

# Difficulties and Countermeasures of BIM Forward Design

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## Abstract

**BIM (Building Information Modeling) technology has greatly promoted the development of construction engineering in recent years. The shift from traditional reverse design to positive design is an inevitable trend for the continuous improvement and development of BIM technology. However, the implementation of BIM forward technology is difficult. This paper combs the implementation difficulties of BIM forward design, and summarizes the corresponding countermeasures.**

## Keywords

**BIM; Forward Design; Implementation Difficulties.**

## 1. Brief Description of BIM Forward Design

BIM forward design is different from the traditional reverse design technology, which is the design process from concept to object. That is, “ modeling first, drawing later ”, which is led by BIM information model and runs through the whole life cycle of the building. With BIM thinking mode, all the information is concentrated to carry out design scheme scrutiny and audit through BIM model. The whole process of BIM application is from the scheme stage, preliminary design, deepening design, drawing and cutting, construction guidance to operation and maintenance application. [1] This is an effective way to promote building intelligence, digitalization and informatization, and also a bridge between BIM and intelligent construction.

## 2. Advantages of BIM Forward Design

First of all, BIM forward design can intuitively show the design intention and design results through BIM information model, so as to facilitate the subsequent design scheme deliberation and verification. Secondly, the use of collaborative work set can break the geographical constraints, and various specialties can work together, which can not only accelerate the design progress, but also strengthen the information exchange between various specialties. In addition, each single component information is stored in BIM model, which is different from the form of reverse design in which single component information is represented by legends. Component information in BIM model is more intuitive and easy to understand and view. Finally, BIM model can reflect the problems existing in the design process at the design stage, and solve them in time to avoid rework.

## 3. Difficulties in Implementation

### 3.1. Lack of Professionals

BIM forward design requires high professional quality of designers. Not only need skilled software operation, but also have a certain professional level, rich practical experience.

The actual situation is that most designers have limited level, which is not enough for BIM forward design. Some designers, although experienced, have not yet mastered the use of BIM software ; some young designers master the operation of the software well, but lack of experience, may lead to design results divorced from reality.

### 3.2. Increased Workload

Compared with the traditional reverse design, the precision of BIM forward design is greatly improved. In the traditional CAD design period, the industry's requirement for designers is to express the design intention through illustrations. The forward design not only requires the industry requires designers not only to express the design intent, but also should fully restore the design requirements. [2] If there is no perfect component library, the workload of designers will increase a lot. At the same time, if there are design changes, it will involve multiple professional model updating work, and will increase the workload of designers.

### 3.3. Difficult Quality Assurance

On the one hand, in the process of BIM forward design, the construction of three-dimensional geometric model is more difficult than the traditional drawing of CAD drawings, which may lead to component duplication or component overlap. On the other hand, a unified positive design audit standard has not been formed so far, which leads to the fact that the positive design results of BIM have not been widely recognized by the construction industry, and the quality of BIM positive design is difficult to guarantee.

### 3.4. Non-uniform Standards

There are many ways to express the name of the same component in the forward design process, and different designers are difficult to unify. In the same project, the design units, construction units, supervision units and other units urgently need the standard unification of the forward design model. The inconsistent standards are not conducive to the exchange of information between designers and the docking of different stages of the model. At present, there are many normative standards in China, but these standards are not universal. The inconsistency of standards is extremely detrimental to the promotion of positive design.

### 3.5. Insufficient Software Application

BIM mainstream software is mainly foreign software products, and cannot be deeply integrated with domestic standards and norms. [3] In particular, in terms of structural design, taking REVIT software as an example, there are no separate structural design modules such as reinforcement arrangement, and only rough civil design can be carried out. Designers often need to carry out fine structural design in special structural design software, and then import it into REVIT. Obviously far from directly using CAD software for two-dimensional design convenient.

### 3.6. High Costs

BIM forward design can greatly improve the design quality, timely find the problems existing in the design process and solve them, increase the actual cost of the enterprise, and bring greater value to the owners. But owners are often only willing to pay for the cost of traditional CAD design, resulting in the high cost of BIM forward design, but the income is not enough to maintain high costs, resulting in many enterprises are not willing to take the risk of profitability or even loss to carry out BIM forward design business.

### 3.7. Unreasonable Progress Requirements

BIM forward design is through the whole process of design, which needs a certain scientific and reasonable time to complete. The working hours required in the design stage are mostly pushed back by the completion deadline, and the time required for forward design is not equal to the time required for traditional reverse design. Under the same time, more precise BIM forward design is needed, and designers need to work overtime. In the high-intensity working state, the quality of the design results of the designer is likely to decline, and due to the existence of this unreasonable schedule requirements, the enthusiasm of the designer will also be reduced,

which leads to the low acceptance of the designer of BIM forward design and is difficult to promote.

## **4. Implementation Strategies**

### **4.1. Personnel Training**

Enterprises should formulate BIM forward design talent training plan, organize training activities regularly, and improve the professional quality of BIM forward design personnel. At the same time, enterprises should also formulate corresponding assessment system, and regularly test the professional quality of designers.

For colleges and universities, it is possible to carry out school-enterprise cooperation, regularly invite enterprise BIM engineers to teach experience to students in construction colleges, or carry out teaching practice, encourage enterprises to receive students from construction colleges to practice BIM engineers, and jointly cultivate compound BIM forward design talents. At the same time, construction colleges should set up BIM-related courses and carry out general education on BIM for students.

### **4.2. Institutional Guarantee**

Establishing a mechanism for auditing BIM forward design results can standardize BIM forward design delivery standards and improve the quality of BIM forward design results. Enterprises can implement the reward and punishment system to improve the enthusiasm and creativity of employees in BIM positive design enterprises, thereby improving the design efficiency.

### **4.3. Technical Support**

For BIM forward design, it is necessary to innovate and improve on the basis of REVIT to develop BIM forward design software that meets the structural design requirements. Specifically, there are the following two requirements: ( 1 ) lightweight project model, so that in the late stage of design modeling, the designer ' s instructions can be quickly completed and the design time can be saved ; ( 2 ) Establish a complete and standard data family to reduce the designer ' s forward design workload.

### **4.4. Financial Support**

Enterprises can jointly promote the advantages of BIM positive design, and take excellent BIM positive design results as a typical case to show the high quality of BIM positive design to the owners. Then properly raise BIM forward design charges, while improving the grade, but also balance revenue and expenditure to ensure the normal operation of the enterprise ' s capital chain.

### **4.5. Improving Information Process**

The promotion of BIM forward design is not only a simple software application, but also involves multiple professional information exchange and cooperation. With the advancement of the project process, project parties need to communicate more frequently, technology flow and management flow need to be further coordinated. In the delivery process of BIM forward design model, attention should be paid to the maintenance of information exchange among various majors. Problems should be timely feedback to improve the efficiency of forward design and enhance the practicality of forward design.

## **5. Conclusion**

There are many problems in the promotion of BIM forward design at this stage, but BIM forward design is an inevitable trend of continuous improvement and development of BIM technology, and it is also an important bridge between BIM technology and intelligent

construction. Therefore, the construction industry should solve the problems existing in the promotion through personnel training, system guarantee, technical support and other strategies, adhere to the promotion of BIM forward technology, continue to promote the informatization, intelligent and digital development of the construction industry, and lay a solid foundation for the development of intelligent construction industry in the follow-up construction industry.

## References

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