The future of design: trends and possible aspects

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Abstract. The article discusses the main possible trends, aspects and ways of development of design in the future and humankind in general. Interdisciplinarity, rethinking the functions of the designer, and understanding the impact of design on the environment are becoming important aspects of the development of future design. An attempt is made to systematize the main trends in the development of design, depending on the interaction with material or virtual realities. It is noted that virtual/augmented reality is increasingly expanding and is gradually penetrating into many areas of life. The author considers different ways of development of the designer's profession. Changes, complication and expansion of designer's functions in connection with the development of artificial intelligence, robotics and neuroimplantation in the body are also reviewed in the article. It is suggested that in the near future, design, science and technology will find and expand ways to connect material and virtual/augmented reality.

It has always been a human mind to think about the future. Sometimes future was viewed from different angles and in different aspects, based on the accepted world view at that time. For example, the Egyptians considered the future as Eternity, in the Renaissance they preferred to look back at the origins, in the freethinking of the Enlightenment people began to model an abstract future.

There is a separate science called futurology which deals with developing the future, with solving possible future problems. Futurology foresees the development of human history [1], both optimistic (from the creation of interplanetary colonies to increasing intelligence and human abilities using artificial intelligence and nanotechnology) and pessimistic (from the death of the entire Earth to the transformation into a robot civilization). Representatives of many professions work in this field: political scientists, sociologists, demographers, scientists-physicists, medicians, film directors, etc.

Among designers, too, there are those who try to anticipate and solve possible future problems. Since the 1960s, amid the euphoria of space exploration, there had been a tendency to think positively about the future, which had also been reflected in culture: cinema, design and art had been laying a positive image of the future. Later, after some sobering up and understanding of the problems facing humanity, in particular, environmental ones, paradigmatic shift has eventually happened. And now there is practically no positive image of future in the culture at the moment, fantastic films and art of recent decades clearly demonstrate this. Design has an immense potential to solve problems under defined conditions. That is why design can look towards the future with optimism. Whenever humanity finds itself in the future - in space [1], under water, underground, in the air, without air, the task of the designer is to make human existence as comfortable as possible under the proposed circumstances. Modern designers such as Zaha Hadid, Marc Newson, Fernando & Humberto Campana, Ron Arad, Ross Lovegrove, Karim Rashid, Jean-Marie Massaud and many others have considered the theme of future design in different ways in their work.
At the end of the XX – beginning of the XXI centuries, there were several trends in design against the background of the financial growth of that period:

- design became a cultural phenomenon in all the economically developed countries;
- the boundaries of design expanded, and design started spreading much faster due to the increased capabilities of the Internet;
- design received influence of fashion such as rapid change of trends (to be in the trend you need to change things every season), functionality was set aside;
- a great interest in iconic design objects of the past appeared as a counterbalance to the trend of rapid changes, some companies began to re-release products of classic design;
- a highly profitable sector of art design was formed, when products were made as collectibles, available to a small stratum of rich people. The advantage is that financial freedom allowed designers to develop their design, to look into the future and to experiment with new forms, materials and technologies. Experimental findings where then infiltrated into the manufacturing processes of mass-produced goods and raised shaping to a higher level [2]. When considering contemporary art design, it is difficult to draw a line between design and art. But the line is and lies in the fact that with some external similarity, functions differ: design solves problems, but art sets tasks, asks questions and does not offer solutions.

Design strives to solve problems under any proposed external and internal circumstances. Relatively recently, design has faced new challenges in the form of the emergence and increasing expansion of virtual/augmented reality. If throughout the twentieth century design was engaged rather in material reality, in the XXI century it became clear that due to the development of programs and technologies, virtual / augmented reality will take more and more space and will change the world. In general, design, over the past century, from applied to industry discipline has expanded into a sphere that permeates almost all aspects of life. The third and fourth industrial revolutions have led to the fact that over time, this influence will increase[3]. Next, we will highlight some trends and aspects in the development of future design.

Interdisciplinary approach. The designer both now and in the future will need to have a wide range of horizons in different fields of knowledge (aesthetics, philosophy, semiotics, social psychology, etc.), as well as to be able to cooperate and to collaborate with representatives of various sciences (physics, chemistry, biology, engineering, etc.) [1] [4]. Therefore, today's design requires specialists with a high level of conceptual, interdisciplinary, and methodical thinking in order to be able to:

- to consider the project task comprehensively and systematically;
- to create a model of the projected object (space, process, relations, communication, image);
- to take into account the peculiarities of consumer perception and reaction;
- to propose a fundamentally new conceptual solution or design approach;
- to choose appropriate design methods for the specific task;
- to offer strategies for project implementation;
- be able to professionally assess the place and role of an implemented project in the space of both culture (cities, systems, institutions) and the environment as a whole [5].

Changes in designer's functions. The trend that the designer will begin to solve specific personal problems of each person at the request of the customer will be more and more widespread. For example, transforming apartments or hotels, which will be able to change the shape and design according to personal preferences [6].

Appearance of special design programs for the general public. Already at this stage, there are more and more programs, sites and applications (such as Tilda, Wix, Squarespace), when anyone can create their own design without the help of a professional (creating a logo, a corporate identity, an interior and much more, up to printing an object on a 3D printer):

- demand for individual design will grow as it becomes more accessible;
- customization and individualization of products for specific customers will allow to work with a much larger number of solutions and meet the needs [7] [8];
- monetization of the author's design using the Internet (the object you invented will be able to place on a special website, where you will quickly check the originality of authorship and will be able to get deductions from each produced object at any factory) [9].

*Availability of technology.* This trend is already clearly visible - due to the acceleration of processes from the invention of a new material, method, technology (stage of development, testing, approval) to implementation and application, the period of time was reduced from 10 years to six months. The development of the Internet makes it possible to obtain and disseminate this information very quickly [9]. For example, in the field of clothing design, recently such materials and technologies as polyester, Spandex, Gore-Tex and Ultrasuede were considered revolutionary. Today, all this is actively used in the manufacture of clothing and footwear. There are several developments, based on greater availability of technologies:

- clothing made of *nanofibers*, which may have thermo-regulated, water-repellent, antibacterial, anti-static, self-healing properties, as well as protection from UV light, fire, etc. [10];
- *Biogarmentry algae living clothes*, that turn carbon dioxide into oxygen via photosynthesis as a more sustainable alternative to fast fashion (figure 1) [11];
- clothing with a color equalizer that reacts to surrounding sounds is quite widespread;
- baseball caps, backpacks with Wi-Fi signal recognition function are made [12];
- English designer Ryan Mario Yasin has created children's clothing that grows with the baby and does not have a certain size. The fabric is very elastic, like origami and spreads as the child grows (figure 2) [13];
- material with the properties of fabric and metal was created by engineers from NASA. Through three-dimensional printing, each side of the material can absorb or reflect light, heat and radiation. It looks like chain mail, with small silver squares strung together fully printed on a 3D printer [14];
- big companies, such as Apple [15] have announced the production of high-tech *smart clothing*.

![Figure 1](image1.png) *Figure 1.* The clothes are the proof of concept for a textile made with living, photosynthetic cells.

![Figure 2](image2.png) *Figure 2.* Origami clothes

*Development of new sources and types of lighting* with interactive light metamorphosis, color and motion. The lighting design will change according to your movement, mood, health and other individual settings. The development of Li-Fi technology makes it possible to transmit data using internal LED lamps to create a communication and lighting control system [16].

*Eco-approach and degradable materials.* Despite the emergence of new design trends, ecodesign has not lost its relevance for several decades. Anthropogenic environment in the form of urban growth, increasing the number of houses storeys, the use of large amounts of glass, plastic and concrete has a negative impact on human health and psyche. Common synthetic materials cannot yet compete with natural ones, despite their economic efficiency (figure 3). Natural materials will become more and more valuable as they are not infinite. It is likely that the concept of environmental design
will change: nature and the human environment will merge and the boundary between interior and exterior will disperse to form a new environment[9]. At the same time, the environmental path of development should not deny new technologies. The future of design is in degradable materials. This trend is already evident, but in the future there is a possibility of more and more expansion and development of reuse and recycling technologies. Climate change is real and we must preserve our resources before it's too late. Plastic is very democratic, but as a polymer it is dangerous to the environment because it may not decompose for millennia. The eco-approach in design can include a set of measures:

*Eco-approach and degradable materials.*
- awareness of the size of the environmental footprint through the choice of a design;
- a high level of energy saving;
- autonomy and eco-sustainability;
- use of other types of energy (solar, geothermal, etc.) [17];
- it is possible that science, in combination with design, will develop artificial nature that replicates original nature. But all branches of design should be aimed at preserving the natural ecological human habitation.

![Figure 3. Nut bench made of pineapple paper on a steel frame. Designer Suwan Kongkhunthian, maker Yothaka International. Thailand is a leader in the development and production of eco-friendly materials.](image)

*Developing 3D printing capabilities* (from printing models and household items to printing organs and tissues). Designers will need to consider:
- inclusion of 3D printing capabilities into the work. For example, changing the design object for individual customer parameters (for example, changing the size, color, texture etc.);
- changes in everyday life, provided that 3D printers are widely used at home (almost everything that was produced on an industrial scale can be materialized with the help of 3D printing). The emergence of 3D shopping, when you download a thing from the cloud storage and print it on the printer, or, for example, the ability to print luggage on trips;
- satisfying the psychological need to reveal your personality and passion for novelty/metamorphosis/change (if you get tired of the thing, you can print another one), which in turn can lead to oversupply of things;
- getting rid of the dictates of global corporations;
- increased prototyping capabilities and it will be quick, cheap and easy. Prototyping capabilities will give the opportunity for more creative risk. Risks are important in the world of design (it gives the
experiments with design, shapes, the embodiment of unthinkable design fantasies, obtaining an important "user experience" from the consumer's side);
- the appearance of services that simplify the work of an architect and a designer (the ability to instantly select and purchase from a common database; to load ready-made 3D models and link them to place. It can give the ability for the customer to observe the project work, pay for it and control it remotely) [9];

Probability of digital and real objects competition. For example, questions will arise, as to whether a printed 3D art/design object will or may have the same value as an object created by hand. There is now a perception of digital works as a lower form of art, but this may change over time.

The increasing development of sensory design that will affect all 5 senses simultaneously. Sound, olfactory, tactile sensations are just as important as visual sensations and there will be more and more opportunities for experimentation. Sensory design is a sphere that will go hand in hand with the development of new technologies. Design will definitely include more interaction between us and our devices, our subject and virtual environment (Internet of Things, IoT).

As a consequence, there will be a complication of the designer's work, who will need to create interfaces for complex systems with individual user settings (such as a smart home, smart clothes [15], etc.). New technologies in the sphere of information working will complicate the work of a designer. But the management of design objects will be able to take to the next level. Traditionally, designers have dealt with real objects that can be seen, touched and used. But with the development of computer programs and virtual reality the design of user settings based on personal data becomes more and more actual [18]. Designers will have to come up with an interaction between people and machines. This is an artificial intelligence in its purest form, and it makes all decisions based on the information it contains. And the way it will interact with the consumer will be a new aspect of the designer's work.

The extension of the concept of "design". Already now we see a tendency when the term design is applied to concepts earlier contacted with it rather remotely (process design, management design, sound design and many other things. For example a human body design can appear in the future - from genetic structure to appearance. That probably is preceded by the following tendency.

Robotization and neuroimplantation in a body. It is likely that over time it will become possible:
- a) connection and miniaturization of all gadgets/devices in one;
- b) implantation of this mini-device with increased functionality in a human body (under the skin, in the brain, etc.), already now there are people who try these technologies on themselves [19];
- c) as a consequence, there will be a dematerialization of design, i.e., it will disappear physically (for example, we will be able to collect, exchange information, make DNA-based payments, make calculations, communicate with virtual and real space through a small chip in the body and, accordingly, we will no longer need cameras, telephones, computers, medical equipment, etc.). But as a discipline / branch of knowledge, there is no doubt that design will continue to exist and influence society and culture [2];
- d) the development of artificial intelligence technologies may lead to the appearance of more and more robots. Robots will both help and replace humans in their activities in almost all life areas. In fact, an artificial person is being created [1], and it needs an interface design for communication with a real person.

The development of virtual/ augmented reality and the development of artificial intelligence (AI) will compete with reality in terms of plausibility, speed of thought and interaction. Digital design is an interdisciplinary industry at the intersection of technology, aesthetics, ergonomics, business requirements and management. The main skill of the designer here is the ability to make a meaningful user interface, to design a harmonious interaction between man and artificial intelligence with a high level of satisfaction. Whether the robot designer will be able to replace the designer-human will show time. But AI design will play an important role in society's acceptance of it.

To be more precise, the term virtual reality (VR) refers to new spaces/worlds created by technical means. There is also a separate concept of augmented reality (AR) and they should not be confused. Augmented reality brings separate artificial elements into perception of the real world, adds to the real
objects imaginary objects as auxiliary information. Augmented reality elements appear in the network, in urban environment and outdoor advertising. In the future it is possible that we will live in an augmented reality. For example, it will be possible to project and change walls' images, patterns and colors on depending on your mood [6]. A designer's task will be to work through all sorts of combinations and ready-made scenarios. Thus, an interior designer will become a designer of augmented reality. Probably, additional attention will be paid to textures and smells to create real sensations.

The technologies of virtual reality give a lot of possibilities and means of their expression. Virtual reality suits/glasses/gloves with visual, sound and haptic sensations are being developed; the user's experience reaches a completely new level [20]. There is a hypothesis that in the future, all the objects around us will be intelligent holograms, or other type of visualization. Furniture and household items will be interactive, not material. The border between the branches of design will gradually disperse and, perhaps, in the distant future, design will be one single industry, not divided into species. Changes in the future transport system. Several trends can be anticipated:

- unmanned cars (there will be a division into those who will drive unmanned cars and those who will self-driving), the management of transport flows will be carried out by artificial intelligence;
- using carsharing, not owning a vehicle,
- changes in an interior/exterior of a car. Car's interior/lounge will change its functionality and adaptability for work, leisure or business meetings without the need to drive a car; cars may look like a capsule;
- there is a chance that the cars will shrink in size, as larger cars are harder to move and park in a huge city;
- public transport will change dramatically. From capacious trains of public transport to supersonic vacuum trains, able to overcome a hundred kilometers in a few seconds (figure 4) [21];
- flying machines as an opportunity to get rid of jams, pollutions and problems in the organization of road traffic. The TerrafugiaTransition project is the closest to implementation [22]. It is a flying car with folding wings, which can both drive on ordinary roads and rise in the air (figure 5).

![Figure 4. Vacuum train Hyperloop.](image1)

![Figure 5. TerrafugiaTransition.](image2)

Summing up, we can say that designers help to solve the real human needs, nevertheless, it is also necessary to develop a more reasonable approach in consumer behavior. And very important to educate people in design and rational consumption, including at the interstate level. Modern researchers believe it is necessary a fundamental rethinking of the system with speculative (projective) design. Speculative design focused on the long-term perspective and far-reaching view. It can use all potential of any material or technology[23]. Design will need to combine both natural and technological, as well material, virtual and augmented realities, because all are important for modern person. Changes in design are inevitable because it keeps pace with science and technology [1]. The future of design depends on many factors. At the moment, from the material world, design is increasingly moving into the virtual world. And probably will find ways to combine them in harmony. Each phenomenon, and design is no exception, has its advantages and disadvantages [24]. It is certain
that in the future, design will not lose its importance, will try to find problems solutions, and perhaps will be even more integrated into public and private life.

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