

Awareness of adopting building information modelling in construction – case study of consultants perception in West Sumatra

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Abstract. Building Information Modelling (BIM) can support and ease project design planning process, schedule management, budgeting, simulation, analysis and various other things. Therefore, it can help to plan projects more efficiently and accurately. The purpose of this study was to determine the awareness of consultants in West Sumatra in adopting BIM. This research was conducted on consultants in Ikatan Nasional Konsultan Indonesia (INKINDO) and Persatuan Konsultan Indonesia (PERKINDO) in West Sumatra. Data retrieval was done by random sampling with structured questionnaires distributed to 20 consulting companies. All questionnaires were collected and analysed. The results showed that the awareness of adopting BIM by the consultants was very low.

1. Introduction

In accordance with Indonesia's Vision 2045, the Government of Indonesia is currently working hard to create a superior, cultured, and mastered science and technology. Therefore, with quality human resources, the Indonesian economy can grow and become sustainable, development will be more equitable and inclusive, and the nation will be more democratic, strong and clean. Indonesia's Vision 2045 has four main pillars, namely human resource development and mastery of science and technology, sustainable economic development, equitable national development, and National Resilience and Governance. The pillars of equitable development and mastery of science are under the purview of the Construction Services Development Institute[1].

The institute acts as a platform for the organisation of construction services community role in carrying out the development of construction services. It has three goals, and one of the goals is to create a strong, reliable, highly competitive business structure and qualified construction work results. To achieve this goal, the construction services development agency has a mission, which is to build the capacity of national consultants and contractors in providing consulting services and construction work through the improvement and development of knowledge and technology in the field of construction services. Therefore, quality construction work can be produced by adopting the Building Information Modelling (BIM) [2–4].



2. Theoretical study

BIM is a digital representation of the physical and functional characteristics of a building. Its system contains all information about the planned building elements, which are used as the basis for decision-making in the building life cycle period from concept to demolition. The BIM concept has been around since the 1970s. However, the term Building Information Modelling (BIM) began to become popular after Autodesk released a paper entitled “Building Information Modelling” in 2002 [5,6].

The purposes of implementing BIM are include to increase productivity and efficiency of the construction process; to collaborate with all construction stakeholders (investors, planners, contractors); to improve quality; cost control and time management of construction projects and regulators actively provide approval, monitor and supervise the progress of digital construction work as other developed countries [7,8]

The most important advantage of the BIM technology is the complete interdependence of all types of information, each of which is updated automatically upon a single introduction of any changes [9]. In detail, BIM produces integrated planning, implementation and maintenance. The benefits of BIM are as follows [10,11]:

- i. Process faster and more effectively
- ii. Better design
- iii. Predictable budget plan
- iv. Better quality of production
- v. Better customer service
- vi. Longer data life cycle

In practice, the BIM has evolved to 7D [12,13]. The characteristics of the dimensions are as shown in Table 1.

Table 1. Characteristics of the BIM dimensions

BIM Dimension	Descriptions
3D	3D building data and information, field layout and civil data, reinforcement and structure analysis, existing model data.
4D	Project schedule and phasing, just-in-time schedule, installation schedule, payment visual approval, last planner schedule, critical point.
5D	Conceptual cost planning, quantity extraction to cost estimation, trade verification, value engineering, prefabrication
6D	Energy analysis, green building element, green building certification tracking, green building point tracking
7D	Building life cycles, BIM as built data, BIM cost operation and maintenance, BIM digital lend lease planning

The implementation of BIM in Indonesia is done through the Indonesian BIM Roadmap which the roadmap was referred to the contents of Malaysia BIM Roadmap [17-19]. Among the the pillars of the BIM roadmap in Malaysia include the awareness and education. The activities that are carried out to create awareness for adopting BIM include national conference and international conference, annual competition)at the industry level), promotion (in media, website, newspaper, etc.), award, syllabus

included in degree and master courses (built environment and engineering) and training modules and documentations [20]

Indonesia has begun to implement BIM in all construction works. The implementation of BIM in Indonesia follow the some planning and regulations stated below:

- UU No. 17 of 2007 concerning the RPJP 2005 – 2025.
- UU No. 2 of 2017 concerning the Construction Services.
- Presidential Regulation No. 2 of 2015 concerning the 2015 – 2019 RPJMN.
- PUPR Regulation No. 22/2018 concerning the Construction of State Building Buildings.
- Making Indonesia 4.0 Roadmap.
- Direction of the Minister of PUPR: 5 (five) Breakthroughs for the Acceleration of Infrastructure Development.

3. Methodology

The main focus of this study was to assess the awareness of BIM adoption by consultants in West Sumatera. Figure 1 depicts the conceptual framework of the study.

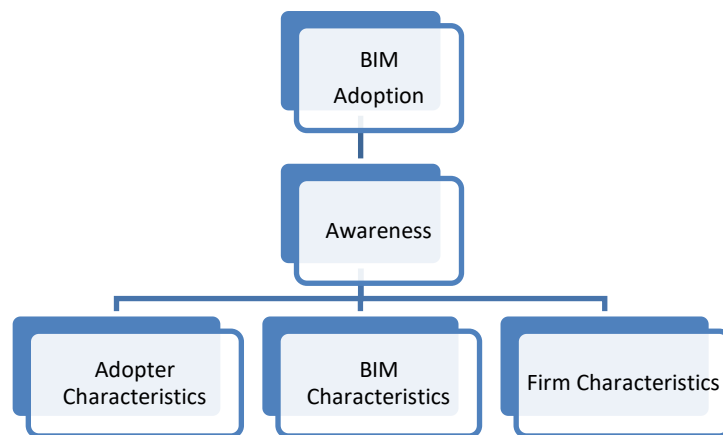


Figure 1. Conceptual framework

The study analysed the survey results from the viewpoint of the construction organisations' representatives to measure the different levels of BIM awareness. The questionnaire was used to collect data that are relevant to the causal factors/items of awareness of adopting BIM by consultants[14,15]. It comprised of three parts and had 22 questions. The questions in the questionnaire were designed based on the identification of the factors. The first part aimed to elicit general information of the respondents. The second part dealt with the BIM awareness items. The third part was intended to examine the BIM adoption items. The items in the questionnaire were assessed with a 5-point Likert scale ranging from 'Not Important' to 'Very Important'. The respondents consisted of the INKINDO members. The results of the study were analysed by counting the number of respondents and comparing with various response groups. The following section presents the results of the survey.

4. Analysis

This section examines the level of awareness of BIM adoption. In the questionnaire, BIM awareness was assessed via the 5-point Likert scale starting from 'Very important' = 5, 'Important' = 4, 'Undecided' = 3, 'Least important' = 2, 'Not important' = 1. Descriptive statistics showed the scores

obtained by the professional groups in terms of BIM awareness. The level of awareness of BIM adoption items in the questionnaires were divided into four categories, namely:

- i. Software in planning.
- ii. Functions of 2D and 3D images.
- iii. Collaboration in planning.
- iv. Benefits of adopting BIM.

Based on the results, the planner consultants used software in planning. The software usage level is shown in Figure 2(a). Based on the figure, 57% and 36% of respondents, respectively, mentioned that it is very important and important that they use software in planning and only 7% of respondents indicated moderately important and least important. Figure 2(b) shows that 22% and 64% of respondents, respectively, indicated that it is very important and important for planner consultants to use 2D CAD for drawing and documentation. Only 7% considered it as moderately important and least important respectively.

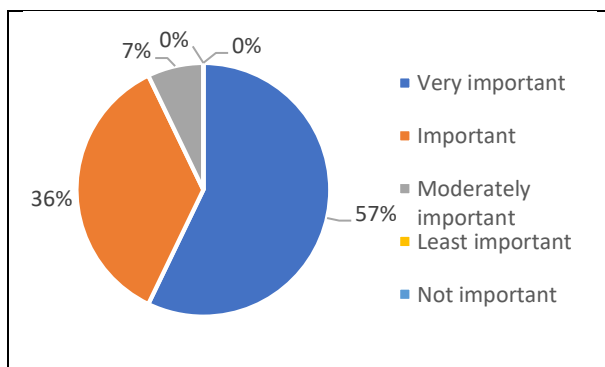


Figure 2(a) Software in Planning - Usage level

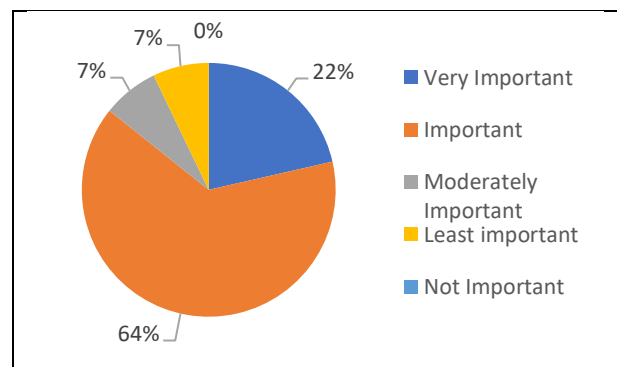


Figure 2(b) Software in Planning - importance of 2D CAD

Figure 3 Figure 3(a) shows that 7% and 86% of planner consultants, respectively, mentioned that it is very important and important to make conceptual designs with a 3D model that is approved by the owner. Only 7% considered it as moderately important. Figure 3(b) shows that 43% and 50% of planner consultants, respectively, mentioned that it is very important and important to use a 2D image to explain construction information. While 7% other percentage were moderately important

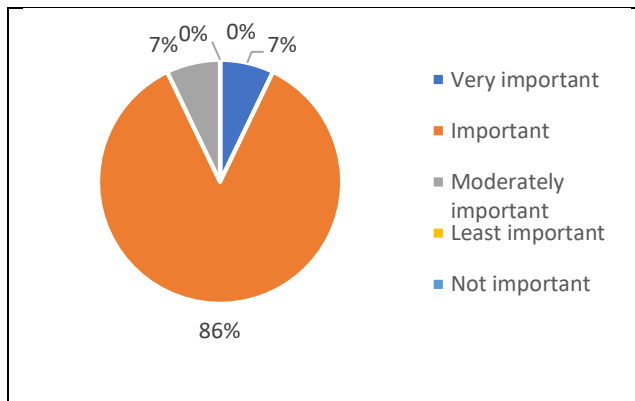


Figure 3(a) Functions of images - 2D image

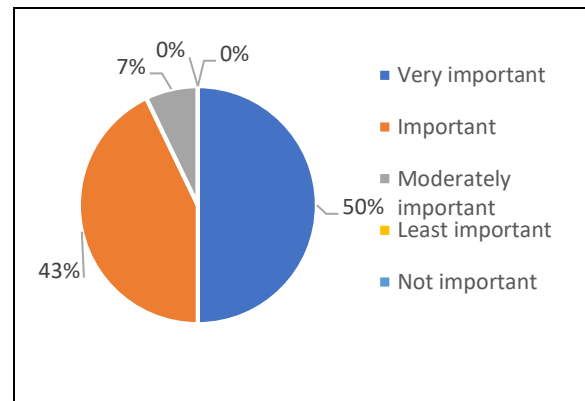


Figure 3(b) Functions of images - 3D image

Figure 4(a) shows that 93% and 7% of planner consultants, respectively, said that it is very important and important to collaborate in one work file between experts. Figure 4(b) shows 57% and 7% of planner consultants, respectively, mentioned that it is very important and important to know the format of IFC2 and COBie3 in the storage format, where as 29% and 7%, respectively, considered it as moderately important and do not know about the format.

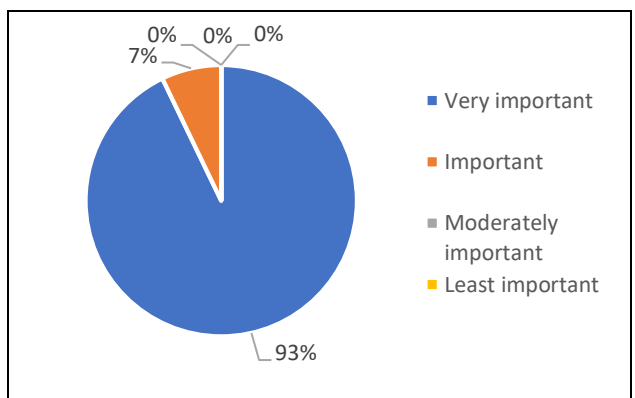


Figure 4(a) Collaboration in planning

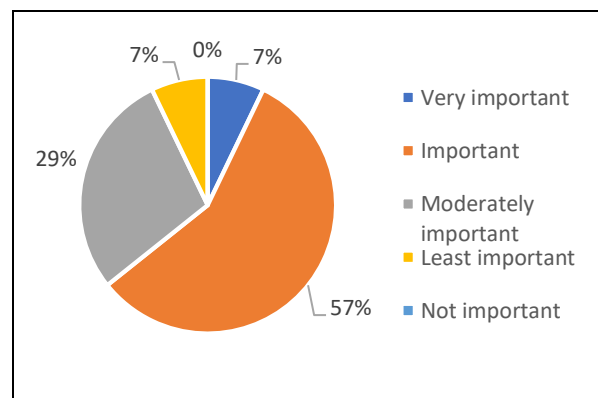


Figure 4(b) Storage format

Figure 5(a) shows that 57% and 43% of planner consultants, respectively, mentioned that it is very important and important to plan to use big data to store files. Figure 5(b) shows that 64% and 29% of planner consultants, respectively, mentioned that it is important and very important to know the benefits of BIM in order to be able to make work more effective and efficient.

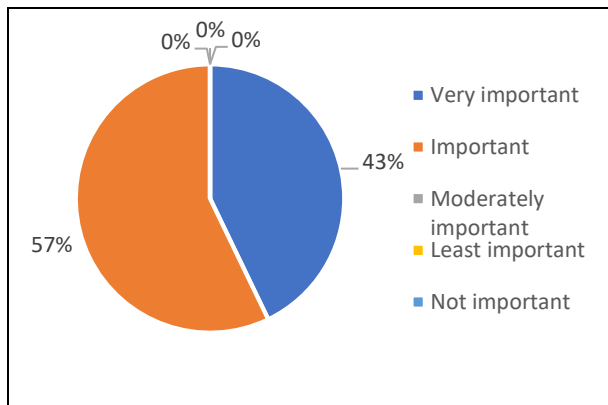


Figure 5(a) Big data to store files

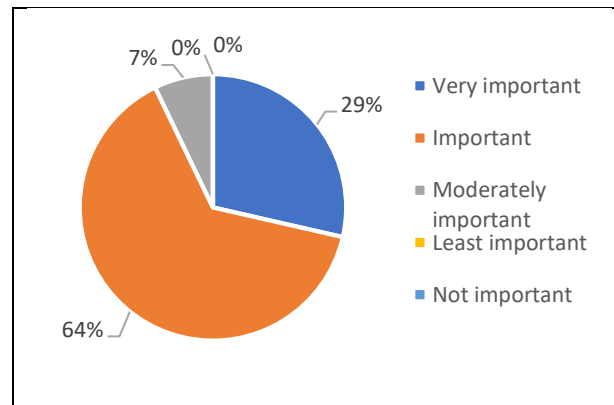


Figure 5(b) Benefits of adopting BIM

Figure 6(a) shows that 43% and 50% of planner consultants, respectively, mentioned that it is very important and important to know the benefits of BIM as it can reduce risk. Figure 6(b) shows that 93% and 7% of planner consultants, respectively, mentioned that it is very important and important to know that BIM can help experts collaborate.

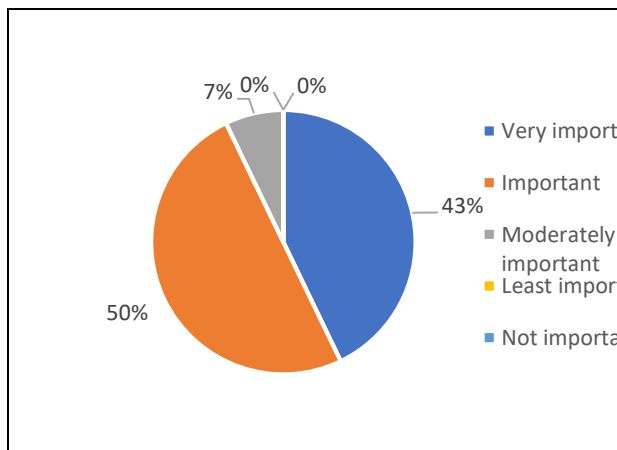


Figure 6(a).Benefits of adopting BIM - Reduce risk

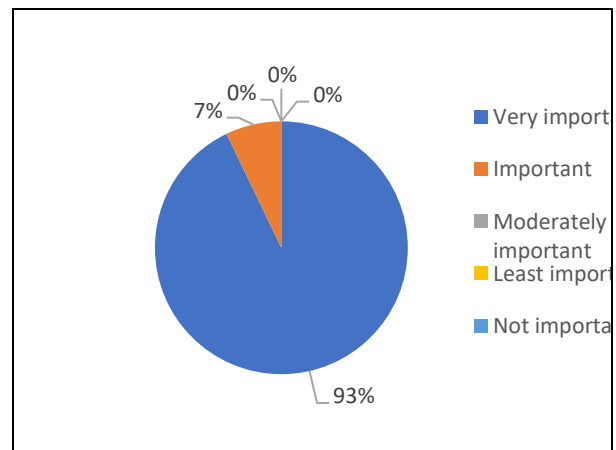


Figure 6(b).Benefits of adopting BIM - Help experts collaborate

5. Discussion

First and foremost, the high cost is due to the expensive hardware and software. By considering the fact that one person cannot model the entire structure, installation or architecture, the price must be multiplied by several workplaces, according to the needs of the design office. High implementation costs also hindered BIM usage in small and medium-sized offices in West Sumatra. Apart from that, not many human resources are experts of BIM in West Sumatra.

6. Conclusion

BIM offers a variety of benefits in the construction industry. Continuous collaboration among planner consultants can provide better results, reduce recurring costs, reduce risk and predict time better.

Therefore, BIM will become an indispensable tool for construction, not only due to its direct benefits but also because it allows more efficient and effective design and construction. The low response rate of the survey questionnaire was due to most construction practitioners today know little or nothing about BIM. Even among those who responded to the survey, only 48% of them applied 2D and 3D BIM on the project and this also depends on the request from the client. The research concluded that the awareness to adopt BIM in construction planning is still low because the planner consultants work based on the client's terms of reference. Within the terms of reference, there is no obligation to use BIM in planning. Since the government does not regulate the use of BIM in planning, planning consultants have no desire to use BIM. Moreover, it is also expensive to implement it in planning. It is concluded that the main barriers to BIM applications are lack of client demand, BIM system costs and lack of company experience. Furthermore, the government has not been too aggressive in promoting the use of BIM in public works.

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