersion. Immersion represents the feeling of being in a computer-generated world. It is determined by the level of reaction of the senses to the conditions created by technology. An environment that shows high levels of immersion also creates a high sense of presence phenomenon.

An important component of the phenomenon of presence is involvement. This is a psychological state that manifests itself when focusing attention on a sequential set of related events or actions. Another factor is cognitive control. This is a system of metacognitive functions that tune specialized cognitive processes to solve certain problems under certain conditions. The processes of cognitive control are the processes of regulation of cognitive activity. It is Allocates three basic functions of cognitive control. These are switching between tasks, interference control and updating the contents of working memory.

The definition of cognitive control involves the adjustment of the human cognitive system to perform certain tasks in specific conditions, for example, in a virtual environment. A person uses the capabilities of his cognitive system to effectively solve problems in any conditions. Features of cognitive control can bring naturalness to the interaction of the subject with the virtual environment and, therefore, determine the appearance of a sense of presence and its degree. This is attention management. The user can arbitrarily focus on any objects in the environment, which increases the likelihood of a presence effect. Arbitrary suppression allows you to ignore external and internal distractors of the environment that are not related to interaction with it.

Switch allows you to switch between tasks. As a result, the occurrence of the phenomenon of presence depends on the effective change of attitudes. Achieving the effect of presence would not be effective without a special space in which the user would store data about the environment and the tasks performed within it. By storing all this data, working memory allows the user to build a complete model of the virtual environment. Monitoring and error correction help the user to detect discrepancies between the expected and actual values of cognitive parameters. Therefore, the more developed the monitoring function, the more discrepancies can be identified, which means that the probability of a presence effect will be lower. The effect of presence would be unattainable without special technological means that affect the human senses, and involvement, which depends on the content of the environment.

It is impossible to say exactly what exactly causes the phenomenon of presence in a person in each specific virtual environment. An analysis of the nature of the phenomenon of presence shows the value of complex neuropsychological studies that confirm the specificity of human experiences in the state of presence in an immersive virtual environment. Presence has modifications. In the context of environmental presence, a person experiences the possibility of interaction with the environment. In the context of social presence, a person assumes the presence of other persons in the same virtual environment with him. In the context of personal presence, a person embeds himself in a virtual environment at the level of memories, imagining the prehistory of his appearance in the virtual world, accepting the experience of his behavior in it.

With a sufficient sense of immersion by the user, the body's natural responses should occur, just as it would in the real world. If the parameters are unchanged, then the environment does not have the necessary effect. Various equipment, output and feedback means are used to increase immersive and overcome cybernetic disease as much as possible. These are helmets and goggles; rooms; informational gloves; gamepads, joysticks and keyboards; Force feedback devices - digital gloves that give feedback (force feedback). Most human skills are directly related to fine motor skills of the hands (or motor fine skills).

We can also highlight omnidirectional treadmills; suspension systems, cabins and chairs; smell simulators; taste simulators; a full immersion suit that contains several systems. We can also single out a tactile feedback system for transmitting sensations; a motion capture system to track the user's position in space and move around it. Climate control allows you to feel cold, warm, decrease or increase in temperature.

Existing equipment for virtual environments increases immersive, but is not perfect due to errors in technical means, its own weight. It is often not comfortable enough for maximum immersion. Cybernetic disease is a serious factor that reduces the immersive of the environment it is difficult to fully suppress it due to the imperfection of existing technologies and the individual user's reaction to virtual environments. The challenge is to isolate the virtual environment from the physical environment and simulate your own movement, as the most immersive movement requires large free spaces.

Achieving the maximum effect of presence is not yet possible for average users due to too high prices for a complete set of equipment. The maximum effect of presence is also currently not achievable due to the fact that modern technologies weakly affect the human senses (such as taste and smell), do not ideally simulate some other sensations (in particular, tactile ones, for example, temperature, weight or texture) objects of the environment). Subjective methods for assessing immersive do not allow one to accurately assess what level of presence the subject of the virtual environment feels.

Methods for assessing the immersive of a particular individual in a particular virtual environment have not been developed. For each individual subject of an immersive environment, unique conditions must be maintained and certain factors identified by specialists by examining the subject for its specific features of the body, analyzing cognitive functions, in which the level of immersiveness, measured using existing methods for assessing the effect of presence, will have the maximum value.

4 Theory and Techniques of Design

When considering design, convergence, digitalization, interactivity are taken into account. The objects of the designer's activity are commodities. The design of design artists emerged and took shape over the past few decades. The generalized function of design is the regulation of relations, the implementation of feedback between production and consumption. A fashionable line, form, finishing method acquire significant significance in the level of active consumption, which largely determines the choice of one or another model from the group of products that are homogeneous both in terms of utilitarian characteristics and in terms of comfort. Consumer ideology, materialism is expressed not in the accumulation of things similar in terms of utilitarian utility, but in their continuous replacement. Under these conditions, consumer value, and not the immediate utilitarian utility of the product, becomes a commodity.

Assigning value to additional product qualities becomes a priority. The fact of purchasing a product with consumer value is an incentive for production to develop new consumer value, to develop means for accelerated artificial aging of products. An artist-designer turns out to be a specialist whose task, regardless of a specific design object and regardless of his ideas about this task, is to create consumer value for any mass-consumed product. The improvement of the functional and constructive structure of the product has moved into the category of particular tasks; increase in comfort in its use. As well as adapting the product to the requirements of fashion by changing its shape, or creating a package, or creating a brand name.

In this context, design is considered as a form of organization of artistic and design activities, producing consumer value of products of material and spiritual mass consumption. The object of a specific design activity to create additional consumer value can be a single object, but it must be a massively consumed single object. Design works for the most part are objects that satisfy not only the material needs of people, but also act as carriers of aesthetic value, and as elements of the form of the artistic and figurative attitude of a single person to reality and to life. Design is an aesthetic activity, the content of which is the realization of human aesthetic attitudes and values that contribute to the formation of new forms.

A design product has a positive impact on the general social atmosphere, it forms an aesthetic taste, accumulates the energy potential of people, increases their efficiency, creates conditions for effective creative activity, and increases respect for the immediate environment of existence. The specificity of design lies in the conscious desire by means of design to satisfy those needs that are not satisfied by other means available today in society. The design begins after a conscious or spontaneous separation of the utilitarian (directly performing an everyday function), aesthetic (creating a positive emotional perception that does not contradict the ideas of beauty in a given cultural and historical context) and semantic (sign) principles, with their subsequent connection in the designed object at a higher level.

The designer seeks to produce a practical result within a certain time frame, while a scientist or a humanist can, and often this is what is expected of them, postpone their judgments and decisions until more data accumulates. The designer seeks to find the primary model-idea, which will allow to indicate the limits of the problem and at the same time make an assumption about the nature of the possible solution. To deal with a poorly formulated problem, a designer must have the courage to define, redefine, and change it in light of the solution he creates. One does not need to have knowledge of the mechanics, metallurgy, or molecular structure of timber to understand that an ax is an effective means of cutting wood.

Despite the fact that many designers and design schools periodically raise the issue of imagery in design, it, in comparison with works of art, must remain neutral, otherwise its consumers will be overwhelmed by a stream of aesthetic and emotional-figurative experiences that can interfere with the direct implementation of the utilitarian functions of design objects. . In the historical development of the design culture, the super-task of design creativity is carried out.

Artistic thinking strives to become effective, and practical activity seeks ways to become familiar with beauty. Design is the path of design culture where these two aspirations converge.

The term "aesthetics" was introduced by the German philosopher Alexander Baumgarten: it acquired its current meaning in his dissertation "Mediationesphilosophicae de nonnullisadpoemapertinentibus" in 1735. However, his later definition in The Aesthetics (1750) is considered the first definition to apply to modern aesthetics as well.

The first theories about the correlation of beauty and usefulness known to the general scientific community today were set forth by the ancient Greek scientists Socrates, Aristippus, Protagoras, Plato, Aristotle. Socrates shared the thesis of anthropological that the idea of beauty should be correlated with man, and not with the cosmos. The beauty of things is indeed relative (a beautiful monkey is incomparable with a beautiful person, and even more so a beautiful God), so you should find the beautiful in itself, the general definition of beauty. According to Socrates, the general principle of beauty lies in expediency.

The word "design" in its modern sense was finally formed in the 16th century and was unambiguously used throughout Europe. The Italian expression "disegnointero" meant an idea born from an artist and inspired by God - the concept of a work of art. The Oxford Dictionary of 1588 defines design as a plan or scheme conceived by a person to be realized, the first draft of a future work of art. In 1849, the world's first journal, the Journal of Design, was published in England, founded by the statesman, designer Sir Henry Cole. He initiated the World Exhibition in London in 1851. Design was defined as strict compliance with the purpose of the created thing and the decoration or ornamentation of this useful structure.

In the modern reading of the meaning, design is defined as a drawing, a line drawing made by hand or with the help of computer programs, in which the shape of the future object, its dimensions, color and tone are precisely expressed. This is a body of artificial origin, having a size, weight, mass, shape, color, smell and taste.

Design involves the construction of an object by hand or with the help of computer programs. The following must be accurately and clearly expressed: the shape of the object, its dimensions, the material of manufacture of the object and its components, including an explanatory note with a detailed description of the object itself and its components, manufacturing technology, methods of processing materials used, subsequent assembly of the object. It is as well as the calculation of the expected constant and variable loads that this item and its components must withstand during operation.

Consider the techniques that designers have used and are using. One of the first is pencil drawing. The name "pencil" came from the east and means "black stone" or "black slate". In Europe of the 14th century, the “Italian pencil” appeared, which was a clay black slate rod wrapped in leather. Sanguine was used (fr. sanguine from lat. sanguis - blood). This is a drawing material made in the form of sticks from kaolin and iron oxides. The color range of sanguine ranges from brown to red.

Sepia was also used (Latin sepia, from Greek sepna - cuttlefish). This is a light brown dye. Natural sepia was made from the ink bag of a sea mollusk. In the 20th century, sepia was prepared artificially. Sepia is also a type of graphic technique that has been common in Europe since the middle of the 18th century (J. O. Fragonard in France).

The silver needle gave the name to the ancient drawing technique, as well as to the instrument. The artist draws on a specially prepared surface (canvas, parchment, paper) using a piece of silver, sharpened on one side and fixed in a handy holder. During the Renaissance, bone dust was used as a primer. The surface was called cartatinta. Currently, gouache and gypsum are also used for this. A drawing made with a silver needle is initially bluish-gray in color and gradually, as a result of oxidation, takes on a warm brownish tint, thereby creating an image of extraordinary delicacy and sophistication. Since the early Middle Ages, manuscript scribes have been familiar with the technique of the silver needle and have used it to write on parchment and paper. During the Renaissance, she becomes one of the most popular among the artists of Italy, Germany and Holland. It was used by Jan van Eyck, Leonardo da Vinci and Albrecht Dürer.

We used a soft drawing material called "sauce". It consists of chalk, soot, kaolin and glue. This is art material for drawings. Gained fame and became widely used in the eighteenth and nineteenth centuries. The use of sauce opened up wide possibilities in the technique of tonal drawing.

Charcoal is the oldest drawing tool that has not lost its significance. Charcoal pencils and rods are easy to draw. The drawings are expressive. Artistic charcoal is made from burnt birch and willow branches or from burnt vines. Grapevine charcoal paints brownish-black, while willow and birch twigs paint bluish-black. Modern technical tools for designers include such computer programs as AutoCAD, ArchiCAD, Revit, V-Ray, Autodesk 3ds Max, Adobe Photoshop. These programs are used to create an image and its subsequent processing and are a powerful tool in the hands of the visualizer. It depends on the work of the visualizer how expressive the future thing will look on paper or on a computer screen.

The designer must be able to draw by hand. This skill not only allows you to quickly make changes to any project, but also develops memory and abstract thinking. Fine motor skills of the hands have a very positive effect on the creation of strong neural connections in the human brain.

In industrial design, in addition to the artist-designer, the following people work on the creation of an object: a process engineer, a design engineer, a marketer, a logistician, an economist. These people set such parameters of the future product as size, material of manufacture, color palette, shape. The first industrial designers appeared in the 18th century in England, which is associated with the activities of Josiah Wedgwood and the development of industrial production of printed fabrics. The definition of "industrial design" appeared in 1919 thanks to the German architect Walter Gropius, who founded the Bauhaus school of industrial design in Weimar. After World War II, industrial design developed in Scandinavia and the Netherlands. Around the same time, pragmatic Americans expressed interest in the direction in order to increase sales. In the 60s of the twentieth century, the College of Industrial Design was organized in the USA.

In the middle of the 20th century, in the professional lexicon, the concept of "industrial design" was used to denote shaping in the conditions of industrial production. Thus, its inextricable connection with industrial production was emphasized and the ambiguity of the term “design” was concretized. At the end of the 20th century, design and artistic activity in the field of industrial shaping began to be called more briefly - "design".

Design can be divided into artistic design - the creation of a material world purely from the point of view of the aesthetics of perception (external manifestations of form); technical aesthetics - the science of design, taking into account constructability (early stage of formation), functionality (middle stage of formation), comfort of production, operation, disposal of a technical product (modern stage of formation).

The English art theorist J. Ruskin introduced in 1857 the concept of aesthetically valuable products of production. He proposed a retrospective utopia: to return from cheap machine production of inferior goods to artisan manual labor. This idea was supported by the English researcher W. Morris, who was trying to create a modern manufactory.

In Belarus 1917-1922 design was formed at the intersection of production and propaganda-mass art. The main object was the artistic design of new forms of social activity of the masses: political processions and street festivities. The original configuration and arrangement of stands, propaganda and theater installations, kiosks proved the validity of the shift in emphasis from the development of new stylistic techniques to artistic and design problems. Graphic design is developing most intensively at this time, which is manifested in a fundamentally new approach to creating posters, advertising, and book products.

The founders of constructivism in design theory were K. Malevich, M. Chagall and the UNOVIS group. They were based in Vitebsk. Then they moved to Petersburg. Their center was the Council of Masters, established in 1919, and the Working Group of the Constructivists of INHUK (A. Rodchenko, the Stenberg brothers, K. Medunitsky, K. Joganson). The recognition of the new concept of shaping came in 1921. This year is characterized by active spatial experiments of constructivists. Constructivism grew into industrial art, having established its own aesthetics and independent goals.

5 Philosophy of modern Design

Contemporary design is becoming environmental design and human experience design, social context design. The subject of design has expanded to designing a social event, designing a style and lifestyle, synthesizing new cultural, moral, and social values. Design philosophy has become a form of social planning of the main socio-ontological dimensions of individual human being. A serious and deep study of the ontological and theoretical-cognitive problems of the profession enriches the methodological and practical arsenal of design with a sufficient set of tools that can provide such spiritual and practical transformations of social life that stimulate the development of constructive and creative aspects of individual and social life.

Designers who have such a methodology in their arsenal acquire wide opportunities for exercising control over a design project even at the stage of an idea and can avoid destructive decisions in advance, which, when implemented, lead to dehumanization of a person.

The unusualness and significance of the ontological qualities of design, identified by design methodology, allows to achieve conceptual changes in the perception and evaluation of the facts of the history of design. Design philosophy reflects on the emergence of influential design phenomena called "problem witches". These anomalies are caused by global social, personal and environmental problems and indicate a growing crisis, a profound change in the design paradigm. The methodology and practice of design is increasingly focused on anthropological, social, and philosophical problems.

The methodology of decorative art in industry is being replaced by the methodology of philosophy and social anthropology, which interprets design as a universal means of exacerbating or appeasing social tension. The problems of man and society are becoming dominant.

The necessity and legitimacy of the disclosure of design issues is substantiated, based on the principles of philosophical anthropology, the need to synthesize in a single system of concepts in a new way meaningful ontological design phenomena and the dynamics of methodological dominants is argued. Two main groups of ontological properties of the objective world of modern techno-societies are revealed: universal utilitarian functionality; powerful psychological and object-sensory impact of design objects on all aspects of human life.

Theories are deeply concerned with the involvement of design in destructive processes. The problem of product quality of design and the problem of quality of life appear as problems of public order, social justice and the polarization of wealth and opportunity. The authors of critical social theories and design theories, the most widely used and cited in the specialized literature, include G. Marcuse, T. Adorno, P. Feyerabend, V. Papanek, N. Cross, K. Dilton, G. Reid, D. Bell , M. McLuhan, R. Faucu, G. Simon, J. McHale.

In the development of the scientific and philosophical methodology of design disciplines, there are three stages in the formation of modern design thought. The first stage in the development of philosophical and methodological problems of design is characterized by the elaboration and development of such design activity methods that are aimed at achieving the greatest efficiency of the engineering, structural and aesthetic aspects of the project. The design models of the 50-70s of the twentieth century are focused on improving the quality of the final product, on increasing the degree of effectiveness of the impact of design on various human life situations associated with technology, with the subject environment.

The second stage is characterized by the emergence of such methods that are aimed at a deep rethinking of the tasks of design, the essence of the initial premises and the features of the social functioning of technical and aesthetic design objects. The period of reflection begins in the 60s of the twentieth century in the works of G. Marcuse, T. Adorno, R. Fokyu, G. Simon, G. Rittel, and the consequences of implementing large-scale technical and technological projects become obvious.

The third stage of the formation of the theoretical context of design activity focuses on social and anthropological problems, focuses the attention of theorists, designers and project executors on the possibilities of stimulating the methods of wide public participation in design, on the “do it yourself” movement; “design for laypeople”; methods of "coalition teams" ("coalition teams"); "Support and filling" ("support-infill").

In the concept of "Design and technical progress:" technology assessment system" ("system of technology assessment") design is understood as an integral part of modern scientific and technological progress. Forecasting the consequences of technological innovations, awareness of the need to design means of social and individual protection of consumers from industrial production becomes a priority in an environment where a variety of goods, information acquires the character of risk factors.

The concept of "Continuum of Complexity of Design Problems: From Simple to Wicked Problems" considers two alternative approaches to assessing the level of complexity of problems in design activity. The first approach states that design problems are simple, well-structured, and "tame problems".

The second approach, which implies complexity, complexity of design problems, draws the designer's attention to the fact that in industrial and post-industrial design each problem must be formulated and solved as unique, taking into account the multidimensionality of negative and positive information about a person and society.

The theory of “change agents” in design contains the definition of design as the most important factor in any changes. The importance of studying design as a social phenomenon that incorporates the influence of not only market conditions, but also the features of state ideology, politics, national culture, regional natural conditions. The definition of design and designer as a carrier of social change fundamentally changes the image of the profession, increases the level of responsibility of a specialist, and the social significance of the results of his work. The concept of participatory design contains methods for involving non-professionals in the search for design solutions.

Participation is also a means of popular control, the mechanisms of which must be thought out and organized so that large masses of ordinary people can effectively control not only the activities of design firms, but also political, municipal, and economic institutions. A summary of the types and forms of implementation of the ideas of participation in design is presented. These are 1) “representation”; 2) "survey" ("questionary"); 3) "regionalism" ("regionalism"); 4) "dialogue" ("dialogue"); 5) "alternative" ("alternative"); 6) "co-decision" ("co-decision"); 7) "self-decision" ("self-decision").

The methods of complicity, specially developed by theorists and designers in order to protect the population from bad faith, dishonesty and from the propensity of part of urban and rural residents to acts, are analyzed. The concept of "impact consumerization" of society contains a critical point of view on the growth of consumer hegemony, endowed with the potential to shift social value systems, actively replenished due to increased attention to human instincts and vices. With the introduction into practice of the concepts of “participative management" ("participative management"), hopes are associated for improving the living conditions of workers and increasing labor productivity.

The design methodology comprehends the problems of man and society in the era of post-industrial upheavals: alcoholism, TV and TV addiction, the spread of gambling, unemployment among young people, and a tendency to behavior of part of the population.

The design puts forward a series of new professional ideas. The new design is very different. Some directions welcome the technology, others criticize it. Some focus on the design process, others do not. Some turn to history and social problems, others are busy with form creation. Most designs are humanistic, if not in results then at least in intent. Influences that permeate design, unleashing the designer's imagination, are relayed from various unrelated fields. Sometimes these are ideas from the philosophical sciences, sometimes concepts from the sphere of culture and technology. Designers come to the conclusion that the new meaning of their profession lies in the ability to create symbols, in the ability to professionally interpret cultural artifacts.

Designers interpret their profession as a national and international phenomenon, as a unity of professional interests of artists, architects, cinematographers and writers. Another aspect of the new design is the mystery, ambiguity, incomprehensibility of both form and content, which gives the works an intriguing depth. It seems that you will never be able to comprehend the very depths of the object. Ambiguity is sometimes achieved by means of minimal design, the introduction of Buddhist symbols, lowering the level of information of the form. The effect is achieved through images and informatics tools. The works of designers are designed for the independence of the audience in the development of new symbols and meanings.

The designer rethinks, redefines the meaning of the object consumed by a person, the designer becomes an intermediary, a resonator between a person and his object-informative environment, becomes the creator of not only an object, but also the human experience accompanying this object. New social and individual priorities and principles of modern design are expressed in the program settings of creative trends. Among the principles: form follows "fun"; openness to emotions; reality is an illusion; black box aesthetics; antidesign.

The principle of co-evolution in the overall structure of the design methodology and ontology includes such design characteristics as the anthropological dimension; compliance of types and forms of design with the level and nature of the development of society; having an aesthetic dimension. The methodological principle of marginality focuses on the sphere of a rather subtle semantic aura, revealing secondary, secondary, temporary, random and elusive manifestations of the essence of the object as extremely important, informative and meaningful and fateful. It motivates to create a liberated symbol, to actualize such existential design singularities, such phenomena of social and personal acceleration, the status of which is associated with both absolute novelty and the significance of cultural and social rarity.

The principle of marginality is characterized by the following pairs of dimensions: the dimension of name or namelessness; measurement of activity or inactivity; measurement of positivity or destructiveness. This is the art of liberating the ontology and logic of design from excessive enslavement by traditions, principles of rationality and functional expediency. The methodological principle of socio-anthropological transience includes four dimensions of transience: transience, manifested in people's relationships, in the nature of one-time actions; transience, manifesting itself in the nature of rapidly emerging and forever disappearing things; transience, manifested in the effectiveness of ephemeral social structures; transience, manifested in the high social effectiveness of ephemeral information.

The feeling of impermanence, transience becomes more and more significant, acute, inextricably linked with radical changes in social things and events. It is the transformation of the dialogue of interpersonal relationships into a monologue of an individual with fetishized things, it is the unexpected obsolescence of industrial products, disposable and discarded things, mobile and modular architecture, rented consumer goods, fads and ephemeral objects as a commodity, purchased and immediately discarded.

These are new types of information, these are psycho-economic products of design. The construction of theoretical design models, the accumulation of information regarding the qualitative, quantitative, dynamic characteristics of the model has an independent significance.

6 Software: code Design

The object of design is not only physical objects, but also computer technologies, in particular, software. The job of a programmer is to write code. Ideally it should be a programmer should write simple code. It is because simplicity is the hallmark of good design. As a result, the main problem is the fight against the complexity of the code.

There is also a lot of cognitive complexity. A developer has to learn a lot of information and keep a lot in mind to understand how the code works. It's not obvious what needs to be changed in the code to change the functionality.

A sign of complexity is a large number of dependencies, as well as non-obvious things in the code. These are generic variable names, multiple variable targets, poor documentation, and non-obvious dependencies or dependency leaks. Complexity tends to accumulate. Code complexity increases when code refactoring is delayed and code design is not taken into account. In such a situation, it is difficult to add new features.

The reasons for the existence of complexity are created by programming practices. One of them is tactical programming. It focuses on solving the problem at hand. The programmer solves it in the first way that comes to mind not thinking that another solution is possible, which is easier to understand. In an effort to solve problems as quickly as possible, the programmer reserves the legacy code. This code is difficult to understand even for himself.

Another option offers strategic programming. The programmer takes into account changes and needs in the future and thinks about the documentation and understandability of the code. He fixes obvious problems in old code, not just writes new code. In strategic programming, it is impossible to write completely correct code right away. Some issues will become clearer in the future.

Therefore, it is important to fix these problems in the written code as soon as they are noticed. Many startups may not agree with this statement. It is critical for them to release a feature as soon as possible, otherwise they simply cannot exist. If a startup is in such a situation, then quality can be neglected, but it is better to refactor the code as soon as possible. It is justified to spend time fixing old code, otherwise the complexity will accumulate its understanding will take a lot of time.

This means that the implementation of modules must be much larger than the interface. The interface tells what the module does. And the implementation talks about how it does it. In good code, when a module is created or modified, it is important to know the interfaces of the modules and not need to know their implementation. It is important to know the implementation of only the modifiable module. Therefore, the simpler the interface of the modules used, the easier it is to work with them. The more methods, arguments, and nuances of use a module has, the more complex its interface.

The formal interface represents the signature, public methods, and properties of the class. The informal interface represents module comments and operational nuances. Simplicity of code relies heavily on abstraction. This is a simplification of the understanding of the module, by hiding unimportant information. Abstraction can have two problems. If there is little hiding, then the complexity of the interface grows. If there is a lot of hiding (not enough information about the module), then errors occur when using it.

If a module is very small, then the module's interface is larger than its functionality. It is important that the module has a simple interface and yet a lot of functionality, so that the interface hides the complexity of the code. You don't need to get too carried away with hiding, because you can hide important information, and you won't fully understand how to work with the module correctly.

Leakage of information reflects the situation opposite to the concealment of information. It occurs when implementation nuances of a module leak into other modules, forcing code to be rewritten when those nuances change. This can happen through the back-door, when several classes know about the file format, although they are only important for one. Such a leak is much worse than a leak through the interface. Modules should be combined into one or information should be taken out and wrapped in a higher-level module.

In the development process, information is often placed according to the principle of the time sequence of its execution. But the module should be tied to knowledge, not the sequence of execution. It is because modules should be reusable. A module may be needed for a completely different task, without being tied to a specific execution sequence.

It is General-purpose modules with a reserve for the future, with the ability to use somewhere else. The advantage of such modules is that they are not strongly tied to the current task and tend to make the interface simpler and more versatile. In such modules, it is better to first describe the interface, and then implement only those methods that are needed in the current task. In a well-designed system, there are different layers of code abstraction higher-level code uses modules at a lower level. On different layers of abstraction, thrown methods can occur, when the result of the method execution is thrown to a higher level, without any processing. This case only complicates the code. The problem here is that the responsibilities of different classes overlap. The exception is dispatcher methods, which are responsible for choosing the right method to call.

Also, decorators use forwarded methods. Therefore, they should be used carefully and only as a last resort.

Dropped variables reflect a situation where variables are pushed down to lower-level classes without processing. The problem is that the dependency is not used in the intermediate layers. The interface of each method through which the variable is passed becomes more complicated, because the argument is accepted and nothing is done with it. It is passed on. In such a situation, you can use the DI container. This is not a perfect solution, it can lead to non-obvious dependencies, so it should be used with care. In order to avoid many problems, variables in a container can be made immutable.

Do not shift the responsibility to the users of this module as much as possible. Solve as many problems as possible inside. A user is not only a person, but also a high-level module that the module uses. There may be a situation where the parameters are incompatible, and this problem will have to be resolved by the user. First, it is worth considering whether it is possible to determine these parameters automatically internally. The module must fulfill its duties to the end. At the end of the development of the module, you should make an extra effort and consider whether it is possible to hide unnecessary knowledge from the user.

To improve the design of the code, it is often necessary to either split the module into several, or vice versa combine with another module. To understand whether it is worth merging, let's look at the characteristics for merging. Modules access common information. It is used together. One cannot be used without the other. They solve a common problem. It is hard to understand one piece of code without the other. After merging, the interface will be simplified. You can split the code into general-purpose and specialized ones. If a module contains a piece of code that may be needed in other tasks, then it should be separated and used inside the second one. The same with repetitions in the code, this is a sign that the part being repeated is a general purpose module.

Specialized code represents a piece of code that is obviously only needed for a specific task. If, after splitting a method or extracting a submethod, you have to switch between them to understand how they work, then this is a sign that the methods are broken incorrectly or should not be broken. The child method does not need to know where it is being used. A dedicated method becomes a general purpose method and can be reused in the future. An exception is not only an exception that is thrown in the code. These are any situations that cause unusual system behavior. When something doesn't go as intended. Exceptions add complexity to the interface because some exceptions generate new ones. They need to be processed. Exceptions may not be caught because they rarely occur. Exception handling can throw a new exception.

The exception is part of the interface. The more exceptions an interface has, the more complex it is. We should strive to hide the exception as early as possible without shifting it to the user. Let's highlight ways to hide the exception. Ignore the exception. Accept it as normal behavior. Handle it inside the module without throwing it outside. Handle multiple exceptions in one handler, bouncing up a few levels and handling it in one place. Abort the program with an error when handling it is useless. . Sometimes it is important for an external module to know about an error that has occurred.

Don't go with the first idea that comes up. It is worth considering several options. This will save time on rewriting the code. First, you should think about the interface. It is not necessary to consider all the pros and cons of each, enough key interfaces. It is important to think about completely different options that are fundamentally different from each other. In the process of reflection, a new one may be born, which will combine the advantages of both. It is worth thinking about which one is easier. It is the variant more reusable. Will the implementation be more perform. If the top-level class needs to be modified to use the option in question, then this is a sign to abandon it. Considering the options should not take much time. The more important and large module we want to develop, the more time we can spend on thinking.

It is impossible to give a high-level description in the code of what a method does or the reason for a particular decision in the implementation. If you try to simplify the implementation for easy understanding, you will have to break the module in such a way that this can complicate its interface. you have to read not only important information, but also not important, because of which the meaning of abstraction is lost. Some nuances of the passed arguments and properties cannot be described in the code.

The absence of comments will force you to spend more time understanding the code in the future, which will cause it to be spent even more. Maintaining well-written comments does not take much time. This is only needed if there are large changes in the code. The main idea in writing comments is to record important thoughts of the developer that cannot be described in the code. This will avoid mistakes that the developer will fall for after him. The intentions of the author will be clear. It will also reduce cognitive complexity.

The developer must understand what the module does without reading the code. If he can write a valid code comment without reading it, then the module comment is not needed. You can use different words in a comment than in code.

It is describing variables think in nouns, not verbs. If interface comments force you to describe an implementation, then the class or method is too complex. There is an incorrect code abstraction.

The purpose of implementation comments is to provide insight into what the code is doing. They are needed only for large and complex implementations. For a simple implementation, no comment is needed. If the developer understands what the code is doing, it will be much easier for him to understand the code itself.

It also happens that the general logic is spread over several modules, for example, sending and receiving an http request. It is difficult to comment on this, since it is undesirable to duplicate comments.

For such cases, it is better to have a common file with notes, and write a comment there. But there will be one problem. Comments are far from the code. As the code changes, it will be more difficult to maintain comments.

It is better to write comments first. In the process of writing code, you can focus on the written comments. Comments become a tool for designing code design. If a comment is too long for an interface, then the interface is too complex and it is better to come up with a simpler version. Early commenting allows for good design and abstraction before the code is written.

Proper naming makes errors easier to find, reduces complexity, and reduces the need for comments. The name should not be too generic, such as count. If it is difficult to find a full name, then this is a sign that something is wrong. Probably the variable has too many assignments. It is better to break it down into several appointments. Such a name must be used in other places with the same purpose, and no other name should be used for the same purpose.

Code consistency means similar things are done in a similar way and dissimilar things are done in a different way. Consistency can manifest itself in naming, code style, interface and patterns. It gives a quick understanding of how the code works Reduces errors. If similar places are made differently, then it is easier for the developer to make a mistake.

Consistency can easily be broken by new people on the team, because they are not familiar with all the agreements. This can be avoided by using documentation, linters and other tools that do not allow pushing code that does not meet accepted standards. When changing the code, look at how it is done now.

There is no need to change existing agreements the value of consistency may be higher than the improvements that are proposed to be introduced. Before introducing inconsistency, answer two questions: Does the old approach not achieve the desired result? The new approach is so much better that it's worse to waste time supporting the old one and everyone on the team agrees? If the answer to any question is “yes”, then consistency can be violated.

You should be careful about using inheritance as it creates a dependency of the child class on the parent class. It's best to try to avoid it and use helpers and composition whenever possible. If inheritance is still used, then it is important to make them less dependent.

The code is constantly being improved and refactored. There is no better solution forever. The problem is that agile often forces you to resort to tactical programming, requiring you to focus on features rather than abstractions.

Unlike integration tests, unit tests are the responsibility of developers. Integration tests are best left to a separate QA team. Unit tests are good because they allow you not to be afraid to refactor the code if they have good coverage.

The problem with TDD is that it forces you to focus on finding a way to implement it rather than finding the best abstraction.

It is best suited for fixing bugs. First, a test for a bug is written. We are convinced that the test does not pass, and then it is repaired.

The main problem with patterns is that they are used when it is better to get by with a simpler solution. They are good because they allow you to maintain consistency. Getters and setters are best avoided because they make access, even to private properties, public. And public methods complicate the interface.

7 Professional competencies of a VR/AR developer

A VR/AR developer is a programmer who develops virtual and augmented reality applications. VR involves complete immersion in the created world. A headset in the form of glasses and a helmet creates an imitation of reality. AR/VR developers are directly involved in product development. Their task is not just to write a piece of code according to the technical specification, but to participate and influence the functionality and development of the product. It is writing clean and understandable code in a given time frame. Maintaining supporting documentation in basic English. Define and develop concepts, mechanics, create scenes, objects and environments.

Form requirements for sound accompaniment Prototype interfaces. Interact to work out requirements, accept the results of work with artists, designers and programmers on outsourcing or freelance. They are engaged in finding and providing references for models and layouts.

The requirements for VR/AR developers include the development of AR and VR products for IOS and Android on Unity. It is working with 3D, textures and shaders. It is application of facetracking technology. It is development of VR/AR games and virtual tours. It is writing code in C#. It is animation programming, particle physics. It is Ability to write native applications for iOS and Android. It is Creation of projects for popular models of VR glasses.

New technologies such as virtual reality (VR) are increasingly being used in various fields: entertainment, medicine, teaching and education, rehabilitation, architecture and engineering. In healthcare research, virtual reality terminology has been used interchangeably to describe a range of displays and environments, such as screen projections.

Virtual reality systems are generally classified as less immersive, which show a 3D environment on a desktop or tablet with limited interactivity; moderately immersive, which are projected onto a screen or are interactive with body cameras, such as the Xbox Kinect; and very immersive, such as the CAVE projection system and head-up display (HMD).

Commercially available I VRs cover a wide range, varying in cost, types of features offered, and possible configurations. These are high-performance PC-based I VRs such as the HTC Vive, Oculus Rift, and Sony PlayStation VR, which are highly immersive systems with a wide field of view. Other options, such as the Samsung Gear and Google Cardboard HMD, are more affordable and work with mobile devices. By comparison, HMDs now offer affordability, a wider field of view, and better tracking at a lower cost than their predecessors. This diversity in both end-user capabilities and available I VR technology not only offers many design options, but also poses a number of challenges.

The I VR community has begun to explore how design choices in I VR systems affect the experience of vulnerable users, including older adults. I VR applications provide a fully immersive user experience with compelling levels of presence through a wider field of view and efficient tracking capabilities that provide an immersive experience. The novelty or ignorance of new technologies can also undermine the value they can bring to users who may be opposed to the technology. To exploit the potential benefits, I VR designers must minimize the challenges and offer features that are well suited to the needs and desires of users. Design approaches such as human-centered design, collaborative design allow for the active use of unique experiences. The visual design of I VR covers several software elements such as terrain, buildings, virtual objects, and avatars (characters).

Design strategies aim to grab the attention of users and create a sense of I VR value through connected or playful challenges. A human-centered design approach is adopted, during which the needs and requirements of users are determined. The gap between all-in-one headsets and wired headsets is gradually closing as new generation devices are commercialized.

Found that cultivating familiar narratives in software and experience with configuration and hardware during interaction provides better contact through alignment with their mental models. Virtual environments may feel more familiar, despite the novelty of the experience, if they run previously known scenes. It is using a new I VR environment while maintaining a familiar experience requires thoughtful and balanced design strategies. The choices made regarding I VR configuration, software and hardware have ethical implications.

There is a lot of information about user transitions from the real world to the virtual world, internal transitions in I VR, or the final transition from the virtual to the real world, which is important because users immersed in I VR experience less of the real world in their interaction. A smooth transition from one virtual scene is considered important. to another. The transition to the real world includes both the mental and physical awareness of going beyond I VR. It is proposed to design virtual worlds with a sense of realism that ensures a smooth transition in and out of the virtual world.

Active participation in I VR offers an interactive experience and provides a higher sense of participation and presence, which can lead to a more engaging experience. Active exploration of the environment and structure of an object can increase recognition over passive observation. In healthcare, the active use of I VR has proven to be particularly effective and quite distracting in the treatment of pain. The latest tracking technologies and improvements in I VR graphics provide an immersive experience, but may present several physical and psychological risks.

8 Philosophy of immersive technologies

Immersive technologies create unique experiences by merging the physical world with digital or simulated reality. Augmented Reality (AR) and Virtual Reality (VR) are two main types of immersive technologies. These technologies have a lot in common. AR blends computer-generated information with the user's real environment, while VR uses computer-generated information to provide a fully immersive experience.

AR uses processors, display, sensors, and input devices to create experiences. There are four types of marker-based AR.AR uses a visual marker, such as a QR code, to produce a result.

Market AR uses a GPS or digital compass, speed meter or accelerometer to provide data. Google Maps Live View uses market augmented reality to navigate users to their destination.

Projection-based AR projects artificial light onto surfaces. For example, researchers at the Digital Nature Group have used lasers, mirrors, and cameras to create a hologram-like experience that the user can feel.

An overlay partially or completely replaces the original view of an object with a new view. IKEA allows users to view the furniture in their home on their smartphone, while GOAT allows users to use their smartphone to put the latest running shoes on their feet.

VR systems use head-mounted displays and input devices to provide an immersive experience. Head-mounted displays cover the user's field of view to display computer content. Input devices such as joysticks, tracking balls, controller balls, and data transfer gloves allow the user to interact with the virtual environment. As with AR, there are different types of VR for different use cases: In non-immersive virtual reality, only a subset of the user's senses are stimulated, allowing the user to remain aware of the physical environment outside of virtual reality. For example, the HP Reverb Pro headset allows designers to create 3D models.

Semi-immersive VR uses more senses than non-immersive VR, but still doesn't use all of the senses. For example, flight simulation allows pilots to learn how to fly a variety of aircraft through realistic displays that simulate different flight experiences.

Immersive virtual reality stimulates all the user's senses. For example, Infinadeck has created a multi-channel treadmill that allows users to move around in a virtual environment.

Immersive technology for entertainment purposes came to the fore with the invention of Sensorama. This cinematic experience, designed by Morton Heilig placed the viewer in a "sensory" theater that included speakers, fans, scent generators, and a vibrating chair to immerse the viewer in the film.

The Sword of Damocles was the first VR head-mounted display connected to a computer. Sega introduced the Sega VR headset at the Consumer Electronics Show for arcade and home use. However, due to technical difficulties, only the arcade version was released.

In 1992, Louis Rosenberg created Virtual Fixtures, the first fully immersive augmented reality system for the US Air Force. The invention used two robot controls in an exoskeleton to improve operator productivity when performing manual tasks in remote environments.

In 1999 H. Kato developed ARToolKit, an open source library for developing augmented reality applications. This allowed developers to start experimenting with augmented reality technology and release applications integrated with augmented reality.

Most of the investment in immersive technology comes from the gaming industry. Since the Oculus Rift, many game companies have created VR games. Companies are using virtual reality to train employees, increase creativity in product development, and collaborate with colleagues across offices. In marketing, companies are introducing virtual reality so that the consumer can interact with products without having them in their hands. The defense industry is also working on the introduction of immersive technologies. Virtual reality is being used to train soldiers in a virtual environment that mimics real-world encounters, while augmented reality is being used on the battlefield, as well as for mapping and communication.

9 Immersive Design

Immersive design describes design work that varies in levels of interaction and allows users to fully immerse themselves in the process. To analyze possible options for implementing virtual interface systems, we introduce the concept of a human-machine interface environment. It is generated by technical-technological and engineering-psychological solutions, in their dynamic unity and integrity with the psycho-physiological system of the operator, the reality and the factors that provide it, allowing the operator to gain and implement experience for effective professional activity.

It is necessary to distinguish interface tools as a set of technical, technological and software and hardware solutions from the environment generated by these tools. In the first case, we can talk about the technical implementation of the interface. This is a technical design task. It is solved by engineering methods and will not be considered further by us. In the second case, we are talking about a perceptual copy of the artificial world, displayed in the subjective sphere of a person in the form of reality. The content of this world determines the effectiveness of the operator's activity and is created by methods of engineering and psychological design. A person does not see the work of a modeling computer and does not feel its presence.

In immersive interface systems with identical display, the generated virtual environment exactly repeats the evolution and content of the real environment, and the virtual copy of the managed object duplicates the observed behavior of the real managed object that obeys the operator's commands.

An example of systems of this class are remote control systems. They allow you to remove the operator from the hazardous working area (work with radioactive and explosive substances, aggressive environments, participation in hostilities). Exclude the effect on the operator of extreme physical factors (overloads, weightlessness, low and high pressure of the environment, gas pollution, shock wave impact). Avoid a long period of delivery of the operator to the place of activity (interplanetary flights).

The main engineering and psychological problems arise when designing the elements of the environment of the interactive component of the virtual interface and the internal out-of-machine form of controls. Typically, virtual controls are designed by analogy, repeating design ideas that have been tested on physical systems. However, this is far from the best way to model when creating a connection between an operator and a controlled environment, since the existing controls are far from perfect and are, to a certain extent, atavism.

Significant restrictions on the design of controls and indications in traditional design are imposed by the laws of the physical world. They require certain object properties from the created structure, such as weight, strength, dimensions, and others. Naturally, in the virtual world, the "laws" of nature can be completely different, and the properties of virtual controls are limited only by the imagination of designers.

So, for example, it is possible to postulate in the scenario of the environment that the controls and indication of weight, and they will be able to hang in the air of virtual reality in front of the operator or freeze at convenient points in space. You can use changing the transparency of objects to access nested information. Similar reasoning can be carried out with respect to the operator’s virtual point of view, the position of which can be freely changed in the virtual space, giving the operator’s organs of vision the properties of “hypervision” - the ability to observe the visual scene from several angles -

When preparing operators, it seems useful to use the procedure of fitting a virtual working environment to a specific student, embedding in the environment. It is technologically easy to implement the training procedure based on the repetition of previously recorded working situations.

Immersive interface systems for tracking in non-optical bands are a variant of identity display systems. They use data on the position of markers of telemetry systems located on the controlled object as a source of information about the object of observation. The control object is not directly observed by the operator. The problem is the selection and generation of background and object parameters in a virtual scene, which can be implemented as a synchronized background (created in real time using information from the natural environment), or in a fixed, using an abstract, not related to the natural environment, form. Examples include thermal imagers and night vision devices.

Systems that filter the display in the generated environment repeat only the elements of the real environment that are important for performing the professional task, the objects are controlled synchronously. This class of systems makes it possible to free the operator from the need to perceive information that is redundant, unnecessary and harmful to the performance of professional activities, which can be used to solve the problems of tracking the evolution of an object against a complex masking background or control in conditions of strong visual and noise interference. The main problems that arise when integrating an operator into the working environment of these systems are related to determining the necessary content of the induced scene.

Systems that reconstruct the display in the generated environment create an object that has a different perceptual form than the real object of control (observation). They are synchronized with each other according to the main working features of a real object. A real physical object of a complex shape is replaced in a virtual environment by an analog with simple visual properties, which helps to provide optimal conditions for observation and work with it. One of the design problems is the selection of signs and type of reconstruction that are sufficient and conducive to the task.

Systems with a professionally oriented display fill the generated environment with additional content in relation to the real environment, which contributes to the fulfillment of a professional task. These can be reference materials and hints introduced into the content of the generated environment. It is useful to include additional modalities in the observed features of objects. Such as changing the color, shape and size of an object, its dynamic properties, changing the properties of the landscape, lighting, turning on hanging lists, icons. It is possible to introduce animated characters into the space of the virtual environment, carrying a different role and information load, helping the operator to make the right decision. Animated characters can be made in the form of personalities known to the operator with an imitation of their characteristic behavior.

The professionally oriented content of the environment can be formed not only in an autonomous form. It can use information obtained through communication and information channels. It is possible to use in the course of work in the generated environment various forms of transferring control to animated characters, reflecting the properties of certain automatic control systems. There are specific social relations between the operator and these characters. This can cause teamwork effects that contribute to the performance of real activities. In order to maintain the level of professional readiness, it is useful to introduce a personal teacher-mentor into the virtual vocational training environment, who performs the functions of reference assistance and analysis of the results of solving training problems.

The main problems associated with the creation of this type of interface lie in the field of forming a professionally oriented content of the virtual environment. This is the development of scenarios for the behavior of environmental objects and the interaction of the professional content of the environment with the operator. It is also important to assess the influence of the content of the environment on the operation of the interface system.

Interactive surveillance systems immerse the operator in a specially organized audiovisual virtual environment that integrates the observed objects and means of working with them in its space. An example of such an induced environment would be an airspace surveillance system. In it, the operator has the means to give the observed objects additional properties that improve the quality of their activities. The main problem in creating these systems is to determine the form and content of the interactive components of the environment and scenarios of activity in the environment. The main load falls on the design of the subject-spatial design of the environment. The task is partially solved by usability methods.

Systems with scaling and reconstruction of connected worlds make it possible to connect the operator's perceptual system with the macro- and micro-spaces in which his activity is carried out. These are virtual analogues of interactive microscopes and telescopes for remote operation in micro and macro scales. To work in the field of nanotechnology with objects of atomic size, it is necessary to place them in a virtual world in which it is possible to carry out adequate manipulations with these objects, taking into account the quantum effects that arise in the microworld.

Working with virtual macromodels on a macroscale leads to significant time delays in feedback, which requires the introduction of special measures into virtual models that enhance anticipation mechanisms.

The induced environment of systems with intelligent construction of the world is a completely artificial formation in the form of a three-dimensional reality, connected by transfer systems with the real world, from which the content is extracted in the process of analysis in accordance with the purpose of the system. Based on it, tools are created that construct the content of the environment. The operator through the interface, which can also be modified, works with the system within the framework of the current task. There are currently no practical implementations of systems of this class. But they potentially allow to give a new quality to the interaction of operators immersed in interconnected virtual worlds representing jointly functioning cells.

The methodology of ergonomic design of induced virtual environments is associated with the solution of a number of problems. This is an engineering-psychological analysis of the operator's activity in an induced environment. Development of a project of an induced environment in the form of a functional structural decomposition: the world, events, scenes, situations, objects, signs. It is Analysis of the influence of the operator's activity in the induced environment on the real environment. It is Determination of the content and type of connections between induced and real environments. It is Determination of the psychological content of the operator's activity, selection and evaluation of media options. It is Development of non-induced and induced scenarios and their synchronous development.

It is Determination of the subject-situational and educational content of the environment in accordance with the scenarios. It is Building a concept for creating a model of a real environment that describes a subset of its elements and their characteristics necessary to create an adequate (according to a given criterion) receptor copy of this environment. It is study of the phenomena of operator immersion in an induced virtual environment and some types of interaction with objects in an induced environment (in particular, visual and tactile). It is the study of the forms of virtual reality properties that maximally eliminate fragments of the subject's experience that hinder the effective inclusion of the operator in the immersive interface.

Virtual reality technologies make it possible to design interface systems that ensure the efficient functioning of a human operator with a high degree of automation of control processes. Induced environments can be used as learning environments by implementing learning scenarios. In this case, the state translator is disconnected from the real world and connected to the simulated world with the required educational content.

10 Transformation of tasks of the interface designer

The fundamental difference between classic media and VR technologies requires a complete overhaul of the interface block, which affects the tasks of the interface designer. Therefore, in order to understand how the role of the designer changes, you need to understand how the interface itself changes. The first thing to focus on is interaction. The control system in an immersive environment is direct. The user does not interact with the interactive environment through the prism of the screen, but directly affects the interactive objects. You need to directly approach the virtual table and pick up the object with your hand or the controller in your hand.

The control system is built around the user himself, his gross motor skills, fine motor skills, his movement in space, as well as processing the direction of gaze and voice recognition. The ways of interaction in the virtual space inherit approaches from the real world and must meet the expectations of the user in the simulated environment.

If a plausible virtual space is created, then the interface must be placed in a virtual environment and justified in it. To do this, you need to make the system menu exit simulation window so that it meets the requirements. Decades of experience of computer game developers played a constructive role.

In the field of game development, there is a division of interfaces into several types, based on how they relate to the game space and storytelling. Interfaces in the game can be divided into non-diegetic and diegetic. The theory of diegesis came from literature and cinema. Diegesis refers to everything that belongs to the world of the game and exists in it.

Non-diegetic interfaces are placed on the screen plane. Elements can inherit the style of the game environment, but they are detached from the space of the game, which is observed behind the screen.

Diegetic interfaces are located within the space of the game and are justified at the narrative level. They are supposed to exist in the game world. The point of dietetic interfaces is that they work for immersion. The player does not need to shift focus from the game world to separate panels and menus on the screen plane.

The task of the designer is not to design and draw the system menu, but to determine how the menu is represented in the virtual environment and how it is justified so as not to violate, but ideally maintain, the effect of immersion in the virtual space. The menu can be placed on the wrist of a virtual hand in the form of a smart watch. It can refer to a specific point in the scene. Projected onto the wall, holographic table, separate panels. The menu can be brought into space by the user's virtual companion.

The bottom line is that, unlike other areas where the designer initially works within a given screen, the range of possibilities in immersive environments becomes wide. Therefore, there may not be a ready-made solution; it is required not to choose from the existing list of approaches, but to create it. The key is to explore the possibilities of virtual space to create effective systems of interaction.

The designer must understand the practices of integrating the interface into a three-dimensional environment and substantiating it in it. It is necessary to understand the specifics of systems of direct interaction with the interactive environment. Particular aspects of what 3D artists, game designers, level designers used to do now become part of the tasks of the interface designer. The designer must understand how, through the architecture of the location with which the interface is associated, it is possible to control the focus of the user's attention.

He should have skills in prototyping 3D environments. Because, in order to test any hypothesis, you need to be inside the simulation from the user's point of view and see how the created virtual reality is perceived. Knowledge of 3D editors allows you to visualize concepts. You need to prototype interactive. Basic knowledge of game engines can help with this. There are solutions that allow you to prototype directly in VR. This is when a virtual simulation prototype is created inside a virtual simulation.

If in virtual reality there is a complete overlap of the real world, then in AR the digital layer is superimposed on reality. At the same time, the elements of the digital layer are also located in space. This is especially true for transitional states, when the transition is made from the real world to VR, and from VR to the interaction format in mixed reality. Study the practices of computer game developers, 3D modeling editors, as well as get acquainted with the experience from the field of VR / AR development.

11 Methodology of Immersive Design

Immersive design is based on total immersion in the product. When the interface does not end on the device screen, but goes beyond. Going beyond the display of the gadget involves the use of useful control tools that create the effect of complete immersion. These are voice control, augmented and virtual reality. A new approach to design requires maximum involvement from developers. They must not only understand the essence of the product, but also design additional ways to interact with the interface. For such tasks, standard tools are not enough. It is necessary to involve motion graphics specialists in the work.

The concept of "immersive design" appeared in 2007. It was invented by British designer Alex McDowell.

Immersive design has two important tasks. The first is to create a digital world that doesn't end with just a smartphone or tablet. The product goes beyond the display and continues into the real world. To do this, it is not necessary to design a large-scale AR tool. Enough micro-interactions. The second task involves linking the interface and additional elements to create an ideal product for specific tasks. Augmented reality will not be useful if it is designed without taking into account the specifics of the project. The project must be holistic, otherwise it will only bring a negative user experience.

The designer must expand the boundaries of his knowledge so that each new project is more progressive than the previous one. But there is a problem in the form of a lack of a theoretical basis. So far, there are no systematic guidelines for getting answers to all questions. Creating and promoting digital products is difficult. Especially in a highly competitive environment. In popular niches, companies constantly compete with each other to meet the needs of the audience and beat rivals. This also shows up in the real world.

Projects created in the style of immersive design have an important property of interactivity. VR technologies allow you to turn the standard interaction into an exciting game. This creates a strong connection between the target audience and the product. It is one thing when an application simply performs certain tasks, and quite another when the interaction goes beyond the familiar environment. AR technologies are actively developing, so the tools do not work so perfectly. So far, the audience is ready for the fact that interaction with a product of this format may not develop according to the scenario. Once immersive design becomes commonplace, the barrier to entry will increase dramatically. Improved interaction implies a non-standard approach to the design of digital products. When users have the opportunity to use technologies that previously existed only in films.

Immersive design involves the use of non-standard management tools. One of the most popular is voice control. It is effective when working with voice assistants. Siri, Alice, and Alexa help you check the weather, exchange rates, and other tasks every day. Voice control saves time, but is not suitable for all projects. It is not worth using a new technology just because of its popularity. Users will quickly become disillusioned with the product and the company. Improved interaction should be such that users have only positive emotions. One of the main problems of most applications is the lack of a clear learning mechanism. Users have to spend a lot of time to master the basic features and work with them automatically.

Immersive design is one of the promising areas that may become part of the everyday tools of designers in the near future. So far, it is available only to large companies. Immersive design draws a clear line between interface and content. The traditional approach to digital product design puts information first, while the out-of-the-box approach puts tools first.

Immersive design products such as voice control or augmented reality provide an immersive experience. Getting to know the new interface is faster than usual thanks to interactivity. A non-standard approach to interface design shows standard qualities on the other hand.

There is a downside. The application of new technologies is associated with tests and experiments. The release may be delayed for a long time due to the correction of numerous shortcomings. Designers will need to design not only the interface, but also the elements that extend beyond the screens. AR technologies are in the development stage. There are few good specialists, and the cost of their services is very high. You will not be able to peep non-standard solutions from competitors. We need a deep analysis of the needs of the audience and the design of a digital product at all levels of interaction.

12 Digital architectural Design

Virtual architecture appears as an interactive media architecture of interactions between external and internal spaces. Virtual architecture creates a living interaction between indoor and outdoor spaces. Three-dimensional display computer technologies have long been used in architecture.

Light in architecture is an irreplaceable shaping factor. Glass is a conductor of light and is therefore of great functional importance in architecture. Virtual architecture can be organized in various form-building techniques. There are many visual techniques. The dismemberment and deepening of space can occur due to the repeated repetition of elements in a certain mathematical dependence, in a fractal way.

The architecture of the metaverse serves commercial purposes, while continuing to be supported by the relationship between the client and the architect. The created 3D design and architecture studio helps users of the virtual world of the Decentralandblockchain to develop their property in the metaverse. The virtual gallery, based on Massively Multiplayer Online Game technologies, features designs focused on user interaction.

Virtual meeting rooms have become ubiquitous since the start of the pandemic, but the possibilities of new virtual workspaces have attracted not only software companies, but also established architecture firms. Architects are tasked with designing master plans and architectural spaces in the metaverse, giving rise to an entirely new area of expertise.

The platform offers users who buy a piece of land in the metaverse the opportunity to create their own sub-version and use it as a virtual headquarters, educational space, or entertainment space. The metaverse is usually understood as a virtual space based on the physical universe, which allows you to do everything that is in life plus what is possible only in virtual reality, for example, instantaneous movement to any point in space.

To enjoy virtual reality devices, the virtual reality itself must be of very high quality. An important role is played by game engines and tools and technologies for working with graphics. These are tools for 3D object scanning and motion capture. We need custom 3D editors to create content right inside the metaverse. Platforms are needed interfaces for content providers to watch movies in a virtual cinema or for virtual store owners to quickly add new products to their windows. NFT or non-fungible tokens will be a tool to prove the ownership of something, as well as to make money on creating something, to exchange values. Blockchain and smart contracts act as a guarantee that each operation is legitimate and will not be changed or deleted.

The basis for the metaverse is the network and hardware infrastructure. The virtual space must be available at any time, with no limit on the number of users. All events should be synchronized for everyone and at the same time everything should work as quickly as possible. This is a decentralized network model. In the metaverse, artificial intelligence is needed almost everywhere, starting from the design and development stages: automatic generation of virtual objects. It is followed by voice command recognition and speech generation, tracking of the position of hands and body in space, biometric identification of the helmet user, and code generation.

The Metaverse should be a single space for various games, online banks, cinemas and other platforms, venues and systems from various manufacturers. A virtual world designer or VR architect creates a fictional reality. It constructs a 3D environment that the user is immersed in using immersive headsets, VR glasses, and simulations. The designer needs to take into account the natural laws of the virtual environment, the possibilities of interaction with objects and characters, as well as the plot of the VR product. Based on them, he creates architecture, landscape and all the details of the new world, including thinking through the smells and tactile sensations of the user.

A specialist in virtual worlds is like an interior designer who fills real spaces. A specialist in virtual worlds fills fictional spaces. The interior designer is involved in the procurement of materials and items and oversees the renovation process. The VR architect himself creates 3D models of objects, tests the world and makes sure that all its parts interact correctly with the user.

You need design skills and the ability to work with 3D modeling programs in order to construct high-quality virtual worlds. You need an understanding of the basics of design and sound design in order to create an atmosphere that meets the goals of a VR product. You also need knowledge of psychology, which will help you figure out how different actions and events in virtual reality will affect the user. You need the ability to use a virtual machine.

A virtual machine has its own operating system, storage, networks, and configuration settings. It is completely isolated from other virtual machines running on the same host. Virtualization consolidates numerous small workloads on a single physical machine, providing high efficiency. Deploying a new virtual machine with an operating system and applications makes it easier for administrators to deploy proof-of-concept studies and environments before changing production environments.

Virtual machines can also simplify asset management by consolidating virtual machines on fewer physical servers. Managing virtual machines can also save a company time by reducing the amount of hardware to maintain, provisioning faster, and reducing downtime. You can reduce the space required to deploy servers. As a result, energy consumption will be reduced. Such solutions are more environmentally friendly.

Virtual machines allow you to continue using legacy applications at minimal cost without porting them to new operating systems. When hardware wears out and becomes obsolete, virtualization helps to solve two problems at once: to update the hardware, but at the same time retain access to earlier operating systems. The best virtual machines are highly portable. They can be moved between physical computers on the network, and between different locations and cloud environments. Running multiple virtual machines on the same host can optimize the use of system resources.

Virtualization allows you to run several virtual machines on one computer (host), each of which will use its own operating system, processor cores, memory, storage and network technologies. If we define virtualization as the ability to run multiple operating systems on a single computer, then the most important component of the virtualization stack is the hypervisor, which combines the virtual machine and the computer. The hypervisor fixes the layer of software that allows virtual machines to run on a computer and allocates processors, memory, and storage to the virtual machines.

The hypervisor can be called a virtual machine monitor: it creates a virtual platform on which various virtual machines run and are managed. This allows multiple operating systems to share hardware. Software and hardware vendors have begun to address some of these challenges by re-architecting traditional data centers through virtualization. Hardware virtualization performs hardware virtualization, including computer versions and operating systems, creating a single virtual consolidated primary server. Software virtualization creates a computer system, including hardware, that allows one or more guest operating systems to run on a physical host computer. Storage virtualization virtualizes storage by consolidating multiple physical storage systems that appear as a single storage to improve performance and speed.

Network virtualization provides an application-based, cloud-based virtual network that is not tied to a physical network infrastructure across a distributed set of systems. Network virtualization distributes bandwidth across channels, providing resources to servers and devices in real time. Desktop virtualization separates the desktop environment from the physical device and stores the desktop on a remote server so it can be accessed from anywhere on any device.

It is easy to confuse virtualization with the cloud, mainly because both are about creating a functional environment from resources on the network. Virtualization allows you to run multiple virtual machines on a single physical device. The hardware runs the software, allowing you to install multiple operating systems that can run simultaneously and independently in a secure environment with minimal performance degradation.

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Clouds represent environments that abstract, aggregate, and share scalable resources across a network. Virtualization is the main software for cloud computing. Containers and virtual machines are used to create isolated virtual environments for software testing and development. If a virtual machine needs a host to run a full-fledged operating system, then the container is an isolated data bunker in which the application runs on the host. Containers run applications that are independent of the operating system. Containers isolate an application by virtualizing it.

Containers do not contain operating systems, so they take up little space. Although containers can be moved, it must be done with the operating system in mind. The choice between a container and a virtual machine depends on how the virtual environment will be used. In addition to production design, the design manager also deals with many other issues - for example, the design of boxes at fairs and sales areas, as well as for resellers. In a manufacturing enterprise, developing a new product is a measured process. Necessity is determined by destination country, sales statistics, interior architecture and design trends, and dominant technology.

It is important to keep an eye on what is happening in the industry, as well as in design and architecture. Production design is a team effort. The product development team begins and ends its work at the weekly product development meeting. Strategic plans are discussed once a year.

The head of design recognizes the designer whose handwriting and creativity fit with the brand. The technologist and designers work together under the supervision of the design manager.

13 Brutal web Design

Brutalism is the most attractive and the least defined. Plenty of big brands have embraced the "brutal" aesthetic online. There are even catalogs for those who want to take a look at their selection. This style is so good that it has surely become mainstream.

Brutal web design for some means practicality, for others it means courage. Much like the architecture from which it takes its name, brutalism in design is two competing philosophies in one.

Brutalism is a style of architecture that emerged after World War II and reached its peak in the 1950s and 60s. Advocating simple geometric designs and exposed building materials, this trend was largely a reaction against the ornate, overly complicated designs of previous decades.

The name comes from béton brut, which is French for raw or rough concrete. Concrete is a common material for brutalist structures. It's perfect for a no-frills style. Other materials are also used, but concrete is the most common choice. Whatever buildings are made of, decorations are considered unnecessary. Enough shape and materials.

RaynerBenham in 1955 wrote an essay "On the New Brutalism". Brutalist buildings don't care about traditional beauty standards. Some of them emphasize a solid, utilitarian character, while others condemn ugliness, impersonality and cruelty. Brutalism in architecture exalts rudeness. Brutalist architecture not only reduces the design to the basic building materials, but also finds beauty in such simplicity. Its goal is rudeness, and the result is perceived as brutal.

Brutalism has found new life on the internet. Websites have become brutalistic. Brutalism has grown and embraced many styles. The first type of brutalist web design has much more in common with its architectural predecessors. The source materials of the sites are very similar. They don't look the same. They are formed around content and purpose. No need to guess how the site works, because everything is in front of your eyes. A similar design is used by trading platforms, forums, encyclopedias.

Brutalism in architecture is characterized by an indifference to aesthetics rather than a deliberate violation of it. When applied to web design, this style is often combined with intentional violation of design guidelines. The rise of brutalist design is about brutality, not brutality. This is a world bordering on anarchy. Design conventions are perverted. Usability is the last thing to think about. Brutalism in web design can be defined as freestyle, ugly, irreverent, rude, and superficially decorative.

Purists cite the architectural characteristics of web brutalism, such as the concept of "Truth to materials" and the use of the simplest markup elements available. UX minimalists consider efficiency and performance to be the main driving force behind web brutalism and even believe that drastically limiting features can increase conversions. The "anti-ists" or artists see web design as an underappreciated art form and don't show much respect for the status quo and mostly write negative reviews.

If the website is owned by an artist, then it's more likely to be something brash than something indifferent. It is closer to Dadaism, with its absurdity, fun and disorder, or the avant-garde desire for expressionism.

The Dada type of brutal web design is looking for expansion. It starts with expanding vocabulary. Since 2018, a language has been used to recognize facial movement and emotions, such as opening the mouth or raising the eyebrows, to control augmented reality masks. Other approaches rely on mouse interaction, while ambitious solutions rely on voice commands to interact with the world inside the screen.

14 Philosophy of immersive Design

The design experiments with the environment to find an adequate concept for a virtual experience and immersive world navigation. Immersive design raises questions about the separation between content and user experience and completely redefines the process of creating digital products.

The image of AR and VR installations and applications as marketing tools serves as a marker of technological innovation and is used by art institutions to attract new audiences. Space organization strategies reshape the relationship between different agents and their constellations. Interactivity does not always imply anthropocentricity. On the contrary, it provides an opportunity for horizontal connections between non-human and human participants. In such cases, interactivity and immersion are in synergy.

This is an occasion to reflect on how the interface redefines cognitive categories, levels of involvement, and ways of knowing and feeling. Immersive environments denote technologies aimed at creating the illusion of immersing the viewer inside an artistic scene (picture). This is an attempt to create a single seamless space of some event with the help of technical means. This is how the pulling inward is done. The system is initially designed with the user's activity in mind, provoking changes and responses from the system. The degree and nature of this interaction can vary significantly. Interactivity for the user comes down to pressing the start button or activating some triggers, the mechanism of which the user is not necessarily aware of. The main interest for analysis is the design of such systems.

Immersive technologies are characterized by the desire to capture and enhance the sensual. At the same time, machine sensibility raises not only the question of cognition and perception, but also the reconceptualization of the spatial and its boundaries. Immersive and interactive environments can be described in terms of two polar vectors. One is aimed, if not at cyborgization, at least at expanding human sensory experience. The second gets rid of anthropocentrism and is aimed at modeling autopoietic systems, studying machine sensibility. Disputes about the position of man in the modern world find their material embodiment thanks to new technologies.

Early experiments with interactive media are, of course, connected with the craze for cybernetics in the 1970s. Students from different faculties worked together on experiments, combining architecture and cybernetics. Nicholas Negroponte has worked extensively on the introduction of computer technology into the design of buildings and the urban environment. The result was the book "Machine Architecture" (Architecture Machine) and the collection "Reflections on the use of computer technology in architecture and design" (Reflections to Computer Aids to Design and Architecture).

The architecture must be participatory. It should free the resident from the patronage of the architect and give the non-expert resident the ability to create their own designs and customize the environment to suit their needs. Such a task should obviously be served by the interface of a computerized home. In "Machine Architecture" N. Negroponte voices his engineering fantasy about a network that directly exchanges information and interacts with each other at home devices.

In the ideal architectural planning model, technology is centered around the user, who is both creator and consumer. This model has become a technological mainstream.

In Price's model, combinations of location of residential units depend on user agency, but the relationship is not linear. It is difficult to predict which interactions in this system (between guests, between the user and the machine, or between parts of the system itself) will be decisive in the next space layout. This share of randomness and unpredictability was fundamental for Price.

The ideas turned out to be in tune with the projects of such architects as Lars Spuybroek, Greg Lynn, the duo of Diller and Scofido (Diller + Scofido). In their developments, the architecture is plastic and programmable. Often these are designs that are originally products of collaboration between the engineer and the computer environment. Sometimes, it is architecture that is directly related to changes in the environment itself. In such a layout, it would be incorrect to reduce everything to a binary scheme of relations between the user and the building/environment, between the subject and the machine. It is about creating certain conditions for the construction and reading the changes in the environment when the construction is ready.

Philosophers Brian Massumi and Manuel De Landa are big fans of generative architecture. Anthropologist Tim Ingold thinks about architecture in a similar vein.

The first building was built in which visitors could control the interior. Thanks to the built-in sensors, you can adjust the levels of sound and lighting in the room, as well as control video projections. The shape of the building is based on the principle of continual architecture. The floor, walls and ceiling flow smoothly into each other, forming an integral structure. In L. Spibrock's projects, a computer is used at all stages of work: at the design stage, and at the construction stage, and at the stage of building maintenance. The software provides the user-visitor with the means to partially control the space.

The architectural duo Diller and Scofido (Diller + Scofido) created The Blur Building as part of the Swiss Expo 2002. It was a computer-controlled artificial cloud generated by 31,400 water-steam jets. The parameters of the cloud changed depending on the indicators of humidity, air temperature, wind speed and direction.

Modern architects like Greg Lynn, instead of starting design from a combination of basic geometric shapes and starting from the idea of some given ideal shape, use special effects software, where programming begins with the environment and the forces that act on objects. Conditions for potential interaction between objects are created. When the program starts running, the objects come into interaction and are transformed. This means that the resulting shape cannot be known in advance.

Philosopher Manuel DeLanda argues in favor of "software" architecture. He says that in the transcendental picture of the world, the form is produced from the outside. She has a creator. This is a picture of divine creation. It is assigned to an inert material. The designer does not invent the form. He helps her to be born from morphogenetically pregnant materiality. People and materials become partners in the process of creating a form. DeLanda connects this way of creating forms with topological thinking, aimed at optimizing one or another characteristic through which the relationships between parts of the system are described.

Interactivity should be seen as the openness of a system to connect new actors or to new interactions between participants. Ecology in this case means a way of self-organization and interactivity. Interactivity is characterized by the ability of an event to generate new events and relationships. He considers ecology not only as a set of existing actions and relationships, but also as a starting point for the deployment of new ones.

The classification of strategies for interactive projects is presented by RyszardKluszczynski in the article "Strategies of Interactive Art" (Strategies of Interactive Art). According to R. Klushchinski, in each work one of the elements around which the project unfolds can be distinguished: this is the interface, interactions, data, data organization (hypertext, cybertext), software / hardware, relations between participants and performance / staging. The classification is based on the principles of organization and hierarchy of the listed elements.

The interface predetermines the order in which the viewer interacts with the system and influences the final result of this interaction. The strategy of the game draws the attention of the spectator-participant not only to the actions that they must perform, but also to how the interaction takes place, what elements are included in it, what tasks are set. In the strategy of the archive, the main role is given to information. Interaction is designed for interaction with data, wandering through a virtual file cabinet.

The basis of the strategy of the labyrinth is formed by hypertext. No background knowledge is provided to the viewer, and the structure of the archive does not affect how the viewer is likely to explore the data. Everything is built on blocks of text that contain links to other blocks of text. The rhizome strategy indicates that the cybernetic text potentially expands to infinity. It has a more open architecture, creating opportunities for building new paths and categories. The strategy assumes multidirectionality and some unpredictability of archive development.

In the strategy of the system, all information and all actions are accumulated within a multi-component closed system. The viewer can get in touch with her and observe what is happening. But its presence for the system is not decisive. The system lives by its own principles and laws. The network system creates, shapes and organizes relationships that unite the participants of an artistic event. The creation of a network of relationships becomes the main task of experience. At the center of the spectacle's strategy is the event itself, which takes the form of a performance. Participants are limited in their influence on the process. They rather take the position of an observer. There is a pretty tough scenario.

15 Setting

A realistic depiction in a virtual environment encourages reflection on the relationship between the subject and the simulation.

Oliver Grau's book Virtual Art: from Illusion to Immersion opens with a description of the Villa of the Mysteries in Pompeii. The author analyzes the visual characteristics of space. The murals in the room can be seen as an interface. As Marcel Mauss has shown in An Outline of the General Theory of Magic, no ritual is complete without careful preparation, including the place intended for the ritual and the intermediary, which was usually the priest.

The specificity of the room is to prepare the viewer-participant of the ritual for action, to create a space that acts as a buffer between everyday life and the sacred world. This is a space of exceptional experience, filled with life and meaning only at the time specially allotted for this. The ritual always has a well-defined structure: the beginning, the main part and the end. It is a world that does not exist without a witness. This space of episodic sacred experience exists to maintain the existing status of the society to which the ritual participants belong. This is a space of exclusion, working to consolidate the tradition.

With the secularization of society, the functions of the panorama also changed. The circular panorama, invented in the 18th century, was a useful tool for militaristic deployments and planning operations. She contributed to the ideological impact on the viewer, presenting selected scenes from the history of military glory.

Panoramas have become one of the popular entertainments of the bourgeoisie. The world's first stationary circular panorama was opened on May 14, 1793 in Leicester Square in London. The London Panorama traveled to different cities and countries for seven years. The landscapes shown in the panoramas did not claim to reflect reality. They represented a collective image, an artistic generalization of a certain place, taken out of connection with time. The era of tourism was just beginning. She found her true ally in the panorama.

If the first immersive environments, such as the Mystery Villas, were no more than mediators between different worlds and situations, then the first panoramas, capturing views of exotic colonial countries or battle scenes, already created a symbolic link between observation and possession, vision and conquest.

Only in the 1970s, with the development of cybernetics, it became possible to animate a panorama that had previously been in a static state. If earlier immersiveness marked the space of timelessness, forever frozen moment, now it acquired its own ontogenetic history. The interface based on interactivity contributed to the reduction of all user interactions with the machine to the binary logic of activity / inactivity. The main trigger in this game was vision. The mechanics of the interface are mainly focused on it. Interface logic encourages the user to react quickly and act on inertia.

With poor VR experience design, users can also experience disorientation, which inevitably leads to motion sickness. Seeing the ground and the horizon is just as important in VR as it is in the real world.

The atmospheric (aerial) perspective can help users understand the scale of the virtual environment, which adds to the realism. The gradual fading of the landscape is necessary in order to give the user an idea of depth and distance.

Some scientists see the technical side in the design issue (D Murphy, Berdnikov A.V., Golubovich S.V., Kislov S.A.), others see the content side of the process (A. Maslow, McCleland, McGregor, F. Herzberg, Alderfer). At the same time, all the founders of different trends do not exclude the possibility of using multimedia design in the system of design methodology. The technical side should not cause undeniable difficulties in creating a virtual resource.

The methodology of multimedia design activities includes the definition of the specifics of the main design categories (image, function, morphology), analysis of the features of the design process (formation, development and implementation of the design concept), consideration of the operational part (means and techniques).

The function of the multimedia design object affects the image and is implemented through the form. The specificity of the design and artistic image category in multimedia design is due to the characteristics of the computer virtual environment. All the artistic features of computer virtual reality are inherent in each of the considered multimedia systems to one degree or another. What they have in common is that the main, environment-forming center of the developed project situation is a person and his inner world. The figurative and semantic core of the design object is determined by the structural relationship of the content-thematic context, the designer's idea and the customer's reflection.

The interactivity, flexibility and transformability of virtual environments allows them to respond to changes in user requests and interests. The priority is not a fixed result, but a dynamically changing situation. This condition determines the fundamental immanent incompleteness of the artistic object of the virtual world. The virtual environment forms the image as the basis of the communicative process, as an attitude determined by the artistic attitude of the author and the creative activity of the recipient, reflecting his worldview. In multimedia design as a complex creative activity, in which it is important not only what is developed, but also how it is done, the main characteristic of the design image is the emotionally and bodily experienced event vitality. This complicates the role of the designer.

The task of creative search for an image is combined with the task of leadership, organization, and direction of user activity. If, according to the traditional method, when creating an image, the designer solves the problem of scenario modeling, then in the multimedia environment, his work is supplemented by directing techniques. The figurative solution of a multimedia work is determined by its non-linear multivariant structure, controlled by interactive multimedia modes.

The object becomes an element of culture through form. This is the structure of the product, embodying the designer's intent, organized in accordance with its function, material and method of manufacture. Virtual reality is a place where both models of real objects are designed to test ideas that have not yet materialized and to obtain a holistic and visual representation of the projected future, as well as fundamentally new, multimedia forms.

In multimedia design, morphology refers to the set of sensory parameters of a system that are consistent with its functional characteristics. The formative structure of multimedia design objects suggests a system of polysensory perceptions and interpretations. It is not limited by physical space and material, defies classification, and has a heuristic focus.

Computer-generated multimedia design objects are mediamorphic. The term connecting the concepts of media - (eng. media - environment of existence) and morphism (from the Greek. morphe - form, appearance), was introduced to determine the general formal characteristics of objects of computer reality, the informational and aesthetic impact of which is determined by the specific polysensory expressiveness of the virtual environment. Mediamorphism opens up new possibilities for finding an artistic image, both for virtual environments and for objects of the material world.

Mediamorphism makes it possible to dynamically experience reality through sensory, which determines the relationship and a series of possible interactions of the subject with another subject and with the environment.

16 Mixed Reality Application Design

It is important for an application developer to understand where the range of possibilities lies in the early stages of development. This decision affects both the design of the application and the technology path for development. One of the most powerful ways that mixed reality can bring is by enabling developers to place digital information or content in the user's current environment. This approach is popular for applications where contextual placement of digital content in the physical world is paramount. Preserving the user's physical environment during interaction is key. Users can move between real digital tasks.

The mixed reality notepad style app allows users to create and post notes in their environment. The mixed reality app is placed in a convenient viewing location. A mixed reality cooking app is placed above the kitchen island to assist with food preparation. The hologram mimics a physical object, allowing the user to see it in a mixed reality format. Mixed reality notes hosted in the factory are used to provide the worker role with the required information. Mixed reality is being used as a way to search the office space. It is a mixed reality communications applications such as Skype are used.

Mixed environment applications can recognize and match the user's environment. They can create a digital layer that can be overlaid on user space. The thin layer respects the shape and boundaries of the user's environment. The application may choose to transform certain elements that are appropriate for the user's immersion in the application. This is called a mixed environment application. Unlike extended environment application, mixed environment applications can only care about the environment to better use its makeup to encourage specific user behavior, such as encouraging movement or exploration or replacing elements with changes (kitchen skin counter to show a different tile pattern). This type of experience can even turn an item into a completely different object, but still keep the object's rough dimensions as its base (a kitchen island transforms into a trash can for a crime thriller game).

It is a mixed reality interior design app that can paint walls, tables or floors in a variety of colors and patterns. The mixed reality app allows a car designer to layer on new design iterations for an upcoming car update on top of an existing car. The bed is covered and replaced with mixed reality fruits in a child's play. The hanging lantern is covered and replaced with a post sign. The app allows users to blast holes in real or immersive world walls that reveal a magical world

Immersive environment applications are centered an environment that completely changes the user's world and can place them in a different time and space. These environments can feel real, creating immersive and immersive experiences that are only limited by the app creator's imagination. Unlike mixed environment apps, an immersive environment app can completely ignore the user's current environment and replace the entire stock with one of its own.

These possibilities can separate time and space. The user can walk the streets of the city in an immersive experience while remaining relatively in the real world of space. The context of the real environment may not be important for an immersive environment application. An immersive app allows the user to view a space separate from own space. He can walk around the famous building, museum and popular city. An immersive app manages an event or scenario around the user.

17 Narrative Design

If there are multiple characters in the game, they should be important to the story and gameplay. It is necessary to give the opportunity to interact with the characters or control them so that they bring real benefits to the player and change the gameplay. If the player goes on a mission without someone from the team, in a particular area, he will lose part of the gameplay and story, since the special abilities and dialogues of the missing hero will not be available.

There is an opposite situation. The game has missions in which the player is accompanied by partners, but they do not affect the gameplay, although the developers could fit allies into the gameplay. For example, with an ally, the player could attack enemies head-on, and if they lost the ally earlier, they would have to hide and rely on cunning.

Getting the player to empathize with the characters on screen on a narrative level is not difficult. If you increase the value of the characters not only narratively, but also gameplay and give them the opportunity to influence the gameplay, this will increase the attachment to the heroes.

A hub is a location that the player can return to between missions. The hub can be a personal spaceship, where the player can take a break from the gameplay and talk to the characters. The player can listen to how partners pour out their souls or immediately go to the next task.

After each mission, the main character returns to his ship. He can roam the ship's corridors, examine found artifacts, and speak with companions to learn details of the world and history. The basis of the game world is created by an extensive zone where there are various activities. It is more difficult to keep the game pace and screenwriting with such a hub.

The hub can be designed as a grocery room, inside which there are dried berries, raisins and chocolate. It is difficult to understand in what sequence the player will eat and whether he will eat at all, because some ingredients may not be to his taste, and the player will go about his business. This is a problem with many open world games.

One of the most important steps in character creation is characterization. Based on the basic rules of the game universe, the developers determine the physiology, occupation, appearance, biography, elements of clothing and character traits of the hero. In the characterization phase, the character is built into the larger machine of the universe. The world cannot exist without characters, and characters cannot exist without the world. But not all games require characterization.

The structure of the hub is justified by the narrative. Developers complement the universe with a thematic layer, raise social problems. Intrigue awakens the protagonist from cryogenic sleep.

The protagonist is a blank slate to which the player chooses an origin, basic skills, and specialization. Need prologue character. Often in games there are situations when something needs to be done urgently, otherwise troubles cannot be avoided. Keeping the timer running throughout the game can have a negative impact on the gameplay and the players, as they would not feel comfortable during the game.

It is possible to completely disable the timer, but implement a notification element. Let the protagonist not die and the stakes are not so high, but a scattering of additional activities would not conflict with the central plot. Now games are more than a set of mechanics, people are waiting for interesting stories that developers have to tell through the story.

Often the problems of dissonance between narrative and game mechanics lie in the fact that the plot is written first, and then they try to come up with mechanics for it. To avoid such problems, the team needs a narrative designer or a game designer who understands this area.

18 Feature Design

Building production processes is a difficult task in IT development. This is a big and complex task that you inevitably have to face on projects in order to deliver a feature on time. There is no one and only correct solution. But there are many markers (crunches, burnout, featurecat) indicating that something is not being done right.

Changes to the workflow can take more than one year, and will not be without errors. The design of a feature can be complex, such as implementing support for the meta game, as well as releasing twelve new pieces of content with unique mechanics. The development of a feature from concept to release can take up to six months. Business always counts on quick results. This means that an effective methodology is needed. It might look like this step by step.

We evaluate the feature design by the whole team, determine the must-have part for the release. This allows each participant to speak and participate in the design, ask a question and get an answer to it. Goal at this stage: The team must agree on the concept and design of the feature and move on to the next stage of development together. This allows us to avoid conflicts within the team in the future on the topic of what we are doing wrong or wrong, that the design came up with a bad one, or that the feature will not work for the players at all.

In addition, discussion at an early stage allows you to settle the issue of the high cost of development and estimate possible options for implementing difficult moments. Here we spared no time: it is important that the team be able to discuss all the concerns together, decide on the must-have part for the release of the feature.

We compare the capacity of the team and the complexity of the feature according to the scheduled tasks = featurecat. Usually, the GDs want a lot and beautifully, but we can allow much less in development, and the business wants it as soon as possible. I did not have any statistics on the work of the team, so at that time I laid down the standard 20% risks + holidays + sick days. I had to go to fichekat. The first time it hurt.

We discuss all changes in the design of the feature in open Slack channels/syncs and do not forget to update the document. Not only at the very beginning, but with each new idea, we began to ask ourselves the question: is this a must-have for the first feature release or can it wait? All improvements that did not pass this test were immediately moved on. This allowed us to filter the flow of ideas and prioritize the most important and critical design changes.

We put an indication on all new tasks after the start of the active development phase. Labels are needed for retrospective analysis. Can we improve some processes to minimize changes in the future? It is necessary to take into development important must-have changes, without which the release could not happen. An important role is played by the analysis of new tasks in the feature. It was found that the increase in the scope occurs not only due to changes in the design of the feature: there are both technical tasks and non-decomposed tasks.

We can highlight a few important rules. The team to discuss the feature should be assembled as early as possible. The concept signals that it's time to form a team of leads. Not only the feature design is discussed, but the MVP for the release is also determined. Alternative solutions are being sought.

The feature is evaluated at the concept stage. The estimation error can be high. But due to the examination of leads at an early stage, you can abandon large and expensive pieces of functionality.

UI prototypes and prototypes of the core mechanics of the feature are being made. This avoids big changes in the meta or core mechanics of the feature at a later stage. The closer to the release, the more difficult it is to reconfigure. The capacity of the team is calculated taking into account the percentage of risks, vacations and potential sick days and compared with the complexity of the feature. If these two numbers do not converge, a feature check is mandatory. Only those changes that belong to the must-have category are taken in dobros. At this stage, it is checked whether the team fits into the required date for the feature to be ready? If necessary, the team agrees on a new release date.

Team statistics are collected from any available sources. Less useful statistics should be discarded. For the most revealing, automated collection and analysis is done. What can be useful from the statistics. This is the percentage of the feature in relation to the total cost of the feature. This is the percentage of good relative to the total cost of the feature. These are new tasks that arise after task decomposition and the start of active feature development. It is important to make a typification of dobros on issues and further analysis.

The team must go to a common result and help each other on the way to the goal. The mood of the team depends on each of its members, including the PM and the producer. Close team contact at an early stage allows you to remove expensive functionality. The risks are reduced. The team gets to the right release. There is no need to overtime. There is no need to expand the team.

There is a concentration on joint constructive work on features. The team does not look for someone to blame.

19 Principle the digital Design

The key design principle that digital design focuses on is movement. This is not just about the movement of the eyes from one element to another. Digital design includes interactive pages, modeling or animation. Also includes sound effects or audio tracks to enhance the effect.

Digital design is based on functionality and requires some form of coding. The coding process is called development. Digital designers convert the coded layout into a working digital design. Digital design comes into contact with print and graphic design technologies.

Print design represents visual content and communication. They are focused on physical publication. The actual design can be done online, but the final product is printed.

Digital designers create infographics, website elements and banner ads social media content, landing pages, online graphics, user experience structures, and video ads.

Digital design includes components such as color, layout, accessibility, interaction, fonts, and usability.

Graphic design can include both printed and digital products. Digital design is for digital products. Graphic design focuses mainly on static designs. Digital design is movement oriented. Digital designers are required to have certain graphic design skills.

Website design plays an important role. It is an important information and communication portal for businesses. A website turns users into customers. Landing page design is also important. A landing page is a specific page on a website. It focuses on the product or service that the business is trying to sell. Landing pages contain a call to action. Their goal is marketing. Digital designer it to ensure that all pages are consistent.

Social media digital design includes profile posts, cover images, and avatars. The post is not limited to photography. It is the combination of words, phrases, images and logos to create an entirely new visual identity that matches the branding and corporate identity.

Applications are functional and user-friendly digital tools for customers as they are downloaded primarily on mobile devices. They can be for games, music, podcasts, book reading, messaging, shopping, scheduling, banking, and more. App design is related to app icon design. The app icon is a small square on the phone screen that identifies the app.

The process of designing an app icon is similar to designing a logo as they serve both for advertising and branding purposes. Infographic design solves the problem of conveying information to customers using visual images. It uses motion and animation to help tell a story with the information available. Email design is used for marketing purposes and newsletters that contain a branded message. The designer creates visually appealing and interesting content.

Banner ads and any other digital advertisement appear in the digital space where the business has paid to be placed. They need to be visually appealing so that the potential customer not only notices them, but also navigates to the product landing page, which has also been carefully designed by a digital designer.

E-books are downloadable booklets, flyers, brochures and brochures. E-books can be shared with customers. The digital designer deals with e-book cover design, typing and typography inside.

Presentation design involves working with pitches for clients, internal updates for the team, and presenting business plans to potential investors.

3D design is common in the entertainment industry. These are interactive product models or mockups that the business wants the potential customer to see the entire volume in a different plane. 3D design can be realistic or animated.

3D design requires the designer to purchase sophisticated rendering and modeling software. Investing in digital design helps standardize brand identity in any form of visual communication.

Before you start creating digital design, you need to study the industry trends, design trends, target audience and content, topics. User testing needs to be done to know all customer friction points, the types of features they are looking for, and any potential interactions they might make.

You need to identify the problem and understand how your design can solve it. Readability plays an important role. It includes text flow, hierarchy, font usage, scale, white space.Accessibility plays an important role.

To increase accessibility, you can use image alt tags, use predictable navigation avoid any flashing images that can cause seizures, use typography to make certain text large and bold, make it accessible to the keyboard and mouse.

Screen size must be considered.The design should be suitable for desktops, tablets and mobile phones. Digital designer skills include an understanding of color theory, fundamental design principles, navigation and layout practices, typography, and typography.It is responsive design, basic HTML or other coding language, prototyping, wireframing, user testing, and the ability to use at least one digital design tool. A digital designer needs the ability to work and collaborate in a team, a work ethic, the ability to handle criticism, and a desire to learn and improve.

The user interface designer designs the elements that the client interacts with.These elements may include text fields, drop-down menus, buttons, or any other interactive element. The user interface designer must make sure that users have fun and find the whole interaction process as simple as possible. Sometimes UI designers must create style guides that interaction designers must then follow. Web designers should be able to design any required site pages or site design layouts and format them for viewing on desktop, tablet and mobile devices. Working as a web designer requires coding skills. Digital product designers make decisions about how these products should work, what services and features they should provide, and how much they should cost. Product designers should be able to answer any questions that arise during user testing. Interaction designers are designed to improve the digital experience of the user and help him achieve the goals that he sets for himself. Major tech companies are hiring psychiatrists to implement addiction technologies.Researchers study the impact of computers on the way people think and behave.

This technique, also known as "addictive design," advocates of addictive design, argue that it can have positive effects on users, such as getting us to take our medications on time or forming habits that help us lose weight.However, some clinicians believe that addictive design companies are manipulating children's behavior for profit.Richard Fried is a psychologist who works with children and adolescents and is the author of Wired Child: Reclaiming Childhood in a Digital Age. The study of this phenomenon was initiated by BJ Fogg, a behavioral scientist at Stanford University.Fogg founded an entire field of science based on research that showed that with a few simple techniques, a product can manipulate human behavior. Today, his research is a ready-made guide for companies developing products whose goal is to keep users online for as long as possible. Addictive design works like this: in order to change behavior patterns, a person needs motivation, opportunity, and triggers.

The motivation is the thirst of people for communication or the fear of rejection by society.As for computer games, it is motivated by the desire to gain any skills or achievements.Ease of use of the product is a prerequisite for the implementation of the design. All companies that develop social networks build their products on the methodology of addictive design. Psychology should focus on improving health rather than harming children and encouraging the overuse of technology. UX design is designing the behavior of people in a computer application so that they act in accordance with the goals of the owners of this application. The value of any computer application lies in the ability to change and retain new behavior of people.The less the application changes human behavior- it the less value.

An important goal of UX design is to reinforce the change in behavior that the application has made in a person, that is, to form a habit. A habit is formed by repeating the same action over and over.Strong emotions are very difficult to repeat several times in a row so that a habit is formed from them. Creating a habit is highly emotional, so the process needs to be carefully designed.When a habit is just forming, any negative emotion can break everything. When the habit of the application is already there, then, on the contrary, it weakens negative emotions.

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