Progress in intelligent and environmentally friendly building schemes

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Abstract

With the rapid development of artificial intelligence industry in recent years, in the field of building structure, an increasing number of new technologies and the corresponding construction method is also used in the actual project, the construction precision is greatly increased, significantly improve construction efficiency, intelligent buildings within the construction industry in recent years obtained the unprecedented attention.In the foreseeable future, more intelligent technologies will appear in the construction industry to speed up the development of the industry.In the rapidly changing industry background, how to better integrate the rapid development of intelligent technology with the traditional construction industry. This paper takes the building information model, prefabricated building scheme and intelligent technology which are highly concerned in the industry as examples, and through the design stage, construction stage, owner's demand analysis and energy conservation analysis of intelligent building, It is concluded that intelligence can be widely used in the construction industry.

Keywords

Intelligent; building information model ; prefabricated; energy.

1. Introduction

The 2019 MWC Shanghai mobile world congress was held at the Shanghai new international expo center. Huawei demonstrated the technology of using huawei 5G to remotely control excavator in henan province for construction, indicating that intelligence will lead the development direction in the future. With the development of intelligence from the traditional computer industry to various fields along with the pace of the Internet of things, the development of national science and technology ushered in a golden period.In the construction industry, the application of intelligent technology leads the innovative research of the whole industry to a new height.With the increasing requirements of new buildings on engineering technology, the traditional construction industry has ushered in a new development opportunity, from uav aerial photography in the reconnaissance stage, to BIM application in the design stage, to " intelligent building site " in the construction stage that can be remotely observed in real time and automatically alarm abnormal information, to new prefabricated buildings and so on.

Since the 19th national congress, the concept of green and sustainable development has changed the development trend and market direction of the construction industry.With the slogan of intelligent construction, the industry vigorously promotes the visual and intelligent management of engineering construction and focuses on the construction of intelligent sites with synchronized information.BIM technology is applied in the whole process of project construction. While improving the overall construction quality of the project, the construction period is greatly shortened and the goal of saving resources can be achieved."Two-dimensional code coverage, chip implantation, real-time video monitoring" and other technologies in the construction process escort, greatly improve the management efficiency.How to better integrate the intelligence with the traditional construction

industry to promote its better development is a problem that the whole industry is exploring at the present stage.

This paper takes this problem as the starting point, stands in the perspective of the construction industry, opens up thinking, and discusses how to better use intelligent technology to complete the transformation and upgrading of the construction industry by integrating the latest information of intelligent technology.How to detect the subtle deformation of underground structure in real time in underground space? On the loess plateau, how to reduce the cost of building materials under the condition of relative lack of resources? How can real-time monitoring of subsea oil and gas pipelines be refined across the vast ocean?There's so much more to explore in the future.In the slogan of the state vigorously promoting innovation in China, intelligent technology has opened up new development space for the construction industry.

2. Traditional construction industry should keep pace with the pace of intelligence

2.1 The state strongly supports the construction of energy science and technology

Since the state council put forward the strategic action plan for energy development (2014-2020), in accordance with the principles of innovation mechanism, laying a solid foundation, advance deployment, and major breakthroughs, we have strengthened independent innovation in science and technology, encouraged the introduction of digestion and absorption of innovation, and built an upgraded version of energy science and technology innovation, and built a strong country in energy science and technology[5]. Today, as the world's second largest economy, China has an unshakable voice in many international fields. Throughout modern history, many years of unrest in the Middle East have been driven by the competition between the forces behind it for oil resources. With the development of science and technology and the gradual depletion of oil resources, all countries in the world will not only focus on the oil resources in the Middle East.In recent years, the heat of the energy topic is rising, and the research on energy has attracted worldwide attention.In industrialized societies, energy drives economic advancement, scientific and technological progress, and social development.In the 21st century, when science and technology lead the development, energy will be the backbone of a country's sustainable development. All industries should seize the opportunity to develop towards the efficient use of energy.

With the positive effect brought by the national "One Belt And One Road" policy, the infrastructure construction projects in many countries along the route provide opportunities for Chinese enterprises to go international.Investment growth in the domestic construction industry is gradually slowing down, and entering the global market is another development direction for Chinese companies. Domestic investors in most countries along the "One Belt And One Road" route have poured a lot of money into transportation, real estate, communication engineering and other fields, which is a rare opportunity for Chinese enterprises whose construction industry is becoming saturated with production capacity.China has also issued relevant policies and established CITIC, the Asian infrastructure investment bank and other institutions to provide strong backing for Chinese enterprises.

2.2 The traditional construction industry is facing transformation and upgrading.

At present, a large number of external fund holders are holding a wait-and-see attitude due to the high cost and stability of the intelligent construction industry.But in the future, with the steady maturity of intelligent technology, the cost will be further reduced.Moreover, as a large number of young labor force is injected into the construction industry, the older generation of construction practitioners are gradually retired. If the construction industry does not develop to the direction of intelligent construction, then the cost of workers will further increase, and they may face the situation of no workers. According to statistics, the energy consumption of buildings and related industries accounts for about 50% of the total energy consumption of the society.In the pursuit of sustainable development today, environmental protection, efficient use of energy are inevitable guidelines. The high energy consumption of the construction industry will inevitably be guided by relevant policies

to adjust the production cost of the traditional construction industry, so as to reduce energy consumption and build a modern industry with high energy efficiency.

The rapid development of intelligent industry also drives technological innovation in various fields, and architectural engineering is no longer limited to reinforced concrete in people's traditional impression.In the design, comfortable intelligent, green environment friendly is our higher goal.When every industry is actively facing the intelligent technology revolution, the construction industry, as one of the pillar industries of the national economy, needs to actively improve the content of science and technology to increase its competitiveness.

The injection of big data, intelligent, Internet of things and other information technologies has provided a powerful internal impetus for the upgrading and transformation of the traditional construction industry.A series of national policies on encouraging transformation and upgrading of construction and related industries are strong external guarantees.Part of the enterprise has scooped into the research and development work in the field of intelligent building, BIM technology has become some college training scheme must master the skills, various universities have joined in the study of prefabricated construction, in the future the whole construction industry more and more energy will be put on the transformation and upgrading, to complete the aimed at intelligent transformation of the traditional construction.

3. Design‐3 d information integration

3.1 Information integration illuminates the construction industry

BIM is widely used in construction industry nowadays information digital integration tools, it will be a building facilities attributes expressed, in the form of digital data in the database construction through long-term accumulation will become more perfect, for the facilities from design to dismantle the whole life cycle of the decision-making to provide reliable basis. All relevant departments of the project can directly extract the latest data information from BIM, so as to coordinate all departments to complete the work more quickly.

With the continuous use of new materials in buildings, some complex geometric shapes have been designed. As to whether these buildings meet the feasibility of actual projects, feasibility research should be carried out in the computer in the way of modeling before construction, so as to provide reference for actual projects.Taking Shanghai tower as an example, BIM technical assistance project is applied in the whole process from design stage to construction stage.Rhinoceros, Grasshopper and rhino-ceros Scripts are used in the modeling process, and the complexity of the data flow and the perfection of the solutions provide important references for the application of BIM technology in domestic buildings. see Fig. 1.
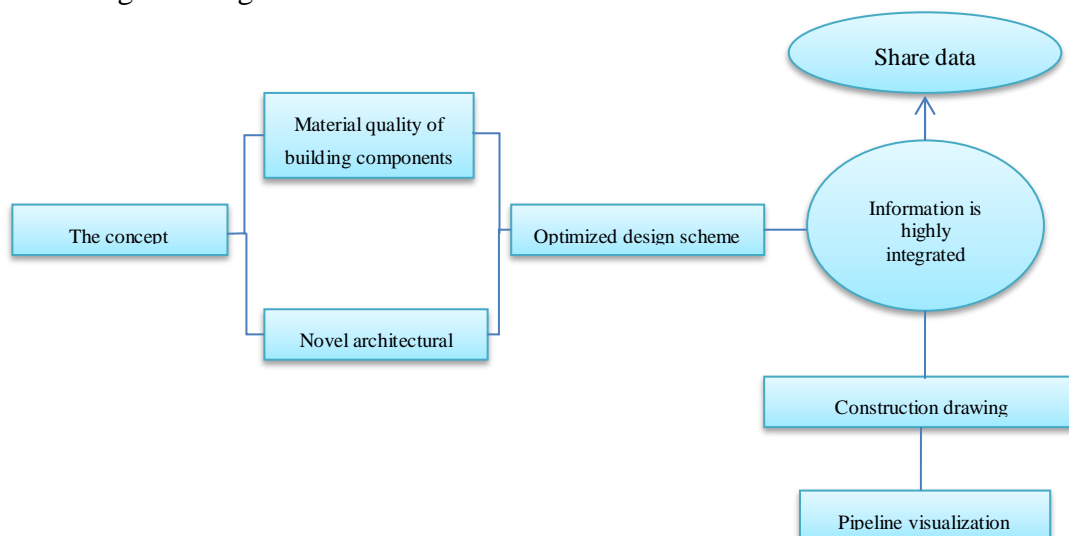
Fig. 1 Building optimization process of information integration

The development trend of large data has been unstoppable. BIM is the software with the highest degree of information integration in the construction industry, which can excellently complete the creation and management application of big data in the construction industry.With the support of BIM technology, enterprises can accurately control costs and expenditures, allocate resources to the most needed places, and improve their economic interests.With the further introduction of the national informatization development outline, BIM technology will also get rapid development under the policy support.However, due to technical reasons, BIM can hardly be applied in the whole process of engineering projects at the present stage. In most cases, BIM is involved in local projects or local processes.It is believed that with the maturity of BIM technology in the future, BIM will participate in the whole process of architectural design and construction.

At the present stage, BIM is mainly involved in the following stages of architectural engineering design:

(1) conceptual modeling stage: in the conceptual stage, through simple modeling, customers can understand the ideas of designers more intuitively, and some preliminary building area and income analysis can be obtained.

(2) design scheme stage: some new buildings have complex shapes, and BIM can play an important role in scheme optimization and feasibility comparison.At the same time, the mechanical properties and energy consumption of the building are optimized.

(3) construction drawing confirmation stage: for complex exterior design, two-dimensional design software may not be able to clearly express, at this time, BIM model can allow the construction personnel to get the best construction plan.Under the circumstance that BIM has not been popularized yet, most projects adopt the mode of BIM and CAD together, and the results obtained based on BIM are deeply optimized with CAD to ensure the accuracy of design drawings.

(4) visualization and integration of pipelines: the pipeline engineering of buildings has been troublesome to the design and construction units, and it has the following characteristics: first, the pipeline design of buildings needs various pipelines with different materials due to different functions and different positions.Second, there are many sizes and quantities of pipelines: in the design of building pipelines, the sizes of pipelines are different.And different sizes of pipeline installation requirements are also different, so it is very important to visualize the pipeline layout.Third, the pipeline design is only a small part of the total project investment, but the reasonable design of the pipeline will determine the safety and comfort of the building.Therefore, the optimization of pipeline design by BIM is very necessary for architectural design work, especially for the complex pipe network design of large buildings such as hospitals, gymnasiums and factories. BIM can completely solve the visualization problem of pipe network diagram and allow it to appear in the architectural model in three-dimensional form.

3.2 The significance of applying BIM in architectural design

Traditional CAD drawing software is to get the building plan, elevation, section drawing and construction details of the way to submit the design results.The biggest disadvantage is that due to the novel appearance of the new building, the complex spatial relationship, the two-dimensional information transfer between the plane, elevation, section is prone to error, resulting in pipeline layout disorder, these cases emerge in endlessly, bring great trouble to the construction party.For the future building tends to the intelligent development direction, the traditional CAD drawing method has been dwarfing in the aspect of information visualization.

CAD design makes every project there are hundreds of thousands of pieces of design drawings, for the construction units, just make sense of all the drawings need to spend more time, and each part of a drawing is a relatively independent, these drawings if you can't effectively integrated into a complete central database, so will inevitably spread technical engineers a lot of time and energy, for the pursuit of the efficiency of the modern construction enterprise is a great resource consumption, but also can extend the time limit for a project.Therefore, it is always a challenge in the field of

engineering construction to ensure the coordination between the design unit and the construction unit, so that the construction unit can understand the design intention.Under the background of higher and higher requirements for the coordination among various units of engineering projects, how to improve the overall fit of projects is a problem that the industry has been exploring.

The application of BIM technology converts the design drawings into the basic unit of code and stores them in the database. The central database of the whole project can be used by multiple units to view all functional and entity features of the project at any time.All design information of the building project is stored in this database to provide technical support for more perfect cooperation between project participants.BIM has a visual dynamic three-dimensional design mode, which replaces the previous line design with a three-dimensional three-dimensional building model diagram.The pipeline system in the building can be displayed in a more intuitive three-dimensional form, which can quickly find the shortcomings in the pipeline layout, so as to better optimize the pipeline design layout, improve the overall pipeline life, avoid the hidden danger caused by the mutual crossing disorder of various pipelines, and create a perfect "water, electricity, heating and ventilation" system.

4. Construction - assembly is more green and energy saving

To balance the construction of ecological civilization and economic and social development is the long-term principle to be followed by China's economic development, and the green development of the construction industry is the inevitable development trend of the future construction industry.Research shows that more and more construction enterprises choose energy-saving buildings, which will encourage more forces to participate in the research of energy-saving buildings.Therefore, how to enhance their competitiveness in the new industry is particularly important.Better technology will lead to better energy conservation, so smart environmental protection is a novel competitive advantage.

Prefabricated building is the hottest topic in the new construction scheme at present. It refers to that the main parts of the structural components, envelope components, internal installation system and pipeline equipment of the building are made by prefabrication method. Combined with the component combination connection technology, the prefabricated components are assembled in the construction site efficiently and quickly[8].It can be seen that the prefabricated architecture should not only focus on whether the structural components are assembled, but also pay attention to the integration of the system and the precision of complete decoration, so as to meet the purpose of realizing the industrialization of new buildings.

Prefabricated buildings were originally inspired by man's exploration and detailed observation of nature.Some animals are natural masters of architecture, they do not know the knowledge of structural systems and advanced construction technology, but still can build amazing buildings.Many birds in nature like to use branches to build their houses in the branches.In fact, prefabricated building is not a new concept, human beings knew how to build prefabricated housing thousands of years ago, but modern advanced material technology and intelligent technology, combined with the policy direction of sustainable development, prefabricated building with a new look to win the attention of the industry.

In 2016, China has issued a number of policies to support and encourage the development of prefabricated buildings, and relevant documents have been issued by various regions to fully support the industrialization of prefabricated buildings in line with the national goals of transformation and upgrading of the construction industry.In the future development of the construction industry, the assembly type will be used as the carrier to solve the long-standing problem of extremely high energy consumption rate in the construction industry through transformation and upgrading.

For the construction industry, prefabricated buildings will comprehensively improve the production efficiency of buildings, reduce the emission of construction waste and the pollution of water source, solve the quality problems that may be caused by the oversight in the field construction, and extend the service life of buildings.At the same time, the development of prefabricated buildings is also in line with the strategic needs of China's new urbanization construction.

5. Live -- intelligent technology into life

The development of science and technology is to bring a better life to human beings. When intelligent technology is integrated into the transformation and upgrading of the construction industry, the ultimate goal is to bring people a higher quality of life.How to better integrate intelligence into the construction industry, first of all, designers try to master the industry's latest technology before the design work, only continuous progress can adapt to the pace of development.Second, investors strengthen the investment in construction technology innovation, and strive to research and develop new construction materials and construction programs.And, make full use of materials, reduce unnecessary material loss, let each material give full play to its value.Finally, the most important thing is that livability should be considered when building intelligent buildings, and whether the application of some new technologies can bring convenience and comfort to the life of the owners.

In the current new intelligent building, more and more new technical solutions are introduced into the building.Relying on large comprehensive energy-saving construction practice case and technical support to achieve the demand for building energy applications diversification, differentiation, and provide the basis of huge amounts of data for artificial intelligence, build wisdom of energy management solutions, through the analysis of the intelligent AI processor, reasonable configuration and management construction mode, which can realize standardization of energy management system, intelligent building energy integrated optimization control, energy management platform of visual, help improve building energy efficiency management, intelligence operations and energy consumption prediction ability, raise the overall energy efficiency of buildings.

(1) Intelligent lighting system

Intelligent lighting system includes not only the lighting Settings in the residence, but also the lighting system connection of the whole building.For example, the lighting brightness of the whole building can be adjusted based on time. At the same time, individual lighting circuit can be customized to meet the immediate lighting needs of different users: lighting adjustment for parties, brightness adjustment for sleep, different modes of meeting and receiving guests, etc.

Intelligent lighting has a variety of control methods, manual, remote control, mobile phone...No longer limited to the traditional warped board switch, it has many advantages such as energy saving, extending the service life of lamps and lanterns, and multi-function, contributing to the energy conservation of green buildings.

(2) Real-time monitoring and warning system

Real-time monitoring and warning system also includes heterogeneous gas monitoring, burglar alarm system, elevator monitoring, building monitoring and other aspects.When something abnormal happens in a certain space of the building, the monitoring system will automatically identify it and send an alarm according to different situations. Modern smart building security systems are connected to homes and properties to keep you informed.The real-time monitoring system can provide a safer environment for people. For example, when people are in danger, the monitoring system will give an alarm and inform the nearest residents and properties to help them deal with the danger.

(3) Renewable natural energy utilization technology

Intelligent buildings should make comprehensive system planning for different water environments in different areas.The most simple is to establish perfect rain water collection, purification, utilization and other supporting facilities to recycle recycled water for indoor toilet flushing, indoor greening, car washing and so on to improve the utilization rate of water resources.

At the same time, develop and utilize other natural renewable resources, reduce the consumption of conventional energy, carry out intelligent detection of various pollutants, and master and judge building energy consumption in real time.

The development of intelligent buildings cannot be separated from the support of science and technology, especially China is entering the period of accelerating the construction of powerful energy science and technology, and more and more advanced intelligent technologies are needed to

interpret the "green and energy-saving" of buildings.The use of intelligent technology can minimize the use of building energy, and even achieve the goal of zero energy consumption, while creating a more comfortable, safe, efficient and healthy living environment for users.

6. Conclusion

Today, with the gradual popularization of intelligence, the surrounding things are rapidly updating and iterating. Therefore, in the future development of intelligent buildings, how will they meet the outside doubts in the face of rapid technological innovation?

Firstly, the integration of intelligent technology into an industry requires a large amount of capital investment. For enterprises that have invested a lot of human and material resources in research and development, can the relevant intellectual property policies guarantee their advantages in the future development process? As for the late entrants, will the early developers implement absolute technology blockade to ensure their interests, thus causing unfair competition in the whole industry?

Second, even if the present adopted the most advanced technology, combined with the optimization of design schemes built a building, the investment is likely to attract a lot of attention at the time, but it will be more advanced technology in the future after facing rapid depreciation risk, is there a comprehensive policy on the cost of investors for the guarantee of a certain extent.

Finally, intelligent create higher quality of life for people at the same time, so its high efficiency, fast construction speed will change the industry employment trends, from design to construction and later maintenance operations, a large number of intelligent technology application greatly reduce the labor costs, will lead to a large number of construction industry practitioners unemployment?

The country is developing at a rapid speed. Intelligent high-tech and low-energy production mode will be the pursuit goal of the construction industry and even all industries. It is an arduous task to properly handle the rapid development of science and technology and the transformation and upgrading of traditional industries. When the development of traditional construction industry is faced with the strong power of intelligence, it is necessary to seize the opportunity to integrate and absorb advanced technologies into its own upgrading, so that the traditional construction industry can also move towards high-tech industry.

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