

Fall 2010

LOCATION LOCATION LOCATION GIS

22°17'2.18"N
114° 9'18.28"E

88 Floors

International
Finance Centre
22°17'6.43"N
114° 9'33.79"E

Temperature: 25 C
Humidity: 74
Air Pollution Index: 32

22°16'46.49"N
114° 9'41.27"E
72 Floors
135,000 m²
45 Elevators

90 m²
Apartment
24th Floor

Lights On

Lights Off

Carpet 48,600 m²
Renewable Energy:
107,219 Megajoule
Energy Use:
8,101,080 Megajoule

26th Floor
22°16'44.02"N
114° 9'0.05"E

Hong Kong Population: 7,055,071
Water: 2.63 Million Cubic Meters Per Day
Energy: 805 Terajoules Per Day

BIM BIM BIM

The Status of BIM Application in China's AEC Industry

By Wu Wei, Raja R.A. Issa and Jiayi Pan

IN 2009, GLOBAL CONSTRUCTION PERSPECTIVES AND Oxford Economics in forecasting the construction market in 2020 estimated that China would overtake the United States as the world's largest construction market by 2018, with a construction market worth about \$2.4 trillion and representing 19.1 percent of the global construction output.

The purpose of this research is to enhance understanding about BIM development in China and to determine the level of BIM implementation in China's architecture, engineering and construction (AEC) industry. In addition, it aims to respond to the ongoing effort of buildingSMART International to promote adoption of International Foundation Classes (IFC)-based BIM standards. The objectives of this pilot study were:

- To reveal quick facts regarding BIM usage in China;
- To understand the industry's attitudes towards BIM;
- To understand the benefits, challenges and factors that impact BIM deployment in China;
- To benchmark the BIM application status in China; and
- To propose a future action plan for promoting BIM deployment in China.

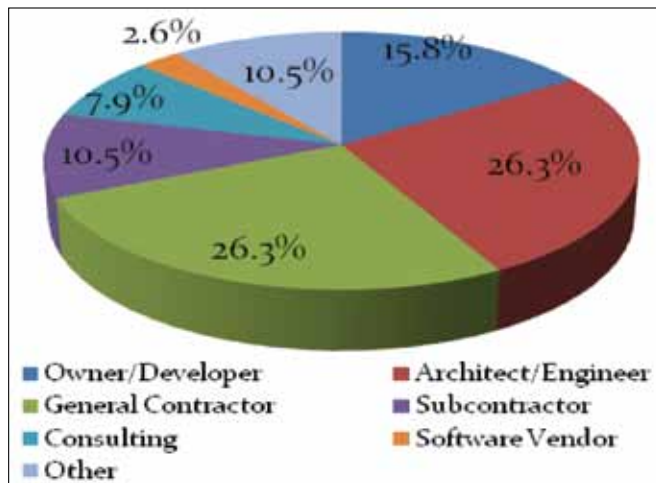


Figure 1. Type of business.

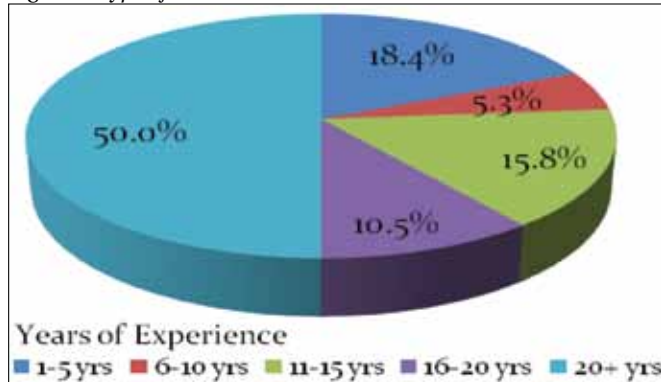


Figure 3. Experience of companies responded.

Survey delivery	Number of recipients	Language	Completed*	Partially Completed	Response Rate
Zoomerang	101	Chinese	22	15	21.8%
Email/Mail	302	Chinese	16	0	5.3%
Total	403	Chinese	38	15	9.4%

Table 1: Survey results summary. *There might be some blanks in the questionnaires.

A survey questionnaire in both Mandarin and English was developed. Survey participants were all Chinese AEC professionals, a majority of whom were members of the Institute of International Engineering Project Management (IIEPM) and were in the client directory of Glodon Co., Ltd (one of the biggest vendors of construction information technology software applications in China). The questionnaires were delivered to the participants as email attachments, through ordinary mail or a web survey hosted at Zoomerang (an online survey tool).

RESULTS

The survey was conducted over 60 days starting on September 15, 2009. Thirty-eight completed questionnaires were obtained and are briefly summarized in **TABLE 1**.

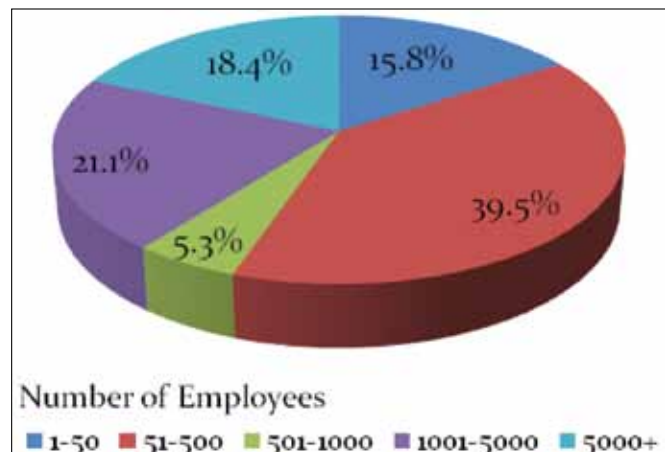


Figure 2. Size of companies.

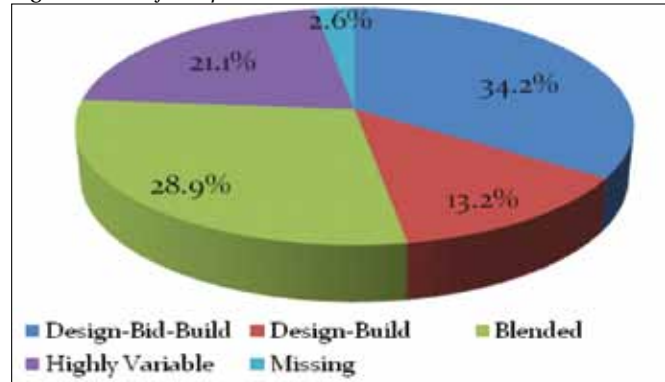


Figure 4. Major project delivery methods.

GENERAL INFORMATION

Part 1 (questions 1 to 4) of the questionnaire collected basic demographic information about the respondents and the companies for whom they worked (FIGURES 1, 2, 3, 4). Part 2 (questions 5 to 7) of the survey targeted the respondents and their companies' experience with BIM (FIGURE 5, 6, 7, 8).

Collectively, Part 1 and Part 2 revealed some quick facts about the AEC industry in China:

- The size of companies tends to be gigantic (40 percent with 1,000 or more employees);
- Design-bid-build is the prevailing project delivery method;
- Most respondents started their BIM journey in the new millennium (50 percent after the year 2000) and a significant portion (32 percent) of them had not done anything on BIM yet.
- Companies using BIM tended to be very active in BIM implementation (11 percent had 20 or more projects that used BIM).
- ArchiCAD (42 percent) followed by Revit (10 percent) were the most popular BIM authoring tools.

PERCEPTION RESEARCH

Part 3 of the survey (question 8) inquired about the perceived benefits of BIM to the Chinese AEC industry. The participants were required to give a score to a list of possible benefits

based on the Likert scale of 1 to 7, ranging from "least beneficial" to "most beneficial" (FIGURE 9).

Part 3 of the survey (question 9) inquired about the possible challenges facing BIM adoption in China and also asked the participants to give a score based on the Likert scale of 1 to 7, ranging from "least challenging" to "most challenging". FIGURE 10 illustrates the perceived level of challenges.

There are three quite distinct tiers based on the Likert Scale scoring. Management-level commitment costs were perceived as the biggest obstacles to BIM adoption in the industry. Lack of external incentives was also a serious fallback. Return on investment, financial risks and liability issues were considered least challenging, which was surprising. The immaturity of BIM development may account for this; it may simply be too early to think about the cost issues.

Part 3 of the survey (question 10) listed possible factors that could significantly boost the development of BIM in China. Participants were required to rank these factors based on their experience, knowledge or understanding of BIM using a Likert scale of 1 to 7, ranging from the "least critical" to the "most critical" factors (FIGURE 11).

"Trial-and-error" is still the most trustworthy method in the industry to gain knowledge and confidence in BIM. Access to reliable databases that capture past project experience seems to be well appreciated to help companies embark on the

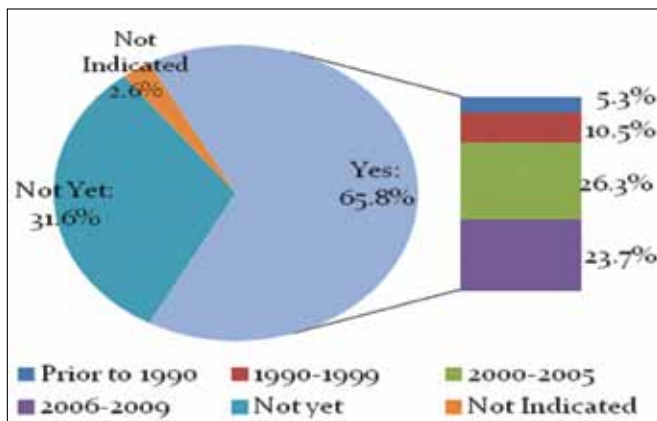


Figure 5. Time when the respondents' companies started to look into BIM.

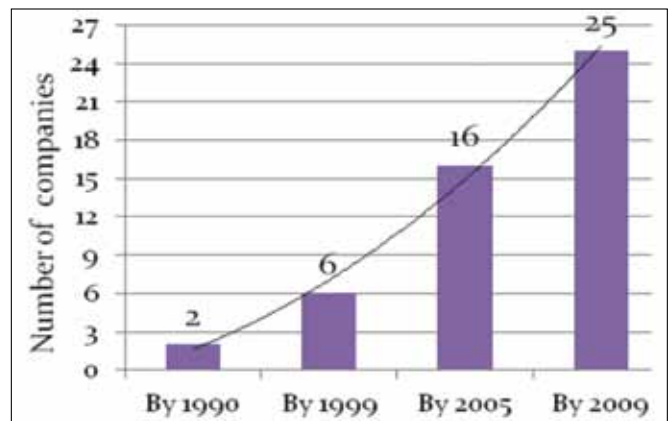


Figure 6. Cumulative number of companies that started to look into BIM, by time period.

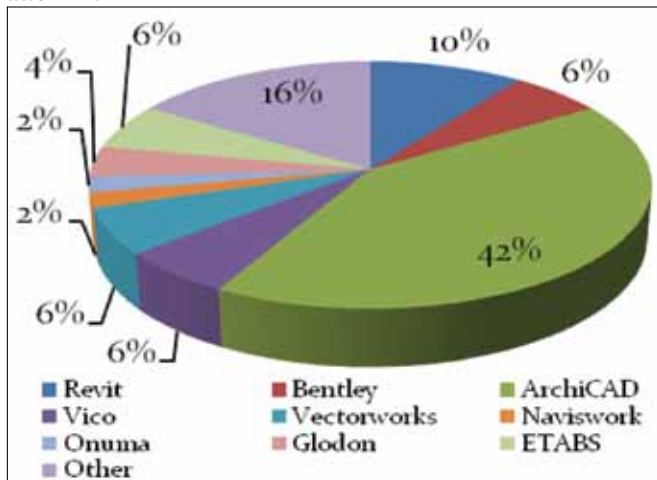


Figure 7. BIM software adopted in respondents' companies.

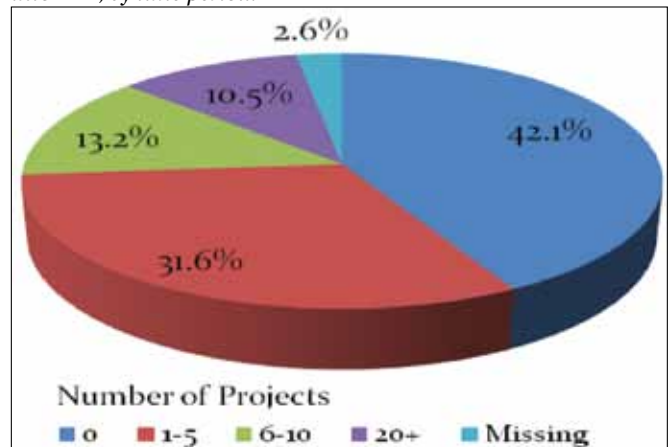


Figure 8. Number of projects in respondents' companies involving BIM implementation.

adoption of BIM. Professional training and continuing education could help tackle the technological challenges and prepare the industry for BIM deployment.

Interoperability is at the heart of efficient BIM implementation and takes into account the magnitude and heterogeneity of the AEC industry in China. Standardization thus becomes critical to provide the top-down guidance to the industry to ensure that the BIM market will grow in the desired direction. Similar to the U.S., the development of a Chinese-specific national BIM standard is the highest priority in the BIM roadmap of China. The more imperative task to the respondents is to establish the preliminary framework for BIM implementation in the industry based on consensus among AEC entities and pertinent governmental agencies.

BIM AND INTEROPERABILITY

Part 4 of the survey investigated the interoperability issue in BIM development. The participants gave their opinions on a set of 10 questions in yes/no format. This allowed the researchers to understand the respondents' awareness of interoperability and their competence in dealing with the challenges posed by interoperability.

As suggested by **FIGURE 12**, most companies knew little about IFC and buildingSMART International. The financial implications of interoperability problems were not recognized and no relevant market data were documented. The respondents showed interest in cooperation with buildingSMART International (for example, membership) in future to learn more about IFC and interoperability and their roles in BIM development.



Figure 9. Perceived benefits of BIM to the AEC industry sorted by score.

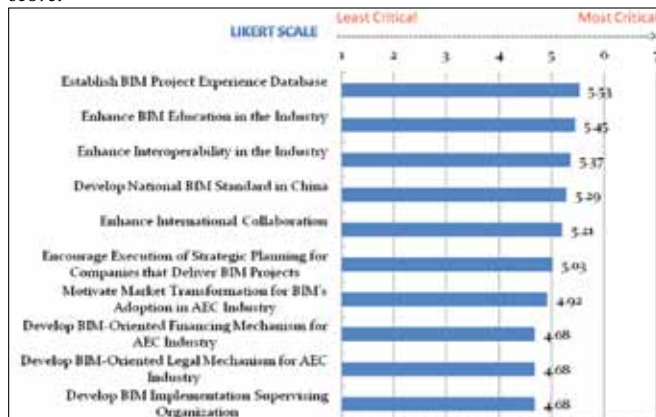


Figure 11. Perceived critical factors for BIM development in China.

CONCLUSIONS

The BIM market in China is underdeveloped in comparison with the overall momentum of its AEC industry. The benefits of BIM are well acknowledged but the lack of management-level commitment and external incentives and fear of extra costs in upgrading to BIM have hindered BIM adoption. Professionals are counting on guidance from governmental and other supervisory organizations. Formulating the national BIM standard is definitely the highest priority in China's BIM roadmap. Initial efforts are expected to take place soon. International collaboration can be very beneficial to ensure a good starting point for such endeavors.

Interoperability issues had been encountered by the respondents but no action had been taken to cope with them. The respondents' interest in more information about interoperability through IFC and buildingSMART International was observed in the responses. The opportunity to enhance collaboration between buildingSMART International and China's AEC industry should not be overlooked. The role of governmental agencies such as the Ministry of Housing and Urban-Rural Development (MOHURD) in such collaboration tends to be critical and needs to be taken into account. ■

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Figure 10. Perceived challenges facing BIM adoption in China's AEC industry.

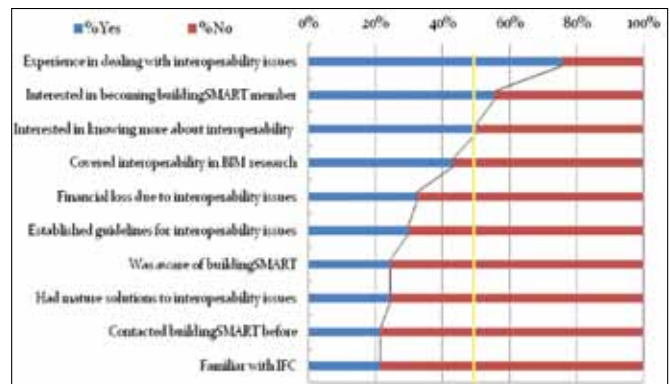


Figure 12. Knowledge and experience in interoperability of respondents' companies.