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# Analysis of Benefits and Barriers Factors in the Implementation of Building Information Modeling (BIM) in Building Construction for Contractor

Egi Gustian[1, b)], Roi Milyardi[1, a)], and Cindrawaty Lesmana[1, c)]

[1]Department of Civil Engineering, Faculty of Engineering, Universitas Kristen Maranatha
Jl. Prof. Surya Sumantri no 65, Bandung City, 40164, Indonesia

[a)]Corresponding author: roi.milyardi@eng.maranatha.edu
[b)]1821007@maranatha.ac.id
[c)]cindrawaty.lesmana@eng.maranatha.edu

**Abstract.** Technological developments in this world are been talked about everywhere, especially now that they are entering the era of the industrial revolution 4.0. In the construction world, this technological development is also not spared, one of which is the application of Building Information Modeling (BIM) technology. During this COVID-19 pandemic, all technology, especially BIM, will become more advanced and developed again. The more developed and advanced BIM, the more the benefits and the inhibiting factors in implementing BIM, especially for the contractor. In the previous study, the BIM application more focus on the construction industry in general, not specific to sub-class (top-class and middle-class contractors) a contractor. The purpose of this study is to analyze the benefits and inhibiting factors in the implementation of BIM in building construction for contractors. This study was conducted using literature from previous studies to determine what statements are the benefits and barrier factors in the implementation of BIM 4D for contractors with top and middle qualifications. Then the statement is compiled into a questionnaire form and distributed to respondents in online ways. The results of the questionnaire survey were processed with statistical analysis of validity tests and reliability tests as well as the calculated mean value for each research variable. The results of this study there is no significant difference in the benefit of BIM application on top-class and middle-class contractors. The benefits of the most dominant BIM implementation for top contractors are better and attractive building design or modeling, and more accuracy in documentation, and for middle contractors, the benefits of BIM implementation are better and attractive building design or modeling. There is a significant difference in the barrier factors in the implementation of BIM, with a lack of knowledge in the implementation of BIM and Cost is quite high for BIM application or software license as a significant differentiating factor.

**Keywords**: Building Information Modeling (BIM), BIM implementation, design-bid-build, design-build, top-class contractor, middle-class contractor

## INTRODUCTION

The development of technology in this world is currently a hot issue, especially now that it's entering the era of the industrial revolution 4.0. Currently, technology can't be separated from human life because humans are always trying to advance and develop current technology and knowledge, as well as the world of construction where at this time the construction world in Indonesia has begun entering the industrial phase 4.0. By entering the industrial era 4.0

or in this digital era, the world of construction will not be separated from technological developments. The construction technology used must be more sophisticated and updated.

The old or conventional methods used in the construction sector have begun to be abandoned because of the times and technological developments in the digital era in the construction world that are very interesting to follow. Many benefits will be obtained for the construction world and make the work of construction workers easier by using more sophisticated and developing technology.

One of the technological developments being faced by the construction world today is Building Information Modeling or usually abbreviated and known as Building Information Modelling (BIM). BIM is a technology included in AEC (Architecture, Engineering, and Construction) that can model, plan, and operate buildings digitally. BIM itself is a digital technology concept process that can help model and manage a digital picture of the physical and functional in a construction building from the planning to operation stage, which can greatly assist the modeling of a construction building [1].

Indirectly in the era of the pandemic due to COVID-19, the use of BIM for construction projects is very necessary and provides opportunities for construction workers, especially contractors, in implementing BIM in their work. So that the use of BIM will be very useful in helping contractor work, especially in terms of modeling and simulating a building accurately digitally. The contractors themselves are divided into three qualifying classes, there is the bottom, middle, and top classes. In Indonesia, most of the contractors who apply for BIM are top-class contractors, but some middle-class contractors apply for BIM at a certain level or dimension of BIM [2].

In this pandemic era, all technology will be required to develop even more. The more developed and advanced the technology is, the more likely there are barrier factors that can hinder the use and application of BIM, this makes the use of technology such as BIM will not escape the shortcomings that will be experienced by contractors.

The previous studies on the benefit and barrier of BIM application in Indonesia has been conducted in various spectrum. Most likely studies focus on BIM application for the general construction industry (contractor, consultant, and others parties) [2]–[7]. The other study focused on BIM application for the contractor in general [8], the other focus on the regulation and dimension of BIM [9]. So, the previous studies haven't focused on BIM application in the sub-class contractors (top-class, middle-class, and low-class contractor) in Indonesia. The class of the contractors in Indonesia, classified by the value of project handled (Top-class contractor >2.5Billion IDR, Middle -class contractor 750Million-2.5 billion IDR Top-class contractor <750Million IDR) [10]. For Top-class contractor, BIM is identified as a risk an opportunity in the technology risk aspect [11]. In the middle-class contractor, there isn't comprehensive and specific study on BIM application.

In this research or in this study was conducted to analyze the benefits of using BIM, especially the application of BIM 3D to BIM 4D and the barrier factors in implementing BIM in building construction for top and middle contractors in Indonesia.

## METHODOLOGY

This study used a descriptive research method with a quantitative approach. The descriptive research method itself is a method that describes or provides an overview of the object under study through samples or data that have been collected [12]. The quantitative approach itself is research based on the collection or collection of data using research instruments (measuring instruments) that have statistical (quantitative) properties that can be measured so that the method with this approach has a goal that can explain or describe the relationship between variables that be measured.

This study was analyzed using a survey. The survey was conducted using a questionnaire in the form of a google form which will be distributed to contractors as respondents. Questionnaires will be distributed online to top-class and middle-class contractors. After that, the data resulting from filling in the respondents will be analyzed by calculating the average value (mean) of the Likert scale value filled in by the respondents, then from the mean value, the variables of this study are ranked from top to bottom. The variables in this study were obtained from previous research, which shown in Table 1. Before being analyzed, the validity and reliability tests were carried out first using the SPSS program. The criteria in the validity and reliability test used an error rate of significance 5%. The validity test for this study used the Pearson correlations method. A variable is declared valid or not, it analyzed by the Pearson correlation value (R statistic) which must be over the significance rate value (R table) [13]. This reliability test uses the Cronbach's alpha method to determine the level of reliability of the data. A study can be said to be reliable or consistent by looking at the Cronbach's alpha value, which must be more than 0.6 [14].

**TABLE 1**. Research Variables from Previous Research

| No. | Statement Item | Code | Ref. |
|---|---|---|---|
| **A** | **Benefits in the implementation of BIM** | | |
| 1 | Better and attractive building design or modeling | A1 | [15] |
| 2 | Can assist in making good decisions during the design or planning phase | A2 | [8] |
| 3 | Can detect errors early so it can prevent it | A3 | [8] |
| 4 | Can ensure and reduce clash detection | A4 | [7] |
| 5 | More accurate in documentation | A5 | [16] |
| 6 | Can increase external demand (client) | A6 | [16] |
| 7 | Can improve understanding of activity from construction | A7 | [6] |
| 8 | Can improve or add the design idea of a construction | A8 | [6] |
| 9 | Helping and making easy in communication | A9 | [9] |
| 10 | Reducing request for information (RFI) | A10 | [9] |
| 11 | Can reduce the duration of project work | A11 | [6] |
| 12 | Have time efficiency | A12 | [9] |
| 13 | Can sort better for scheduling construction activities | A13 | [17] |
| 14 | Can control the planning of a project | A14 | [9] |
| 15 | Software integration | A15 | [18] |
| **B** | **Barrier factors in the implementation of BIM** | | |
| 1 | Lack of knowledge in the implementation of BIM | B1 | [18] |
| 2 | Problem in BIM license | B2 | [18] |
| 3 | Cost is quite high for BIM application or software license | B3 | [18] |
| 4 | Lack of BIM training and learning | B4 | [18] |
| 5 | The cost of BIM training is quite expensive | B5 | [18] |
| 6 | Lack of experience and skills in using BIM | B6 | [19] |
| 7 | Lack of client requests in the use of BIM | B7 | [19] |
| 8 | The use of BIM is quite difficult and complex | B8 | [19] |
| 9 | Lack of BIM experts or specialists | B9 | [3] |
| 10 | Lack of awareness of the benefits of implementing BIM | B10 | [6] |
| 11 | Lack of support from the government to implement BIM | B11 | [6] |
| 12 | There is resistance to adopting new technology | B12 | [6] |
| 13 | Lack of management participation in providing motivation and training | B13 | [8] |
| 14 | Everyone uses different BIM applications or programs, so it's quite difficult to put the information together | B14 | [8] |
| 15 | Large hardware specifications are required, so that the BIM application can work properly | B15 | [5] |
| 16 | The absence of BIM standards, regulations and guidelines in Indonesia | B16 | [1] |
| 17 | Lack of trust in the integrity of BIM technology | B17 | [4] |
| 18 | Lack of introduction to BIM at the education level | B18 | [4] |
| 19 | Still comfortable in using conventional methods | B19 | [20] |

## RESULT AND DISCUSSION

In this research, a questionnaire that was distributed via google form containing 34 statements divided into 2 categories has been filled in by 35 top-class contractor respondents, with various job position (BIM engineer and Drafter engineer) that shown Figure 1a and 30 middle-class contractor respondents with various job position (Drafter engineer, Engineer, Project manager, Site engineer, and site inspector) that shown in Figure 1b. And majority for top-class contractors were have got a construction project with design and build contracts the same as middle-class contractors too, that shown in Figure 1c and Figure 1d. The data obtained from the respondents were tested for validity and reliability and all data on the statement variables in the contents of the questionnaire were declared valid and reliable. The data that have been tested is analysed by calculating the average value (mean) which is then sorted or ranked from the largest to the smallest mean value.

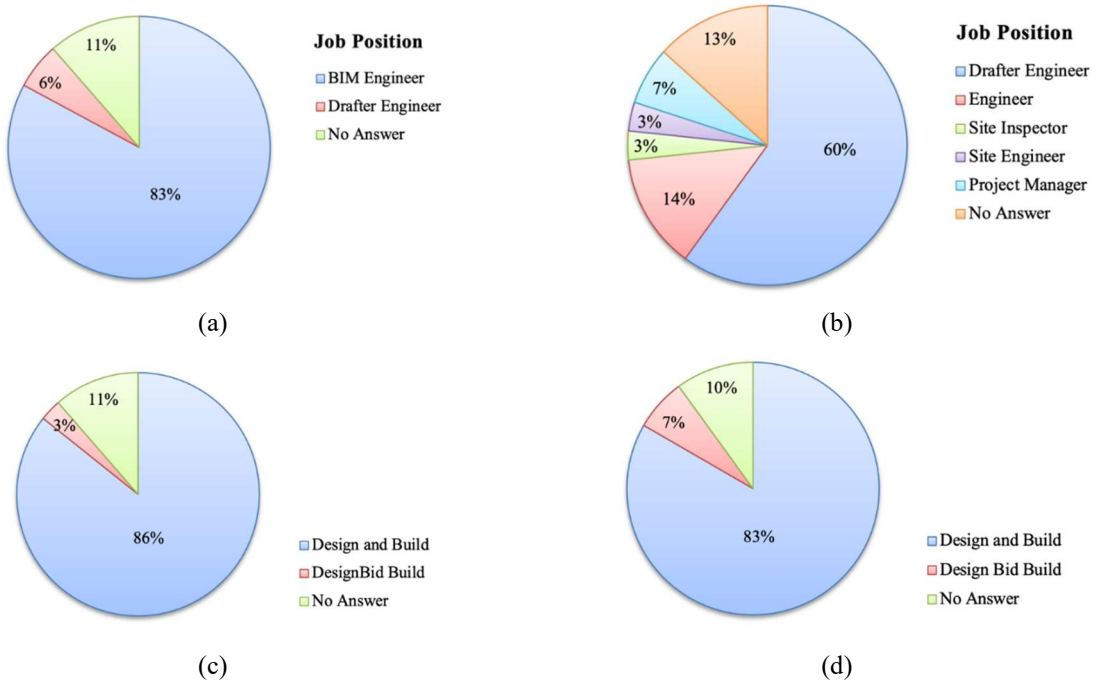


**FIGURE 1.** Profile Respondent (a) Job Position for Top-Class Contractors (b) Job Position for Middle-Class Contractors (c) Type of Contract for Top-Class Contracts (d) Type of Contract for Middle-Class Contracts

### Benefits in the Implementation of BIM

Based on Table 2, the most dominant variable of benefits in the implementing BIM for top-class contractors is a better and attractive building design or modeling. The benefits of implementing BIM in building construction for top contractors based on the analysis of mean value, the dominant variables are taken from the top five rankings, namely: better and attractive building design or modelling, more accurate in documentation, can improve or add design ideas to a construction, can increase external (client) demand and can assist in making good decisions during the design or planning phase. While the benefits of implementing BIM in building construction for middle-class contractors based on the analysis of mean value that can see in Table 3, the dominant variables are taken from the top five orders, namely: better and attractive building design or modelling, more accurate in documentation, can improve or add design ideas to construction, can assist in making good decisions during the design or planning phase, and can increase external (client) requests. From the analysis that has been carried out, the top five rankings for each variable of the benefits of BIM implementation for top-class and middle-class contractors are almost the same, not too different for the statement variables of the benefits of BIM implementation, the comparison shown in Table 4 and from the column chart visualization in Figure 2. In this study also make comparison based on from the top five rankings of benefits in BIM implementation from top-class contractors, middle-class contractors, and as well as from previous studies [8] shown in Table 5.

**TABLE 2**. Benefits of Implementing BIM for Top-Class Contractors

| Code | Statement Item | Mean Value | Rank |
|---|---|---|---|
| A1 | Better and attractive building design or modeling | 4,486 | 1 |
| A5 | More accurate in documentation | 4,400 | 2 |
| A8 | Can improve or add the design idea of a construction | 4,286 | 3 |
| A6 | Can increase external demand (client) | 4,257 | 4 |
| A2 | Can assist in making good decisions during the design or planning phase | 4,229 | 5 |
| A7 | Can improve understanding of activity from construction | 4,200 | 6 |
| A9 | Helping and making easy in communication | 4,200 | 6 |

| Code | Statement Item | Mean Value | Rank |
|---|---|---|---|
| A4 | Can ensure and reduce clash detection | 4,171 | 8 |
| A3 | Can detect errors early so it can prevent it | 4,143 | 9 |
| A15 | Software integration | 4,143 | 9 |
| A13 | Can sort better for scheduling construction activities | 4,114 | 11 |
| A10 | Reducing request for information (RFI) | 4,057 | 12 |
| A12 | There is resistance to adopting new technology | 3,943 | 13 |
| A14 | Can control the planning of a project | 3,886 | 14 |
| A11 | Can reduce the duration of project work | 3,600 | 15 |

**TABLE 3**. Benefits of Implementing BIM for Middle-Class Contractors

| Code | Statement Item | Mean Value | Rank |
|---|---|---|---|
| A1 | Better and attractive building design or modeling | 4,733 | 1 |
| A5 | More accurate in documentation | 4,500 | 2 |
| A8 | Can improve or add the design idea of a construction | 4,467 | 3 |
| A2 | Can assist in making good decisions during the design or planning phase | 4,367 | 4 |
| A6 | Can increase external demand (client) | 4,333 | 5 |
| A3 | Can detect errors early so it can prevent it | 4,200 | 6 |
| A4 | Can ensure and reduce clash detection | 4,167 | 7 |
| A15 | Software integration | 4,067 | 8 |
| A7 | Can improve understanding of activity from construction | 3,933 | 9 |
| A13 | Can sort better for scheduling construction activities | 3,733 | 10 |
| A9 | Helping and making easy in communication | 3,667 | 11 |
| A10 | Reducing request for information (RFI) | 3,667 | 11 |
| A14 | Can control the planning of a project | 3,267 | 13 |
| A12 | There is resistance to adopting new technology | 3,233 | 14 |
| A11 | Can reduce the duration of project work | 3,033 | 15 |

**TABLE 4**. Comparison of the Benefits of Dominant BIM Implementation for Top-Class Contractors with Middle-Class Contractors

| Rank | Top-Class Contractors | Code | Middle-Class Contractors | Code |
|---|---|---|---|---|
| 1 | Better and attractive building design or modeling | A1 | Better and attractive building design or modeling | A1 |
| 2 | More accurate in documentation | A5 | More accurate in documentation | A5 |
| 3 | Can improve or add the design idea of a construction | A8 | Can improve or add the design idea of a construction | A8 |
| 4 | Can increase external demand (client) | A6 | Can assist in making good decisions during the design or planning phase | A2 |
| 5 | Can assist in making good decisions during the design or planning phase | A2 | Can increase external demand (client) | A6 |

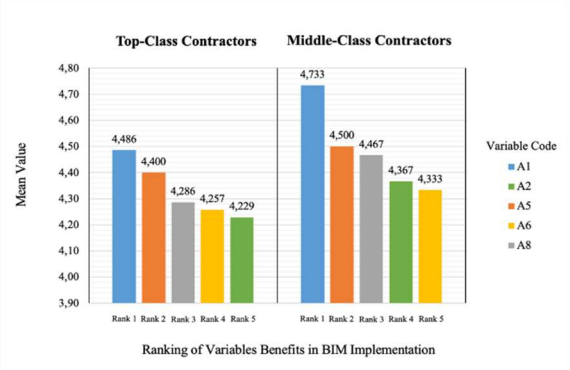

**FIGURE 2.** Comparison of the Benefits of Dominant BIM Implementation for Top-Class Contractors with Middle-Class Contractors

**TABLE 5**. Comparison of the Benefits of Dominant BIM Implementation for Top-Class Contractors, Middle-Class Contractors, and Previous Studies

| Rank | Top-Class Contractors | Middle-Class Contractors | Previous Studies [8] |
|---|---|---|---|
| 1 | Better and attractive building design or modeling | Better and attractive building design or modeling | Can detect errors early so it can prevent it |
| 2 | More accurate in documentation | More accurate in documentation | Can be able to share information completely and quickly |
| 3 | Can improve or add the design idea of a construction | Can improve or add the design idea of a construction | Can assist in making good decisions during the design or planning phase |
| 4 | Can increase external demand (client) | Can assist in making good decisions during the design or planning phase | Can help build trust and reduce risk |
| 5 | Can assist in making good decisions during the design or planning phase | Can increase external demand (client) | Can make it easier to design a better and more attractive building model |

The results of the data analysis carried out have found five dominant benefits in the implementation of BIM. For top-class and middle-class contractors, it turns out that it gets the same five dominant benefit variables, only differing in the order of ranking. Because they obtain the same variables, it can do a different test between the results of data analysis from top-class contractors and middle-class contractors to see if the answers to opinions from both parties have a significant difference by looking at the mean value. This different test uses the independent sample T-Test test method. This method is used to test data by comparing the difference between the two mean values of the difference in the mean of two different groups of parties, but having the same variable. If T test value is smaller table (This study got 1,999 for the T table) and the Sig. value larger than 0,05, it means that the dissent of top-class and middle-class contractors are not significant. The following are the results of the different test calculations of the five dominant benefits in the implementation of BIM for top-class and middle-class contractors with the assistance of the program, that shown in Table 6.

**TABLE 6**. Different Test Result of the Benefits of BIM Implementation for Top-Class Contractors and Middle-Class Contractors

| Code | Benefits Implementation BIM | T test | Sig | Description |
|---|---|---|---|---|
| A1 | Better and attractive building design or modeling | \|1,831\| < 1,999 | 0,072 > 0,05 | No Significant Difference |
| A2 | Can assist in making good decisions during the design or planning phase | \|0,995\| < 1,999 | 0,324 > 0,05 | No Significant Difference |
| A5 | More accurate in documentation | \|0,565\| < 1,999 | 0,574 > 0,05 | No Significant Difference |
| A6 | Can increase external demand (client) | \|0,269\| < 1,999 | 0,789 > 0,05 | No Significant Difference |
| A8 | Can improve or add the design idea of a construction | \|1,420\| < 1,999 | 0,160 > 0,05 | No Significant Difference |

## Barrier Factors in the Implementation of BIM

Based on Table 7, the most dominant variable of the barrier factor in implementing BIM is the lack of BIM training and learning. The barrier factors in the implementation of BIM for large contractors based on the analysis of mean value, five dominant factors were taken from the top five rankings, namely: lack of BIM training and learning, high costs for licensing applications or BIM software, lack of knowledge in BIM implementation, problem in licensing BIM, and need the of large hardware specifications, so that BIM applications can work properly. As for the barrier factors in the implementation of BIM for middle-class contractors based on the analysis that shown in Table 8, five dominant factors are taken from the top five rankings, namely: high costs for application licenses or BIM software, lack of knowledge in BIM implementation, the need for large hardware specifications, so that applications BIM can work well, and problems in BIM licensing, and lack of BIM training and learning. From the analysis carried out, the top five rankings for each variable of the barrier factors in the implementation of BIM for top-class and middle-class

contractors there is a slight difference but the difference is not too significant and not too different, the difference shown in Table 9 and also from the column chart visualization shown in Figure 3. The same as of benefit in BIM implementation, for barrier factors in BIM implementation also make comparisons based on the top five rankings from top-class contractors, middle-class contractors, and as well as from previous studies [6] that shown in Table 9.

**TABLE 7**. Barrier Factors in Implementing BIM for Top-Class Contractors

| Code | Statement Item | Mean Value | Rank |
|---|---|---|---|
| B4 | Lack of BIM training and learning | 4,286 | 1 |
| B3 | Cost is quite high for BIM application or software license | 4,229 | 2 |
| B1 | Lack of knowledge in the implementation of BIM | 4,171 | 3 |
| B2 | Problem in BIM license | 4,171 | 3 |
| B15 | Large hardware specifications are required, so that the BIM application can work properly | 4,143 | 5 |
| B5 | The cost of BIM training is quite expensive | 4,057 | 6 |
| B18 | Lack of introduction to BIM at the education level | 4,057 | 6 |
| B16 | The absence of BIM standards, regulations and guidelines in Indonesia | 3,943 | 8 |
| B19 | Still comfortable in using conventional methods | 3,914 | 9 |
| B10 | Lack of awareness of the benefits of implementing BIM | 3,886 | 10 |
| B14 | Everyone uses different BIM applications or programs, so it's quite difficult to put the information together | 3,800 | 11 |
| B6 | Lack of experience and skills in using BIM | 3,771 | 12 |
| B8 | The use of BIM is quite difficult and complex | 3,743 | 13 |
| B9 | Lack of BIM experts or specialists | 3,714 | 14 |
| B7 | Lack of client requests in the use of BIM | 3,629 | 15 |
| B13 | Lack of management participation in providing motivation and training | 3,629 | 15 |
| B17 | Lack of trust in the integrity of BIM technology | 3,629 | 15 |
| B12 | There is resistance to adopting new technology | 3,571 | 18 |
| B11 | Lack of support from the government to implement BIM | 3,486 | 19 |

**TABLE 8**. Barrier Factors in Implementing BIM for Middle-Class Contractors

| Code | Statement Item | Mean Value | Rank |
|---|---|---|---|
| B3 | Cost is quite high for BIM application or software license | 4,700 | 1 |
| B1 | Lack of knowledge in the implementation of BIM | 4,567 | 2 |
| B15 | Large hardware specifications are required, so that the BIM application can work properly | 4,267 | 3 |
| B2 | Problem in BIM license | 4,233 | 4 |
| B4 | Lack of BIM training and learning | 4,133 | 5 |
| B18 | Lack of introduction to BIM at the education level | 4,067 | 6 |
| B5 | The cost of BIM training is quite expensive | 3,967 | 7 |
| B19 | Still comfortable in using conventional methods | 3,867 | 8 |
| B6 | Lack of experience and skills in using BIM | 3,867 | 8 |
| B8 | The use of BIM is quite difficult and complex | 3,833 | 10 |
| B10 | Lack of awareness of the benefits of implementing BIM | 3,833 | 10 |
| B9 | Lack of BIM experts or specialists | 3,800 | 12 |
| B14 | Everyone uses different BIM applications or programs, so it's quite difficult to put the information together | 3,700 | 13 |
| B16 | The absence of BIM standards, regulations and guidelines in Indonesia | 3,700 | 13 |
| B11 | Lack of support from the government to implement BIM | 3,500 | 15 |
| B13 | Lack of management participation in providing motivation and training | 3,467 | 16 |
| B17 | Lack of trust in the integrity of BIM technology | 3,233 | 17 |
| B7 | Lack of client requests in the use of BIM | 3,067 | 18 |
| B12 | There is resistance to adopting new technology | 3,000 | 19 |

**TABLE 9**. Comparison of the Barrier Factors of Dominant BIM Implementation for Top-Class Contractors with Middle-Class Contractors

| Rank | Top-Class Contractors | Code | Middle-Class Contractors | Code |
|---|---|---|---|---|
| 1 | Lack of BIM training and learning | B4 | Cost is quite high for BIM application or software license | B3 |

| Rank | Top-Class Contractors | Code | Middle-Class Contractors | Code |
|---|---|---|---|---|
| 2 | Cost is quite high for BIM application or software license | B3 | Lack of knowledge in the implementation of BIM | B1 |
| 3 | Lack of knowledge in the implementation of BIM | B1 | Large hardware specifications are required, so that the BIM application can work properly | B15 |
| 4 | Problem in BIM license | B2 | Problem in BIM license | B2 |
| 5 | Large hardware specifications are required, so that the BIM application can work properly | B15 | Lack of BIM training and learning | B4 |

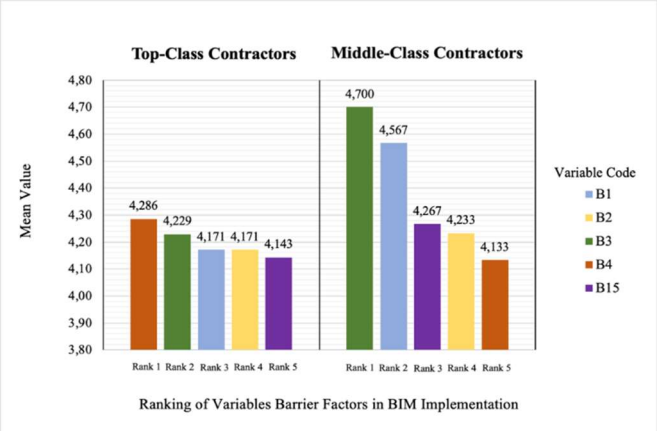


**FIGURE 3.** Comparison of the Barrier Factors of Dominant BIM Implementation for Top-Class Contractors with Middle-Class Contractors

**TABLE 9**. Comparison of the Barrier Factors of Dominant BIM Implementation for Top-Class Contractors, Middle-Class Contractors, and Previous Studies

| Rank | Top-Class Contractors | Middle-Class Contractors | **Previous Studies** [6] |
|---|---|---|---|
| 1 | Lack of BIM training and learning | Cost is quite high for BIM application or software license | High cost for license application or BIM software and required hardware |
| 2 | Cost is quite high for BIM application or software license | Lack of knowledge in the implementation of BIM | Lack of knowledge in the implementation of BIM |
| 3 | Lack of knowledge in the implementation of BIM | Large hardware specifications are required, so that the BIM application can work properly | Lack of awareness in the implementation of BIM |
| 4 | Problem in BIM license | Problem in BIM license | The cost of BIM training is quite expensive |
| 5 | Large hardware specifications are required, so that the BIM application can work properly | Lack of BIM training and learning | Lack of awareness of the benefits that BIM provides |

The results of the data analysis carried out have found five dominant barrier factors in the implementation of BIM. For top-class and middle-class contractors, it turns out that they obtain the same five dominant barrier factor variables, only differing in the order of ranking. Because it gets the same variables, it can perform a different test between the results of data analysis from top-class and middle-class contractors to see if the answers to opinions from both parties have a significant difference by looking at the mean value. The same as benefits of BIM implementation, different tests, for this category also use an independent sample T-test. The following are the results of the different test

calculations of the five dominant-barrier factors in the implementation of BIM for top-class and middle-class contractors with the assistance of the program, that shown in Table 10.

**TABLE 10**. Different Test Result of the Barrier Factors of BIM Implementation for Top-Class Contractors and Middle-Class Contractors

| Code | Benefits Implementation BIM | T test | Sig | Description |
|---|---|---|---|---|
| B1 | Lack of knowledge in the implementation of BIM | \|2,796\| > 1,999 | 0,007 < 0,05 | Significant Difference |
| B2 | Problem in BIM license | \|0,328\| < 1,999 | 0,744 > 0,05 | No Significant Difference |
| B3 | Cost is quite high for BIM application or software license | \|3,040\| > 1,999 | 0,003 < 0,05 | Significant Difference |
| B4 | Lack of BIM training and learning | \|0,826\| < 1,999 | 0,412 > 0,05 | No Significant Difference |
| B15 | Large hardware specifications are required, so that the BIM application can work properly | \|0,839\| < 1,999 | 0,405 > 0,05 | No Significant Difference |

## CONCLUSION

Based on the analysis, there is no significant different the benefit of BIM application on top-class and middle-class contractors. The top benefits on both classes of contractor variables quite similar consists of better and attractive building design or modelling, more accurate in documentation, can improve or add the design idea of a construction, can increase external demand (client), can assist in making good decisions during the design or planning phase, can assist in making good decisions during the design or planning phase. The top-barrier factor on both classes consists of lack of BIM training and learning, cost is quite high for BIM application or software license, lack of knowledge in the implementation of BIM, problem in BIM license, large hardware specifications are required, so that the BIM application can work properly. On the barrier factors in the implementation of BIM, there is a significant difference. The two barrier factors, consist of Lack of knowledge in the implementation of BIM and Cost is quite high for BIM application or software license, are differentiating factors for top-class and middle-class contractors in Indonesia.

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