Three waves of theoretical architecture and design

IlginaShakirova[10000-0001-8805-4836]

1Kazan State University of Architecture and Engineering, Kazan, 420043, Russia
E-mail: Ilgina@list.ru

Abstract. The history of architecture and design as a complex discipline is no longer seen as a direct evolutionary structure. A more rational approach implies multilinearity, one of the lines of evolution is theoretical. Alvin Toffler in 1970 developed the theory of three-wave development of society, and, as a result, this influenced the development of design as a whole. Therefore, we are interested in considering the very theory of the three waves of Alvin Toffler and understanding how this development can be considered in relation to architecture and design. The purpose of the article is to consider the theory of three waves of Alvin Toffler, to compare the development of architecture and the theory of design and history with these waves, thereby identifying the processes that were the starting point for the emergence and development of each wave in these directions. To consider how certain processes that took place in the world have influenced not only the development of society, but also the development of architecture and design.

Keywords: three waves theory, architecture, architecture history, post-industrial design, architecture periods, designhistory.

1 Introduction
In recent years, architecture and design have become an integral part of human activity. They are, among others, one of the most actively developing areas of human activity. Despite its relatively short path of historical development, architecture and design shows us an example of quite rapid development.

Architecture, as well as design, like human activity and historical progress, are not linear, the society development dynamics flows through certain time intervals, like the ocean waves, and the same way design has a wave development dynamics.

Wave motion views are not single. There are a lot of views on wave development. American financier Ralph Nelson Elliott1 has works on this subject. His monograph is called The Wave Principle. The American journalist Charles Dow is the author of the Dow Theory2, and in 1913 the Dutch economist Jacob van Gelderen3 developed the undulating evolutionary development theory [1-4]. Also, the work on this topic was carried out by our compatriot Nikolai Kondratiev. However, we will consider the wave motion proposed by Alvin Toffler.

According to the American philosopher, sociologist and futurist, one of the authors post-industrial society theory, Alvin Toffler, society is in constant development dynamics. He believes that this development occurs according to certain time periods. [5-7] Toffler calls these time segments...
waves, thus distinguishing three waves: the agricultural wave, the industrial wave, and the post-industrial wave. We briefly consider each of them, indicating what served as the prerequisites for their occurrence.

First-wave. According to Toffler, it took millennia for occurrence of the agrarian wave. As a breakthrough to serious changes in the society life was the introduction of agriculture. After the first agrarian technical revolution, there was a wave of agricultural civilization. This stage is also sometimes called traditional or agricultural. The predominant activities here are fishing, farming, and mining. The main part of the population (about 90%) is engaged in agriculture [4,5]. One of the most important tasks for the agrarian society was the food production to feed the population. This is the longest of the three stages, and its history goes back to thousands of years. Land was the main resource of the first wave, and most of its product was consumed by those who directly produced it. Repeating the cycles of agricultural production, time in the first wave civilization went in a circle. The first wave between 1650 and 1750 began to lose power when appeared the crest of the second wave, creating an industrial society that in turn conquered the world [8-10].

The second wave (industrial) occurred much faster than the first, just a couple of centuries, the reason for this was the industrial revolution. Compared to an agricultural society, in industrial society all forces are directed to industrial production, the production of necessary goods for society. The industrial society primary product is a commodity and the formation of its environment. The industrial revolution has borne result — now the main task of industrial society is satisfying the society needs in its basic needs, for example, just to feed the population and provide them with basic livelihood, has gone into the background [11]. A small part of the population, only 5-10%, engaged in agriculture, produced enough food to feed the entire society. After 200 years of expansion in 1950, the second wave also declined in the industrialized countries. Toffler takes the "inflection point" the fifties of the twentieth century because exactly then the number of knowledge workers and services in the United States for the first time exceeded the number of industrial workers. In the countries of the industrial world, at the same time third wave began its run-up around. And as it gains strength in the face with the second wave, thesecond wave outdated principles and institutions begin to crack at the seams under its pressure [12-16].

The third wave (post-industrial) is gaining their turnovers and will finally replace the second one by 2025. According to Toffler, the computer is the third wave. Since the late 1960s, the term "post-industrial society" has been filled with new content — the education prestige increases, there is a whole layer of qualified specialists, managers, and people of mental work. The services sphere, science, and education are gradually beginning to prevail over industry and agriculture, where scientific knowledge is also actively used. In the 1950-1970s, it became obvious that humanity was entering a new era. In Toffler's concept, the appearance of corporations and a specialized class of managers-integrators refers to the second wave (industrial society), after which there is a period of superindustrial society. In the third wave society corporations already have multiple objectives (social) and not just the economic benefits [17-20].

2 Methods
Like society, architecture and design also develop and do not stand still. The theory and history of architecture, as well as design, develop accordingly. Like society, architecture and design goes through three waves of its development, the so-called architecture and design development periods. All the changes that took place in society irreversibly brought changes in industry, which in turn changed the architectural appearance of enterprises and aesthetic views on the subject-spatial environment. Each period has its own prerequisites for its occurrence and development. These periods have their own name: pre-industrial, industrial, and post-industrial. The borders of these stages are conditional, and this can be explained by the fact that the prerequisites of any period were born before its beginning, and the subsequent stages still had the features of the previous one. The borders of periods more reflect to the new messages features in the architecture and design development in general. If you try to mark each period with time limits, it will look like this:
• pre-industrial XVIII-XX centuries.
• industrial 1919 - 1990
• post-industrial 1990 according to the present time.

Let's look at each period in more detail.

2.1. The pre-industrial period
The pre-industrial period dates back to the XVIII century and lasts until 1919. The pre-industrial period beginning has floating time boundaries. Why? Because the first boundary of the pre-industrial period may be different, depending on which of the design theories we take as a basis. The pre-industrial design starting point can be interpreted by historians in different ways, depending on the theory of design origin. The pre-industrial period in architecture and design arise in connection with the scientific and technical revolutions in the XVIII century - this can be considered the beginning of the pre-industrial period, since the industrialization process has only just begun. Pre-industrial design appeared in the transition period, when the first manufacturing plants appeared, and mass circulation was already present. But according to other art historians, design is the brainchild of the industrial period.

If we take the theory of N. V. Voronov⁴ as a basis, then the occurrence of the pre-industrial period shifts to the first tools appearance. But is it design? There are composition rudiments, the layout rudiments, but despite this, there is no mass character. Since we believe that design is a production mass object, that is, design is exactly replication, we do not take this theory as a basis.

Considering at the pre-industrial design period from the beginning of the XVIII century, it can be seen that during this time there were important events for the design world. At first, the first world industrial exposition, which was held in 1851 in London, because in the middle of the XIX century, England was the richest country in the world. It was the first industrial exposition that started the tradition of periodically holding international agriculture expositions, which undoubtedly played a significant role in the pre-industrial wave beginning in design. In 1855, Godfried Semper published his work entitled "Practical aesthetics", in which he clearly expressed his idea not only about the fatal decline of artistic creativity in the industrial production field, but also about the necessary to find out the causes of bourgeois taste crisis. In contrast to the philosophical idealism of his time, Semper emphasized the style-forming significance of materials and technology. He considered the form as a derivative number of objective factors: the practical content (purpose, function), the material and methods of processing it, consumer tastes, traditions, religious and political institutions, the personality of the artist-creator. He was not an opponent of machine production, but was looking for a new "aesthetic" in the production products. His teaching largely predetermined the theory ideas. He believed that the current situation can be corrected with the artistic reforms help, studying and popularizing the true beauty origins, the surrounding object world. He made a serious attempt to understand what was happening. He was far from a fundamental socio-aesthetic analysis of the phenomenon. His views were utopian, but nevertheless led to a fundamentally new formulation of the question in the relationship between technical progress and the development artistic creativity subject. Semper showed that science and technological progress provide artistic practice with processing materials and methods that have not yet been mastered aesthetically. According to Semper, practical aesthetics makes it possible, based on the study of art, not only to understand the reasons for the artistic form change, but also to anticipate their development.

Secondly, an equally important event that occurs in the pre-industrial period is the transition from manual labor to machine work in 1860, which left its mark on the design history, and also serve as a powerful development for the first wave. This could not but influence to the development of theoretical thought and marked the beginning in 1880 the William Morris theory called "aesthetic

⁴In total, there are 6 origin theories of design
⁵Voronov Nikita Vasilievich (08/01/1924 - 05/24/2002) - PHD of historical sciences, doctor of art history, «Artists Union of the USSR» and «Designers Union of the USSR» member, Commission member on Russia State Prizes for the Design Department.
theory". In many ways, W. Morris came out as a D. Ruskin follower, taking his creative work interpretation, the idea of educating the people artistic taste, as the morality basis and exposing the "luxury and poverty neighborhood". Morris went much further. He proposed a practical program for creating a new life style, gave a fairly vivid picture of the possible highly developed technology combination with manual work, craft work, as a special folk art manifestation, although utopian. It was based on the following statements: each people generation and each epoch inherit all the wealth of mankind’s accumulated culture, they have approximately equal artistic opportunities, the ability to perceive beauty and embody this beauty in the products of their work. For Morris, the object environment was important without dividing it into aesthetically valuable or ordinary.

An equally important event of this period is the opening of the applied arts school in Weimar in 1900, which was founded by the Belgian architect and artist, one of the Belgian branch art Nouveau founders- Henri van de Velde. In 1914, the First World War began and continued until 1918, which could not but leave its mark on the design in particular. This was due to the decline of the pre-industrial wave in design.

If we talk about the pre-industrial period architecture, everything was a little different here. This stage is the industrial architecture prehistory with simple production based on manual work. The buildings architecture in this period had no specific features and had a very large similarity to civil architecture. During this period, craft workshops were most often located directly in the structure of housing, or with the appearance of the first manufactories, private workshops were combined into small productions with simple equipment.

2.2. *The industrial period*

On the crest of the agrarian technological revolution, a new industrial civilization was formed. And for us, the industrial society occurrence means that industrial design has appeared and is beginning to develop. The first industrial designers appeared in the XVII century in England and associate this primarily with the activities of Josiah Wedgwood and the printed fabrics development. Industrial design was developed at the beginning of the XX century, and a significant role in this was played by the opening in 1919 the revolutionary industrial design school in Weimar (Germany) "Bauhaus" by the German architect Walter Gropius.

The Bauhaus school (State Bauhaus) was formed in Weimar on April 25, 1919 as a result of Saxon-Weimar Higher fine arts school and the Saxon-Weimar applied arts school merger founded by Henri van de Velde. Being the new institution creation initiator, A. van de Velde proposed the candidacy of a young Berlin architect, Walter Gropius. This event can be considered the industrial wave beginning in design. This can also be associated with the appearance of the first certified specialist in design.

Subsequently, in 1920, the VKHUTEMAS school was opened in the USSR. In 1918, on the basis of the Moscow painting, sculpture and architecture school and during the reorganization of the Imperial Stroganov Central art and industrial school art education system were formed the First and Second state free art workshops (GSHM). In the autumn of 1920, the First and Second GSHM were transformed into a single educational institution — VKHUTEMAS (Higher art and technical workshops). Eight faculties were formed in the new educational institution: architecture, art (painting, sculpture) and production (printing, textiles, ceramics, woodworking and metalworking) [21].

These schools opening also played an important role for theoretical design. During this time, many significant design theories occurred. Already in 1920, appeared the "Industrial formtheory ", the founder was the head of the Bauhaus school from 1919-1928. Walter Gropius – he saw the essence of the theory in the fact that industrial or industrial design refers to the design art field, which deals with the artistic design of human environment subject content elements. Industrial designers try to define the appearance of household items around us and at the same time try to make them as functional as possible. The ease of the item use, product functionality and appearance depend to a large extent on its success in the market, so today industrial design is extremely popular. Many people who stood at the origins of industrial design were outstanding architects in their time [22]. In fact, we owe a great deal to architecture and industrial design in shaping the spatial environment that surrounds us as it exists.
today. However, if architecture solves rather spatial problems, then industrial design is focused on the formation of an object environment. The main task for industrial design is the functional and structural features of equipment and products, determining the exterior, technology that surrounds us in everyday life. In this regard, industrial design distinctive feature can be called its orientation to mass industrial production.

Another equally significant theory that appeared in 1930 is the "Bionic forms theory". The theory founders tried to solve the using functional zoning problem by bionic forms in the design, that is, the projected or reconstructed building, with the people in it, is represented as a single organism, which is based not on traditional structures, but on tectonics and form refracted through the architect's understanding, based on the principles of building existing natural systems [24]. A specific feature of the wildlifeformsdevelopment in architecture is that it is not just the formal aspects of wildlife that are mastered, but deep connections are established between the laws of wildlife and architecture development.

During the industrial period, important events also occur, which served as a kind of impetus for the industrial design development. Of course, opening of the main schools Bauhaus and VKHUTEMAS, which were mentioned earlier, helped to develop the design, despite the world economic crisis of 1929. Of course, it left its mark, and development is not as fast as we would like, because the world has not fully recovered from the war, but despite this, architects and designers created and implemented their projects [25]. For example, the well-known American architect Frank Lloyd Wright created his famous "Prairie Houses" in the period from 1911-1925. And in 1936, the famous "House over the waterfall" was built, which was later recognized as a monument to the United States. No less famous is its construction – the "Imperial" in Japan, which stood during the earthquake of 1923, thanks to its powerful "floating" foundation that goes into the ground for 18 meters. Another important detail is that it is F. L. Wright who is the organic architecture founder and one of the bionic forms theory authors. Another, no less famous architect, one of the modern industrial architecture and design founders, Peter Behrens implemented his projects during the First World War. For example, the national automobile company building (Berlin, Germany; 1914-1917). And during the world economic crisis, too, was not without work: the tobacco factory building (Lenz, Germany; 1929-1935), Alexandrhaus (Berlin, Germany; 1930-1932). Walter Gropius, who took his first steps in the workshop of P.Berens also created many famous buildings at that time, such as the Shoe factory "Fagus"building (Alfred, Germany; 1911-1913, the interiors were completed by 1925), the Bauhaus building in Dessau (Dessau, Germany 1925-1926).

In 1933, after the national socialists came to power, the Bauhaus school was abolished by the Nazi government. But despite this, Walter Gropius, Ludwig Mis van der Roe and many other Bauhaus teachers emigrated to the United States, mainly through the United Kingdom, where they continued to spread the their movement philosophy: they performed orders for buildings architectural projects, organized expositions and, in the case of Gropius and Mis van der Roe, LasloMahoy-Nad, were engaged in teaching [25].

In 1940, the "International approach in design"theory appeared. One of theart modern trends, which was less utilitarian, was an international approach, which arose in the United States with the designers'arrival who had previously taught at the Bauhaus. In addition to the modernism style variant implemented by Walter Gropius, Mis van der Roe, Johannes Itten and his followers, the term "international style" was used to apply the modernist aesthetic, which appeared as a result of a functional approach to design, but only on a stylistic level. The international design style reached its peak in the 1960s. As this style developed, some designers, including Eero Saarinen and Charles Eames, tried to make it more humanistic, while others, such as KenzoTange, leaned to the other extreme and worked in an exceptionally brutal spirit. Almost synonymous with the international approach was the term "good design", the concept of which originated in Northern Europe and the United States immediately after the Second World War, "this style objects were developed taking into account the formal, aesthetic and technical principles" of modern. The international approach was applied in modern design [26].
Another important event that turned the activities of many designers who like to experiment with form, was the appearance of plastics in 1957. The plastics advent gave birth to new experiments by designers, and this was an experiment area at the design, art, and science intersection. Architects and designers such as AllesandroMendini worked in this area. One of the many iconic objects in industrial design Mendini was his kind of chair "Prosta" 1980, furniture-plant "Kaktus" 1983, chair "San Leonardo" 1985, the lounge chair and Ottoman "Sabrina" 1982 coffee pot 1983, "Metaphysical furniture" 1985, a small furniture series such as mirrors, hangers, shelves, tables, stools, etc., a "Makaon"tables series, gamma decorative patterns of upholstery fabrics, decorative floor coverings, finishing tiles, etc.

Another equally important designer G. Pesce also worked in this area. His most significant works are-up 5 chair for B&B Italia 1969, organic building in Osaka (Osaka, Japan 1990), galoshes for the Shoe company "Milissa" 2009 [27].

In architecture, the industrial period is also characterized by the industrial revolution, which began with technical inventions in England, which contributed to the birth of industry. This is the beginning of the period of the transition from manual work to machine work, which led to a change in enterprises, the architecture began to lay more functionality and this could not but affect the architectural appearance of buildings which played an important role in the development of architecture in the 20th century.

This period architecture is characterized by the active industry development based on machine production, the beginning of this stage and the previous parallel completion one were the Peter Behrens and Walter Gropius industrial buildings. These buildings were formed on the basis of a functional approach and the latest industrial aesthetics. This period became a functional architecture period. On the one hand, this is the functionalism flourishing period as the leading industrial architecture direction, when the basic principles were formulated, and the transition to new spatial forms of enterprises based on rationality and efficiency was carried out. The other side of the coin in this period is not so rosy, because it was caught in the post-war period, which was famous for the General crisis due to the comprehensive unification and standardization of industrial structures, aesthetic inexpressiveness, as well as the soulless industrial environment.

At this point, the industrial wave begins to come its logical conclusion, because by 1990, the "computer-the word of the century" began to appear in every home. Society becomes informational, and as a result, the second wave begins to be replaced by the third wave, which is called the post-industrial wave. Design also takes post-industrial features.

2.3. The post-industrial period
The emergence of post-industrial design is due to the fact that at the turn of the XX-XXI centuries, industrial design began to transition to a new quality, since the consumer goods production was carried out using the latest information technologies. In this regard, design in the information technology society has moved to the next stage of its development, which is called post-industrial design, and it, in turn, provides a wide range of opportunities.

As society transitions to post-industrialism, more and more aspects of human life become covered by post-industrial processes, so the industrial formation person is replaced by a highly intellectual and spiritually rich person. And, in this regard, the post-industrial society design receives a higher-quality consumer with higher demands, which in turn requires a revision of industrial design, its principles and its transition to a new stage.

The post-industrial period in architecture consisted in the transition to production, which is based on energy-saving technologies, technological processes automation, universal computerization, the introduction of telecommunications electronic instruments, and the active small and medium-sized enterprises development. Improving working conditions and humanizing the production sector are becoming the main factors in the new industrial architecture formation.
3 Result and Discussion
Due to the general mass society computerization in the post-industrial period, each of us is a multi-user game part, in which all the rules and technologies can dictate the game outcome. There are strategies that are winning and are programmed to succeed or are doomed to lose in advance. This means that we must review the technological capabilities of the post-industrial period so that all these technologies can function in a single space, so that they are more consistent, more useful, and more science-based. A more conscious approach to the benefits of the post-industrial period will lead to economic changes, since the third Millennium technological capabilities must be based on a thrifty attitude to universal resources, and not on its waste, which occurs when creativity is monetized.

Thus, we see that each successive wave brings us more and more new and qualitative changes. Wave motion implies certain cyclicity. With each new wave, society changes, its habits and needs. And in this regard, all spheres of human life are changing, and design is no exception. It is constantly changing, adapting to the person, his habits and needs. Everything develops cyclically, including the theory. There is evolution of theories - three waves, three periods, as well as the cyclical development of the theories themselves.

Considering such a phenomenon as Toffler waves in this article, we can say with confidence that these waves played a role in the design development, in the development and formation of theoretical thought in design. We can also say that design develops like a society, as well as having its own three waves - three development periods, each of which has its own beginning and the end. After analyzing all of the above, it becomes clear how interesting it is, to use completely different prisms of perception in presenting this information, in particular, the Toffler waves, which are developed not by designers or architects, not by design theorists or critics, nor even design teachers, but by cultural scientists, economists, sociologists, philosophers, physicists and mathematicians. And this perception helps us look at what we are doing in a very different way. This is a rather interesting approach of combining economic theory with design theory and an attempt to identify common points of development in the modern multilinearity development, multi-aspect and synergetics, which allows us to engage in such interdisciplinary research and, accordingly, it cannot be denied that the economy and some global events will affect to the design development.

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