Research on the Deep Integration of Intelligent New Technology of Architectural Design from the Perspective of Industry 4.0

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Abstract. After the German government proposed the strategy of "Industry 4.0", it raised a boom in world Industry 4.0. Our country has also embarked on the road of industrialization in the information age. Driven by Industry 4.0, information and digital technologies are also emerging. The improvement of the level of science and technology provides a good technical environment for the development of the construction industry. However, this industry still lags behind other industries in terms of automated production and digitalization. Thus, the construction industry should also catch up with the Industry 4.0, which will bring a new development opportunity to the transformation of the industry. Through the analysis of the shortcomings of the traditional construction industry, this paper puts forward some specific strategies for the deep integration of the intelligent new technology of architectural design.

Keywords: Industry 4.0, Architectural design, Intelligent new technology, Deep integration

1 Introduction
With the continuous improvement of the level of science and technology, the construction industry in China has developed rapidly under the support of the technical environment and economic environment. Meanwhile, the engineering quality of the construction industry has also been improved. Architectural design is the foundation of construction engineering, so its design is related to the quality of the whole project. With the development of industrialization in the information age, intelligent new technologies have been applied to architectural design. The deep integration of new technology and architectural design not only guarantees the quality of buildings, but also promotes the sustainable development of the construction industry in a far-reaching way.

2 The Great Influence of Industry 4.0 on the Construction Industry
Intelligent interconnection, information integration, human-computer cooperation and intelligent decision-making are all the core areas of Industry 4.0. The wave of Industry 4.0 has brought tremendous changes to all walks of life. These new intelligent technologies have been applied to industries and promoted their rapid development. At the same time, the arrival of Industry 4.0 has brought new changes to the construction industry. For example, the current popularity of industrial software in the construction industry is not high, and the foundation of informatization is relatively weak. However, the influence of Industry 4.0 and the application of intelligent new technologies to architectural design will bring the construction industry to a new level. High-tech new technologies
are gradually changing the traditional construction industry, which makes this industry shift from labor-intensive to technical and knowledge-intensive.

3 The Advantages of Deep Integration of Intelligent New Technology in Architectural Design

3.1 The deep integration of intelligent new technology in architectural design helps reduce consumption

With the continuous development of society and the continuous development and utilization of resources, energy conservation and environmental protection has become the focus of attention in various industries. The application of new intelligent technology promotes the combination of architectural design and high technology, which can avoid the use of non-renewable resources in buildings. This virtually saves resources and reduces energy consumption [1]. For example, architectural design can make full use of new resources such as wind, geothermal and solar energy to make reasonable modifications to the building's drainage and lighting systems. This not only rationally utilizes energy, but also reduces the consumption of non-renewable resources.

3.2 The deep integration of intelligent new technology in architectural design helps improve utilization rate

Due to the relatively large scale and the open nature of construction projects, this has increased the difficulty for their management. Designers can use intelligent technology in architectural design, focus more on the rational use of architectural space, and improve the utilization rate of construction projects.

3.3 The deep integration of intelligent technology in architectural design helps improve service quality

The basic requirement of architectural design is to make people feel comfortable, and the application of intelligent technology reflects the feature of humanity. Designers make full use of intelligent technology when designing to improve the service quality and better meet the needs of living and working. In the construction industry, with the popularization of intelligence and automation, intelligent equipment is integrated into the architectural design. This not only improves the level of the construction industry, but also improves the function of buildings, and brings people better service.

4 Analysis of the Current Situation of the Construction Industry

4.1. The construction industry faces a major shift in automation

With the continuous development of the construction industry, people's requirements for buildings are gradually increasing. With the development of Industry 4.0, the construction industry will also shift from manualization to automation, and the efficiency of construction will be improved through the use of new technologies and materials in construction production.

4.2. There is a waste of resources in the construction industry

In recent years, with the continuous development of market economy, the construction industry has developed rapidly. However, the rapid expansion of this industry also causes a problem of waste of resources. According to the relevant survey and statistics, the construction industry accounts for about 30% of the total social resource consumption. Moreover, a considerable part of the consumed resources are not fully utilized [2]. The root cause is still due to the backwardness of construction technology and the conservative concept of technicians.

4.3. The construction industry lacks talents, and the quality of architects needs to be improved

Architectural design is the premise and foundation of the development of the construction industry,
and the architect's philosophy is the soul of architectural design. Firstly, only when architects have good ideas can they create good buildings. However, at present, architects lack the concept of green environmental protection, which leads to the waste of resources in architectural design. This not only increases the construction cost, but also is not good to the rational use of resources. Secondly, the comprehensive quality of architects needs to be improved. Although many architects have received a high level of education, many of them lack practical experience and cannot combine theory with practice. More importantly, the architects lack advanced innovative concepts and cannot apply new technologies to architectural design, which will hinder the further development of the construction industry.

4.4. Architectural function is constantly improved, and its design needs to be improved
With the continuous development and improvement of the construction industry, people's requirements for architectural functions are gradually increasing. Thus, concepts such as "green houses and smart houses" come into being [3]. In the past, traditional design paid more attention to the structure and layout of buildings. However, with the continuous improvement of architectural functions, intelligent buildings focus more on the coordination of multiple departments such as power supply and information equipment, turning the entire building into a complete system. This requires the overall plan in the architectural design, which will also improve the working efficiency and the whole architectural quality.

5 Concrete Strategies for the Deep Integration of Intelligent New Technology in Architectural Design

5.1. Using BIM technology to promote intelligent upgrade of architectural design
The traditional architectural design relied on CAD drawing. However, a project is made up of different modules. In the process of information transmission of each module, some errors will inevitably occur, which will eventually lead to some problems in the construction, and thus affect the architectural quality. Architectural design is the starting point of architecture. The original intention of architectural design is to plan and prepare for construction, to improve the architectural quality with the minimum consumption of personnel, costs and materials[4]. Different from the traditional 2D graphic design, BIM technology realizes the visual design of the project through the advantages of computer technology. BIM technology has achieved professional collaborative design and changed the traditional working mode. Different from 2D graphic design, BIM technology is a visual design of "what you see is what you get". Architectural design can see the interior design of the building through a 3D view, so that the entire design can be more clearly and intuitively understood[5]. In addition, BIM can also be applied to the implementation of architectural planning. For example, at the beginning of the architectural design, reasonable control of the operation of the project can greatly save the construction time and improve its efficiency.

5.2. Using artificial intelligence technology to improve working efficiency
With the advent of the Internet and the era of big data, artificial intelligence has become a hot topic. The information society makes the environment that people are in experience a tremendous change. Artificial intelligence has covered all walks of life, such as finance, retail, and so on. Architectural design is the starting point of buildings. The application of artificial intelligence to architectural design can be started in the following two aspects. On the one hand, the early drawing design. After training the relevant machine algorithms with a great amount of architectural scheme data, the artificial intelligence system will form a relatively accurate concept for the creation of architectural scheme. On the other hand, the selection of materials. Through artificial intelligence, suitable architectural materials can be selected to improve the rational use of resources.
5.3. Using digital technology to improve efficiency
Driven by "digitization", the manufacturing industry has shifted from automation to intelligence. The source of the construction industry is architectural design, which is also the source of architectural digitization[8]. Through the forward design platform of "modularization + digitization", limited modules will be used to complete the design of "infinite" main building[8].

At present, digital intelligent technology has been widely used in security control, indoor temperature adjustment and so on. The use of digital technology allows designers to build intelligent architectural systems. Taking an architectural design as an example, a high-performance LAN and exclusive application system are designed for this building on the premise of fully considering the cost and security in the construction process. And, mobile network, wireless network and other devices are readily available. The use of digital intelligence makes the building full of technology[8].

5.4. Using ecological technology to improve energy efficiency
Low carbon and environmental protection is now advocated by many countries, and the energy consumption of the construction industry is quite huge. Applying ecological technology to architectural design is good to avoid using non-renewable resources, and is also a good advocacy for low-carbon concepts[9]. The first is the transformation of energy technology. The maintenance of mechanical and electrical equipment should be strengthened in the design. With the help of advanced mainstream technology, the system performance is more mature and easy to operate. The second is the use of roof insulation technology. In buildings, insulation is generally prevented between the top and the waterproof layer[10]. However, the insulation effect of the top layer is often poor, which is because of the poor thermal conductivity of these insulation materials themselves. In the construction process, it is necessary to select qualified insulation materials in strict accordance with the regulations.

5.5. Using environmental protection technology to reduce building consumption
Compared with other industries, the proportion of resource consumption in the construction industry is relatively huge. The application of environmental protection technology in architectural design can obviously reduce the resource consumption in this industry. In addition, in architectural design, the use of wall insulation and heat insulation technology can reduce the consumption of equipment[11]. On the other hand, building materials are a factor that designers must consider. Energy-saving building materials can achieve the goal of environmental protection on the premise of satisfying their functions. The second is to use green energy technologies, such as solar technology in the design of lighting systems. Solar energy itself is a kind of renewable clean energy, which can not only provide a good lighting environment, but also reduce the consumption of buildings.

6 Conclusion
The quality of architectural design is directly related to the good development of the construction and even the whole construction industry, so architectural design is getting more and more attention. The deep integration of intelligent new technology of architectural design is the inevitable trend of the development of the architectural industry. The application of intelligent new technology improves the level of architectural design and reduces the resource consumption of buildings. Meanwhile, it also lays a solid foundation for construction, improves the quality of engineering construction, and creates a higher quality of life and working environment for people.

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