

BIM-Based Employment Guarantee mode for Migrant Workers in Chinese Construction Industry

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Key words. ID cards; BIM; migrant workers; employment Guarantee; management Model.

Abstract. Based on information sharing idea, BIM (Building Information Modeling) technology had been widely used in construction industry. Employment Guarantee for Migrant Workers is hot topic in Chinese construction industry. There were few articles focus on using BIM to solve the Employment Guarantee problem. Based on the BIM technology, a new management mode was developed in this paper. In this mode, ID card which was hold by migrant workers was designed as the core and the migrant workers personal data system and BIM data could be linked together by ID card. Then, the insertion, extraction, update and modification of migrant workers' personal information during the construction stage could be used to solve the workers' employment guarantee problem.

1 The introduction of BIM

BIM originated in the 1980s, at the beginning of the 21st century, with the rapid development of computer technology, a large number of engineering software matured, the software developers involved in BIM development, BIM research was quickly promoted up. Subsequently, Autodesk Inc. made comprehensive exposition in the white paper of BIM. It was marking the new era of BIM [1-3].

BIM's full name is "building information modeling"- a engineering data model that is based on 3D modeling technology, exchanging information resources as the core and integrating the related project information together [1-2]. So it supports the participation of the project to insert, extract, update and modify a variety of information through the BIM, to reflect the work of their respective responsibilities, to ensure the reliability and the circulation of the data.

In the past ten years, building information model technology has achieved a lot of application results in the construction field in the United States, Japan, Hong Kong and other countries and regions. Many domestic forward-looking and vision strategic construction enterprises began to think about how to apply BIM Technology to enhance the level of project management and the core competitiveness of enterprises, such as Shanghai Center, Tianjin 117, Chinese statue, Wangjing SOHO and so on [4]. With the continuous growth of China's economic development and the construction industry's communication for information, the corresponding construction technology is becoming more and more complex, the traditional mode is unable to meet the demand to reflect the structure and project cost of construction. But now, we could apply 3D modeling analyze project based on BIM platform and PIP technology [5], BIM certainly will become the mainstay of the development of construction industry.

2 The problems of employment guarantee for migrant workers in chinese construction industry

Currently, the construction industry is shifting from 2D to 3D collaborative work, it is a period of technological change, multi department's information sharing, delivering and exchanging is the core and foundation in construction industry [1-4].

At this stage, the main research is the application of BIM in the decision phase, design phase, construction phase and other, to solve resource sharing problem among designer, contractor and

owner, it is a research main for structure. BIM research is very new at present in our country and it have been neglected an important issue that migrant workers' position in the industry information and whether the problems of migrant workers can be solved by BIM Technology. Migrant workers are the main body of the construction industry, there are 27395 million. Migrant workers totally in 2014 according to National Bureau of Statistics and migrant workers in the construction industry accounted for 22.3% among them. The drawbacks of the huge crowd and the construction industry's labor employment have been caused a troubled years of the China's migrant workers issues, construction management and construction quality problems. This paper is going to solve two aspects of migrant workers problem based on BIM platform: one is migrant workers' employment guarantee, the other is derivative problem caused by migrant workers' problem. The specific content as shown in figure 1:

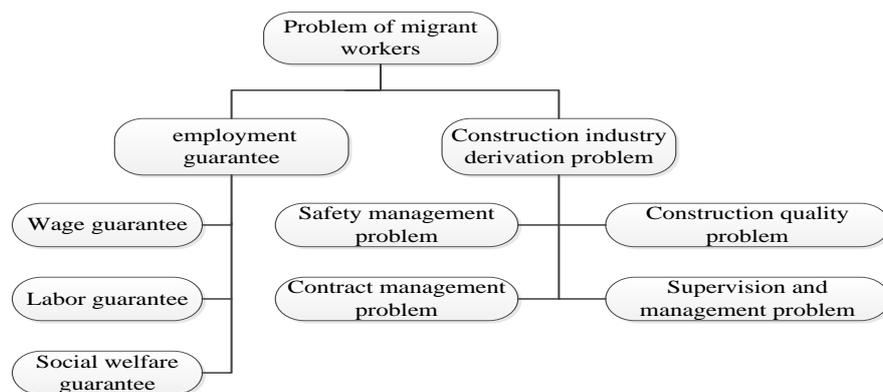


Figure 1. Analysis of the problem of migrant workers

Migrant workers' problem of employment guarantee are mainly embodied in the following aspects, firstly, wage guarantee problem that wages can't be paid by time; secondly, labour guarantee problem that they haven't signed contract or have signed unfair contracts, they haven't participated in the Union, working for a long time, learning and training is not sufficient and other problems; thirdly, social welfare guarantee problems, namely, the migrant workers' identity and social guarantee in city, migrant workers social insurance, employment injury insurance problem and so on[7-9].

The problem of migrant workers is mainly due to their job's mobility, so the traditional Department of social functions such as village committee or city community organizations can't put them into their management and service [9-10]. This lead to the migrant workers becoming more and more vulnerable and marginal and finally result in derivative problem caused by migrant workers' problem, namely, the construction safety management problem, construction quality problem, contract management problem, construction supervision problem and other issues. This is because the whole industry do not attach importance to the individual capacity of migrant workers, meanwhile, the workers' culture level is not enough and technical ability is uneven. So it directly leads to the uncertainty of construction safety and construction quality, the complexity of the construction contract and construction supervision. This series of hidden dangers increases the difficulty of construction management.

The problem of employment guarantee and management for migrant workers seems complicated, the real reason is that migrant workers personal information run sluggish in the construction industry information. Now, BIM's emergence make all building data gather together and it could be used to solve the problem of migrant workers. Firstly, we should establish a set of migrant workers personal information system and import the personal information of migrant workers to the information system, then let the information system data flows into the construction industry information data chain, finally, it could provide a rapid and effective method to solve the problem of migrant workers relying based on BIM.

3 The BIM-based method to solve the problems of employment guarantee for migrant workers

3.1. The BIM-based personal information system for migrant workers. The designer, contractor and owner in construction industry could import each other's information into BIM data stream through a variety of software, including four parts: data layer, platform layer, model layer and application layer. The following functions can be implemented through data connection of the four levels. Firstly, we could check relevant construction information to correct it and update information [5].

Secondly, establishing a cloud information-sharing platform to prepare for the late operation and maintenance with big data information construction as the background. This paper will design a kind of ID card as the carrier of migrant workers' personal information and sharing above information into the BIM platform. The relevant government department is responsible for statistics and distribution of ID card. Building work on the ID card statistics, entry and payment management responsibility. Converging migrant workers personal information data with BIM building information and migrant workers' personal information could be extracted by everyone independently at one's convenience. So the migrant workers' personal information system could be established based on BIM.

3.2 Structural design of ID work card. ID card is the carrier of migrant workers' personal information and the key to entire construction industry for millions of migrant workers. Meanwhile, the ID card is an effective way for protection of migrant workers' rights and management of migrant workers, it consists of personal information, work experience, work state, rights guarantee and other classes. The specific content as shown in figure 2.

Personal information class: name of migrant workers; gender; date of birth; native place; permanent address; telephone; other relatives' contact; blood type; history of diseases and so on.

Work experience class: migrant workers' subsidiary companies and types of qualifications formerly; basic status of the projects formerly, including time and place; migrant workers' rewards and punishments, safety accidents which caused or avoid by personal reasons.

Work state class: the types of migrant workers and their qualification currently; basic status of the projects currently, including the location and the time of the project, the project level and the subordinate units, migrant workers' work quality and so on.

Rights guarantee class: unit of migrant workers; the contents of the contract; migrant workers' social insurance; salary payment situation; rights and interests dispute, migrant workers' complaints and situations.

Other classes: this classes are reserved for future problems that may arise in the future, to facilitate other features or data access.

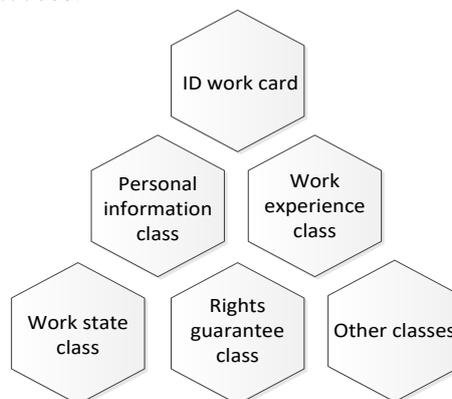


Figure 2: ID work card structure diagram

3.3 Colour illustrations. The ID card is a kind of information flow and information terminal platform that relatively independent of the construction information, the migrant workers' personal information is collected on ID card. Integrating two kinds of information together through the BIM platform, then, insertion, extraction, update and modification of personal information of migrant workers at the appropriate stage based on BIM platform too, this way could apply to solve the

construction problems. The specific contents are shown in figure 3. The migrant workers' personal information contained in ID card could exchange with building information based on the BIM platform, and it won't work without the connection of ID card and BIM platform, the solutions will be expounded in subsection next.

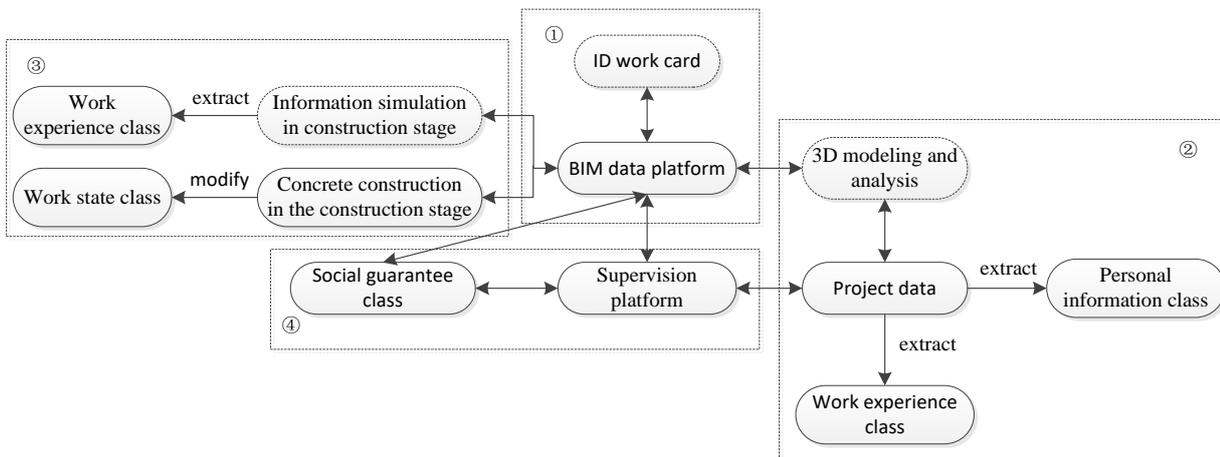


Figure 3: Information flow diagram based on BIM platform

3.3.1 ID work card data entry. ID work card would be issued by the relevant government departments since the migrant workers set foot in construction industry. It should be emphasized that the migrant workers' labour relations should belong to a qualified professional services company when the worker was under the mode of ID card, the company apply for work card uniformly and report training status to the relevant departments. Migrant workers sign labour contract with labour Service Company, labour contract mark ownership, training, wage, social insurance and so on. So the migrant workers have clear labour ownership, clear payroll and other key rights to avoid labour contractor, to regulate the labour market, to protect the rights of migrant workers, to make the migrant workers to be an organized and disciplined groups.

ID card data is embedding as shown in the region one. The personal information in the ID card not unidirectional and could feedback with BIM platform, personal information's changes will reflect to the platform and the project progress information will feedback to work card so that the information can be shared. Thus, government regulators can supervise the construction process through watch over the progress information of the project, the responsible could be found out when something happened though monitoring the record of construction process.

3.3.2 Information flow in the construction stage. As shown in area two, all kinds of information of the project data could be built through 3D modeling analysis in the early stage of project. Then, selection of qualified migrant workers though ID card information and building information which provided by BIM platform, namely, extracting work experience information to select the migrant workers which have relevant construction experience and qualifications by comparing concrete construction method and construction process. So the construction quality can be ensured through the above discussion, the construction waste can be reduced; the construction problems derived by migrant workers can be solved also. The qualified migrant workers can be selected first and quality of construction can be ensured subsequently.

As shown in area three, with the construction progress advance steadily during concrete construction process in the construction stage, modifying the working state of migrant workers information work in ID card and record the work hours, calculation amount, performance evaluation record in the construction process at any time. You can clear the source of the problem timely and modify the work state information when there is a problem. This method can promote the migrant workers understand their employees will be reflected in the flow of information, it will has a great influence in the future work, make migrant workers engaged in the process of work seriously, participate in learning and training consciously, improve their own strength to ensure the quality of construction. Namely, the migrant workers volunteer to guarantee the construction quality to strengthen and improve the construction management further.

3.3.3 Supervision information data flow. The regulation contains two aspects: the supervision of the relevant departments and the quality supervision. Make supervision information join together to supervision platform and let the platform connect with BIM platform and ID card to form a cross data connection, the regulatory aspects could follow up the progress of the project and the interests of migrant workers to, make attention to contents of the contract, the state of the contract at any time, social insurance, progress in resolving disputes, the rights and wages of migrant workers and so on. In addition, dealing with the illegal situation of management in time to ensure the legitimate rights and interests of migrant workers.

4 Summary

We can determine that combining the ID work card personal information data with BIM platform together is very effective to protect the employment guarantee of migrant workers, including wage protection, employee labour guarantee and social welfare. Besides this, it also could be used to solve the derivative problem caused by migrant workers' problem, namely, the construction safety management problem, construction quality problem, contract management problem, construction supervision problem and other issues. In a word, combining personal information in ID work card with BIM data platform to solve the problem of employment guarantee and derivative problem caused by migrant workers, and ultimately achieve a goal: a sound guarantee system + smooth information = excellent construction worker + efficient management + excellent quality.

However, we need to clear that the solution of the migrant workers must be led by the government and it cannot be separated from the active cooperation of all parties in the construction industry and the close supervision of the third parties of the society. Only in this way can the problems of migrant workers be solved radically, to promote the entire construction industry to enhance the quality of construction and quality management, to make the industry move forward steadily. In a word, threaten of the new program cannot be implemented successfully without the support of the outside environments.

Acknowledgements

This paper was supported by the Natural Science Foundation of Hebei Province, (Grant No. E2016203147).

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