BITLIS EREN UNIVERSITY
JOURNAL OF SCIENCE AND TECHNOLOGY

E-ISSN: 2146-7706

ISSUES AND CHALLENGES IN THE PHILIPPINE CONSTRUCTION INDUSTRY: AN OPPORTUNITY FOR BIM ADOPTION

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KEYWORDS

Construction issues
BIM adoption
BIM application
Philippine construction

ARTICLE INFO

Research Article
DOI: 10.17678/beuscitech.1279862

Received	9 April 2023
Accepted	19 September 2023
Year	2023
Volume	13
Issue	2
Pages	93-119

ABSTRACT

The construction industry is widely regarded as the driving force behind global economic growth. The Philippines recorded a GDP increase of 11.8% in the second quarter of 2021. The construction industry is one of the main contributors, with a growth rate of 25.7%. However, the industry faces numerous challenges and issues, the most well-known of which involve the iron triangle of project management, attributed mainly to poor technology adoption, resulting in massive declines in productivity.

Building Information Modeling (BIM) is a popular technology with proven benefits, as demonstrated by countries that have mandated its use. However, BIM is said to be in its infancy in the Philippines. Construction professionals have a low level of awareness, and BIM is primarily used by firms that are outsourcing their services for international projects.

This study aims to identify construction industry issues and their degree of occurrence in Philippine construction. The study also seeks to determine the current state of BIM and identify the current BIM applications to resolve these issues. The study utilized a mixed-methods approach involving a literature review and a structured survey. Data analysis includes Cronbach's alpha for reliability testing, descriptive statistics, the Relative Importance Index (RII), and Kendall's W test.

1 INTRODUCTION

The construction sector is widely regarded as the driving force behind economic growth around the world. This is apparent in both developed and developing countries [1]. In the Philippines, the Department of Trade and Industry (DTI) reported that a GDP growth rate of 11.8% was recorded as of the second quarter of 2021. The construction industry is one of the main contributors, with a growth rate of 25.7% and an average employment of 4.337 million workers [2].

However, the construction industry is often portrayed as a backward industry that fails to adopt innovation, causing a massive decline in productivity as compared to other industries [3]. The industry is confronted with numerous challenges and issues, the most well-known of which are issues involving the iron triangle of project management (time, cost, scope, and quality). Several projects face time and cost overruns, reworks and poor quality, construction claims, waste generation, and other issues. These problems and issues are primarily the result of the construction industry's fragmentation [4]. A study claimed that the conventional way of doing construction failed to address the increasing trend of poor construction performance [5]. In a report conducted by McKinsey Global Institute (MGI) in 2017, the conventional method of construction had lost an estimated $1.63 trillion as of 2015 due to the industry's productivity gap. Over the last two decades, global labor productivity growth in construction has averaged only 1% per year. The construction industry is highly fragmented. As a result, there is poor project management, insufficient design processes, and a lack of investment in skill development and innovation [6].

MGI identified seven ways to tackle the root causes of poor productivity growth. The infusion of technology to improve the performance of the construction industry is one way to optimize the construction process and productivity growth [6]. Many studies have established that the lack of framework, policies, and programs is the main concern of construction companies when adopting technology and innovations [7]-[9]. To address the increasing trend of low productivity and the severity of construction problems, the issues of fragmentation and poor technology adoption must be resolved. In recent years, technology and innovation have presented multiple ways to improve the construction industry's performance. Some of these includes Augmented Reality/Virtual Reality, Robotics, 3D Printing, Digital Twin, Sensor Data, Building Information Modelling and many others [10].

Building Information Modelling (BIM) is a technology that is gaining popularity due to the proven benefits and return on investment demonstrated by countries that have adopted and mandated its use in construction [11]. The concept of BIM is said to be at a developmental stage in the Philippines. The application of BIM principles in the Philippine construction industry has not been widely adopted in terms of implementation, owing primarily to the high cost of BIM software [12]. The government sector has a low level of awareness of the BIM process. The majority of early BIM adopters were working on large-scale projects that required BIM submittals. Furthermore, BIM is not yet included as a part of undergraduate coursework for engineering and architecture students [13].

This study aims to identify issues and obstacles in the construction industry, as well as the frequency with which these issues are encountered by Filipino construction professionals. The study also aims to determine the current state of BIM in the Philippines and identify current BIM applications in the nation. Finally, the opportunity offered by BIM to address concerns and challenges in the construction industry will be identified.

2 ISSUES AND CHALLENGES IN CONSTRUCTION

Construction industry challenges and issues exist all over the world, whether in developed or developing countries. These impediments and challenges, on the other hand, are more visible in developing countries such as the Philippines, along with a general state of socioeconomic stress, chronic resource shortages, institutional inadequacies, and an overall inability to deal with major concerns. Furthermore, there is evidence that the scope and severity of the problems have grown in recent years [14].

Numerous studies have been discussed on various issues that the construction industry faces and the problems that emerge upon construction project implementation. Table 1 presents a summary of construction issues from various studies where BIM technology has the potential to positively impact and create more opportunities for the industry.

Table 1. *Issues frequently encountered in a construction project.*

Construction Issues	Literature
Variation/change orders	[15], [16], [17], [18]
Design changes	[19], [20], [21], [22]
Time overruns/project delays	[23], [24], [25], [26]
Cost overruns	[27], [28], [29], [30]
Lack of collaboration	[31], [32], [33], [34]
Poor communication	[35], [36], [37]
Reworks	[38], [39], [40]
Quality	[38], [41], [42]
Safety	[42], [43], [44]
Handover/turnover	[45], [46], [47]
Construction wastes	[16], [48], [49]

3 BUILDING INFORMATION MODELLING (BIM)

BIM is a system or approach for managing important building design and project data digitally throughout the life cycle of a building. It is a collection of regulations, software, processes, and technology that are all linked together [50]. BIM uses an intelligent model and a cloud platform to create a digital representation of an asset throughout its existence, from planning and design to construction and operations [51].

BIM-based methodologies can be utilized at any step of a building or infrastructure project, including design, construction, and operation [52]. BIM provides numerous opportunities for all stakeholders to improve the built output and industrial sustainability for the benefit of all. Table 2 outlines the applications of BIM throughout the construction lifecycle, from pre-construction to post-construction, as reported in various literature.

BIM has a wide range of uses and applications [50]. Visualizations may be created using 3D rendering [54], drawings and shop drawings [57] can be extracted, and building codes can be examined using object parameter analysis [52], [53]. Renovations, maintenance, and operation may all be made easier [85], [86], and cost estimation can be done by analyzing the quantity of materials [60], [63].

Construction sequencing can also be used to make scheduling more efficient [61], [62]. Aside from that, the model may be used to run a variety of various analyses and simulations in order to improve the overall performance of any project [87], [88].

***Table 2**. Applications of BIM in the construction industry.*

Applications of BIM	Literature
Visual presentation	[52], [53], [54], [55]
Design and analysis	[20], [52], [53], [56]
Drawing and detailing	[52], [53], [57], [58]
Project scheduling and controlling	[59], [60], [61], [62]
Cost estimation	[50], [60], [63], [64]
Quantity surveying	[60], [65], [66], [67]
Tendering	[52], [53], [68, [69]
Site utilization and lay-out	[70], [71], [72], [73]
Constructability analysis	[50], [74], [75], [76]
Collaboration	[53], [77], [78]
Safety management	[79], [80], [81], [82]
Facility management	[83], [84], [85], [86]

4 KNOWLEDGE GAPS

To identify knowledge opportunities, an investigation of related studies in the Philippines itself is crucial. In the Philippines, there is little research focused on BIM technology. Prior to 2013, almost no research on BIM in developing nations existed, and the current studies are limited to the three countries of China, India, and Malaysia [89]. More research is needed on BIM awareness, definitions, and developments, as well as how these difficulties should be addressed.

The most recent study related to BIM application in the Philippines was conducted by Silva et al. in 2021, which focused on creating an interdisciplinary framework integrating BIM and Lean Construction principles concerning the triple constraints of project management using Structural Equation Modelling (SEM) [90].

The study is focused on determining the impacts and prospects of BIM and Lean integration but does not provide a specific assessment of BIM or construction issues.

Rodriguez et al. conducted a study in 2019 on BIM adoption in the Philippines. The study was focused on determining the acceptance level of BIM in the AEC industry and evaluating the prospects and challenges of BIM as applied to lean construction principles [12]. This research used a structured survey questionnaire with questions aimed at describing the current state of BIM in relation to key prospects and problems in lean construction in the Philippines. This study is limited to BIM status assessment and does not evaluate the issues in construction.

Ongpeng conducted another study in 2018 which he used BIM as a simulation tool to compare the time and expenses of two formwork methodologies: traditional and steel deck. A Process Control Model (PCF) approach was used to measure quality costs between methods [91]. This study demonstrated how BIM simulation may assist managers in deciding which construction methodology to use in order to balance project cost and schedule. This study is purely a case study about practical BIM application in decision-making and does not provide an assessment of construction issues.

Based on a thorough review of the literature, it was established that no particular research has been conducted into the Philippine construction industry in order to assess the construction issues and identify the opportunities for resolving these issues through BIM technology. To close this knowledge gap, this study aims to evaluate all of these gaps, provide an assessment of the frequency of construction issues, identify BIM opportunities to resolve these issues, and assess the current BIM status in the Philippines.

This research will focus on covering knowledge areas such as construction issues, applications of BIM, and current BIM status in the Philippine construction industry.

5 RESEARCH METHODOLOGY

This study was conducted using a mixed-methods approach incorporating both qualitative and quantitative methodologies. The research data will be collected in two phases. The first phase is a qualitative approach that involves a review of related literature to determine the issues and challenges in the construction industry and the applications of BIM. Phase 2 is a quantitative approach that includes the distribution of a survey questionnaire to construction professionals in the Philippines.

5.1 Literature Review

The review of related literature resulted in the identification of 11 issues frequently encountered in the construction industry and 12 commonly cited applications of BIM in the construction process.

The 11 issues include: variation or change orders, design changes, time overruns or project delays, cost overruns, lack of collaboration, poor communication, reworks, quality, safety, handover or turnover, and construction waste.

The 12 BIM applications include: visual presentation, design and analysis, drawing and detailing, project scheduling and controlling, cost estimation, quantity surveying, tendering, site utilization and layout, constructability analysis, collaboration, safety management, and facility management.

These findings will be used in constructing the survey questionnaire to be used in the data collection.

5.2 Survey Questionnaire

The study utilized a structured survey to elicit responses among construction professionals and establish the degree of agreement and frequency for each variable. A 6-point Likert scale was used to eliminate neutral responses and solicit a more valid response as compared to odd-numbered Likert scales [92].

The survey consists of three parts, which include: (1) demographic profile; (2) construction issues; and (3) BIM awareness and current applications.

5.2.1 Demographic profile of respondents

The first part aims to collect the demographic profile of the respondents, including their educational attainment, profession, years of experience in construction, sector involved, construction stakeholder group, type of construction involved, position level in their current company or organization, project location, project cost and company size.

5.2.2 Issues in the construction industry

This part involves collecting responses on the degree of frequency with which each respondent encountered the listed issues in the construction. The list of construction issues was based on the literature review. Each issue will be rated by the responder based on a 6-point Likert scale: 6 for Always, 5 for Very frequently, 4 for Occasionally, 3 for Rarely, 2 for Very rarely, and 1 for Never.

5.2.3 Current BIM status and its applications

The last part involves collecting data from respondents on the current status of BIM in the Philippines in terms of awareness and applications. The first two questions aim to identify the knowledge of the respondents about BIM and whether they are BIM users or not. For the non-BIM users, the questions were about the current technology or process that they use in preparing designs, plans, estimates, and project schedules. For BIM users, the questions were about the BIM software that they use and the applications of BIM in their current project(s). Finally, all respondents were asked about their perception of the future of BIM in the country.

5.2.4 Sampling method

The sampling method used is purposive sampling, which specifically targets construction professionals in the Philippines. Professional organizations provided an approximate number of registered professionals, numbering 233,300, as shown in Table 3.

Table 3. *Approximate number of registered construction professionals in the Philippines as of 2021.*

Profession	Number	Source
Civil Engineer	100,000	[97]
Architects	42,000	[98]
Mechanical Engineer	65,000	[99]
Electrical Engineer	23,000	[100]
Sanitary Engineer	3,300	[101]
Total	233,300	

The minimum required sample was calculated using Slovin's method as shown:

$$n = \frac{N}{1 + Ne^2} \tag{1}$$

where n is the sample size, N is the population and "e" is the margin of error taken as 9% or 0.09. The calculated minimum sample size is 124.

5.2.5 Pilot testing

The initial survey draft was sent to 12 construction experts for pilot testing. The experts hold supervisory and management level positions. The profiles of the experts are presented in Table 4.

***Table 4**. Profile of experts for pilot testing.*

Expert	Job title	Years of Experience
1	Department Head	5
2	Senior Civil Engineer	17
3	Senior Architect	23
4	Director	24
5	Project Manager	20
6	Lead Architect	9
7	Portfolio Planning Engineer	5
8	BIM Manager	7
9	Lead BIM Engineer	12
10	Operations Manager	20
11	Associate Professor IV	24
12	Senior Lead Piping Engineer	23

The experts were from various organizations, such as academia, city engineering offices, consulting and design firms, AAA contractors, and construction management firms. Aside from minor revisions such as the inclusion of project location, the general consensus suggests the validity of the instrument to gather the relevant data required.

5.3 Data Analysis

This study used descriptive statistics and the Relative Importance Index (RII) to assess the level of importance of each construction issue. A reliability test was also performed to determine whether or not a respondent would give the same score on a variable if it were given to the same respondent again and again. The data will be analysed using Microsoft Excel and SPSS software.

5.3.1 Reliability test

This test was conducted using Cronbach's alpha (α), which is a measure of internal consistency and determines if all variables are moving in the same direction and have a statistically significant relationship [93]. Cronbach's alpha (α) can be calculated using the formula shown:

$$\propto = \frac{K}{K-1}\left(1 - \frac{\sum {s_y}^2}{{s_x}^2}\right) \quad \textbf{(2)}$$

where K is the number of items/questions, ∑s2y is the sum of variance for each item/question and s2x is the variance of the observed total test scores.

5.3.2 Relative importance index (RII)

The Relative Importance Index (RII) approach is widely used to examine survey data resulting from the use of response scales in construction management research surveys. RII is calculated in several ways across construction management research. The frequently cited formula [94] and the simplest form of RII are calculated as:

$$RII = \frac{\sum W}{AN} \quad \textbf{(3)}$$

where W is the sum of scores awarded a variable from N respondent sample, A is the largest integer on the response scale (Likert) and N is the total number of samples.

5.3.3 Kendall's W - coefficient of concordance

It measures how well "k" sets of rankings agree with one another. It is a linear relationship between the mean rank correlation coefficients for all ranking pairs [95]. Kendall's W is determined as follows:

$$W = \frac{12S}{n^2k(k-1)} \quad \textbf{(4)}$$

where S is the squared deviation, n is the number of observers/raters and k is the number of objects to be ranked. Chi-square (x^2) is also calculated using SPSS. If the number of items to be ranked exceeds 7, chi-square analysis should be used instead of Kendall's W. The chi-square for Kendall's W can be calculated as:

$$\chi^2 = k(N-1)W \quad \textbf{(5)}$$

where k is the number of respondents, n is the number of items to be ranked and W is the Kendall's coefficient. If the calculated x^2 exceeds the critical value, there is significant agreement among "n" observers in the ranking of "k" objects.

6 RESULTS AND DISCUSSIONS

The initial minimum required sample calculated using Slovin's method is 124 respondents. After the distribution of the survey questionnaire online, a total of 134 valid responses were collected.

6.1 Demographic Profile

The first part of the survey aims to identify the demographic profile of the respondents.

The first question asks for the respondents' highest educational attainment. The results are presented in Figure 1.

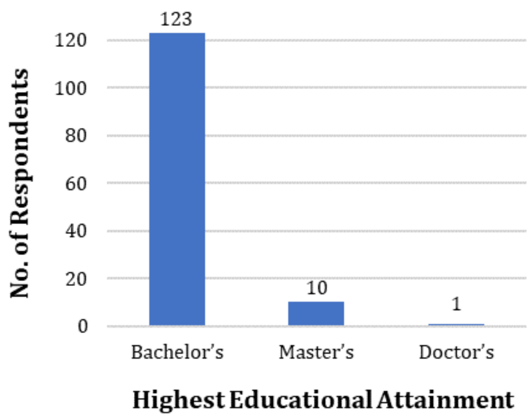

***Figure 1**. Respondents' educational profile.*

Based on the survey, most respondents have relevant bachelor's degrees (123) and some of them have master's degrees (10), but only one has a doctorate.

The next question asks for the respondents' profession related to the construction industry. The results are presented in Figure 2.

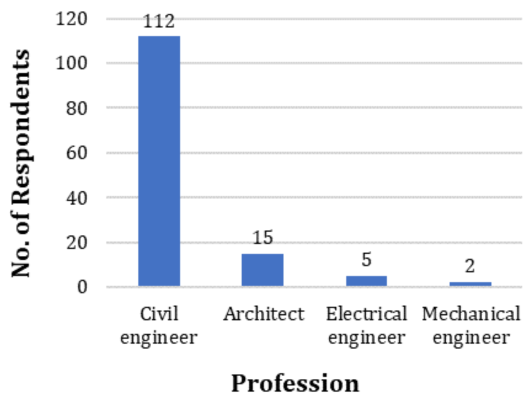

***Figure 2**. Respondents' professional profile.*

From Figure 2, the majority of the respondents are civil engineers (112), followed by architects (16), electrical engineers (5), and mechanical engineers (2).

The next question aims to identify the level of construction-related experience of the respondents. The results are presented in Figure 3.

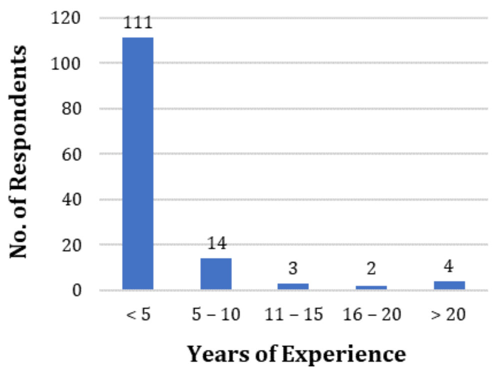

***Figure 3**. Respondents' experience profile.*

From the survey, the majority of respondents are young professionals with less than five years of experience (111); fourteen have 5–10 years of experience; three have 11–15 years of experience; two have 16–20 years of experience; and four have more than 20 years of experience.

The next question is about the current sector affiliation of each respondent. The results are presented in Figure 4.

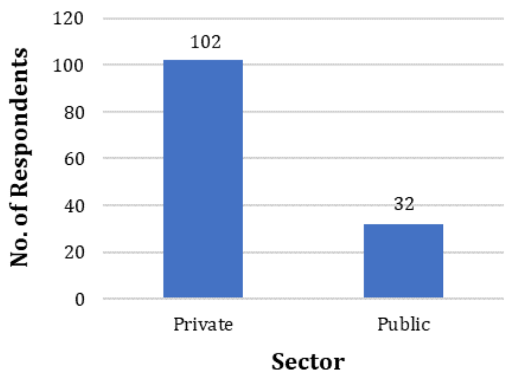

Figure 4*. Respondents' sector profile.*

From the survey, the majority of respondents are from the private sector (102) while only 32 are from the public sector.

The next question is about the stakeholder group of each respondent. The results are presented in Figure 5.

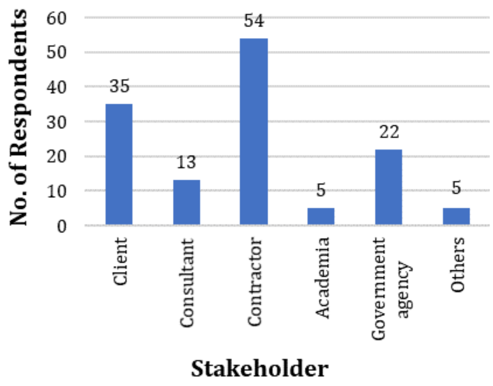

Figure 5*. Respondents' stakeholder profile.*

From the survey, the majority of respondents are from the contractor's group (54), followed by the client's group (35), the government agency (22), the consultant's group (13), academia (5), and other groups (5).

The next question is about the level of position in the company of each respondent. The results are presented in Figure 6.

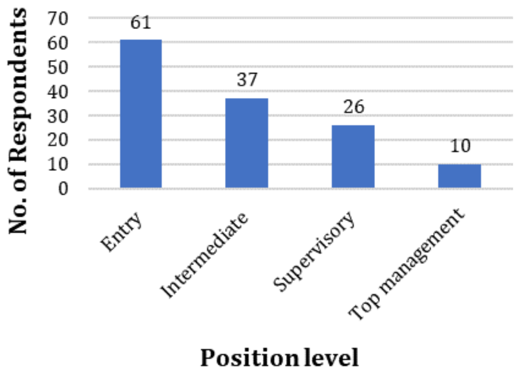

Figure 6. *Respondents' company position profile*.

From the survey, the majority of respondents hold an entry-level position (61), 37 hold an intermediate-level position, 26 hold a supervisory-level position, and 10 hold a top management-level position.

The next question is about the project costs handled by the respondents' companies. The results are presented in Figure 7.

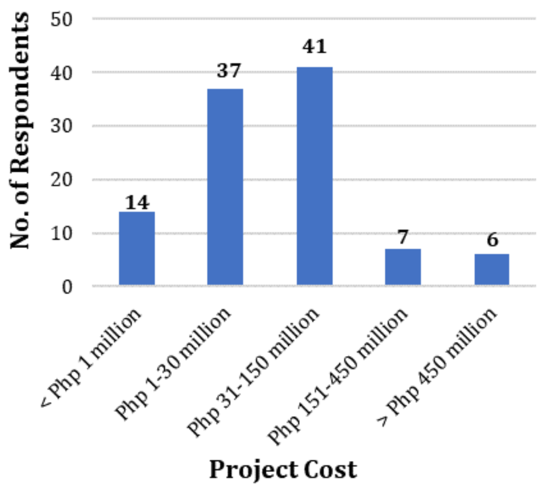

Figure 7. *Respondents' project cost profile*.

From the survey, the majority of respondents' companies handle projects costing 31–150 million pesos (41), followed by projects costing 1–30 million pesos (37), then projects costing less than 1 million pesos, then projects costing 15–150 million pesos (7), and lastly projects costing more than 450 million pesos (6).

The next question is about the geographical location of each project handled by the respondents' companies. The results are presented in Figure 8.

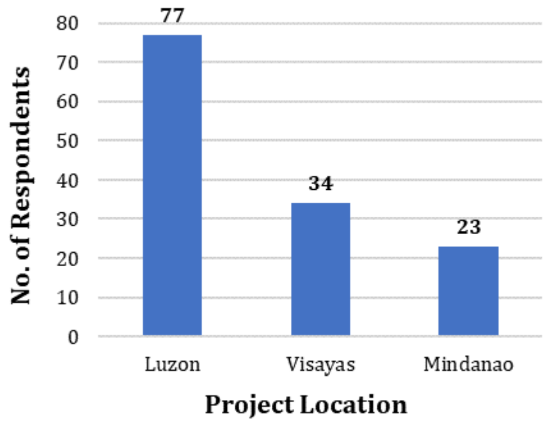

***Figure 8**. Respondents' project location profile.*

From the survey, the majority of respondents' projects are located in the Luzon area (77), followed by the Visayas area (34), and lastly, the Mindanao area (23). This suggests that the concentration of construction activities is still within the area of Luzon, where the two highly industrialized regions are located: the National Capital Region and the Calabarzon region.

The next question aims to identify the company size of each respondent to determine the extent of their workforce. The results are presented in Figure 9.

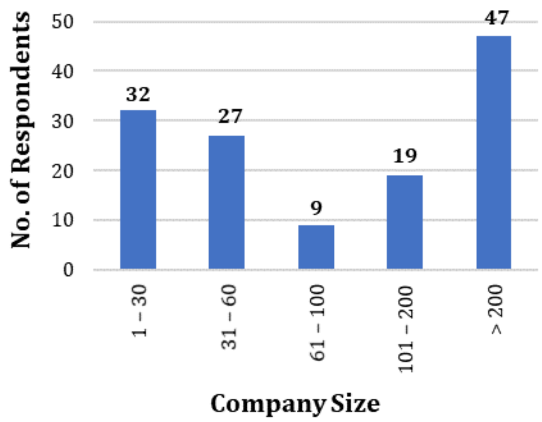

***Figure 9**. Respondents' company size profile.*

From the survey, the majority of respondents belong to large companies with more than 200 employees (47), followed by companies with 1–30 employees (32), then followed by companies with 31–60 employees (27), followed by companies with 101–200 employees (19), and lastly by companies with 61–100 employees (9).

The last question is about the type of construction project that each respondent handles. This question asks about all types of projects in which the respondents are involved. The results are presented in Figure 10.

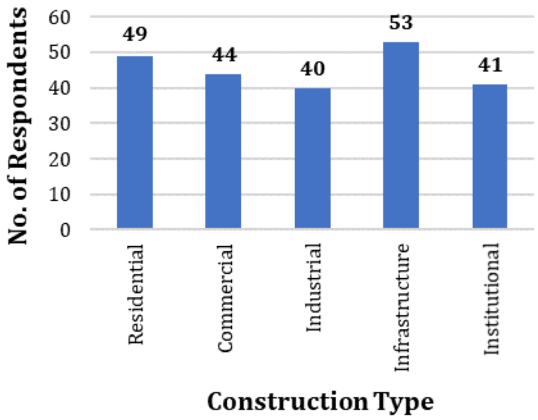

Figure 10. *Respondents' construction type profile.*

From the survey, the majority of respondents are handling infrastructure type projects such as roads, bridges, and flood controls (53), followed by residential type (49), then commercial type (44), then institutional type such as schools and hospitals (41) and lastly, industrial type (40).

6.2 Construction Issues

A total of 11 issues frequently encountered in construction have been identified. The respondents were asked to rate each issue based on its degree of severity or occurrence in their construction projects and experiences.

The results of the survey were tested first for reliability using Cronbach's alpha. The test results showed that the sum of the variance for each barrier (Σs_y^2) is 18.39 and the variance of the observed total rating (s_x^2) is 174.32. The calculated Cronbach's alpha for the 11 items is $\alpha = 0.984$, which signifies "Excellent" internal consistency and reliability [96].

The results of the survey are presented in Table 5.

***Table 5**. Rankings of construction issues from the survey.*

Construction Issues	$\bar{x}$	σ	RII	Rank	Importance Level
Change order	4.806	1.28	0.801	2	High
Time delays	4.866	1.28	0.811	1	High
Cost overruns	4.597	1.32	0.766	6	Medium High
Lack of collaboration	4.418	1.31	0.736	10	Medium High
Poor communication	4.343	1.28	0.724	11	Medium High
Design changes	4.716	1.33	0.786	4	Medium High
Reworks	4.522	1.31	0.754	8	Medium High
Safety management	4.709	1.33	0.785	5	Medium High
QA/QC	4.761	1.22	0.794	3	Medium High
Handover issues	4.552	1.32	0.759	7	Medium High
Construction waste	4.470	1.30	0.745	9	Medium High

Note: $\bar{x}$ = mean and σ = standard deviation

Based on the results of the RII rankings shown in Table 5, the top five issues that are frequently encountered in construction are time delays, variation or change orders, quality issues, design changes, and safety. The most frequent issue encountered in construction is time delays, with an RII of 0.811. This is consistent with the findings of Sweis in 2013, wherein it is mentioned that time overruns are a common occurrence and are almost always associated with construction projects [26]. Consequently, if there are change orders, additional duration will automatically follow, and based on the survey, change orders have an RII of 0.801. Keane et al. stated that consultant-related variations due to changes in the design are the norm in the construction industry [17]. Quality issues ranked third with an RII of 0.794. In a study by Wawak et al., it was stated that only 14% of construction projects are successful, 67% are challenged, and up to 19% fail in terms of delivering quality projects and customer satisfaction [41]. Design changes ranked fourth with an RII of 0.786. Design changes generally contribute to change orders that ultimately lead to additional costs and project durations [21]. Safety-related issues are the fifth most common, with a RII of 0.785, which is consistent with the study of Zaid Alkilani et al., which found that safety problems in the construction industry are becoming more widespread than previously recorded [44]. Ogwueleka mentioned that because of its unique nature, the construction industry is regarded as the most dangerous [42]. As a result, these top five issues are the major issues that the respondents frequently experienced during project implementation.

Based on the data, issues such as cost overruns and reworks are ranked 6th and 8th, respectively. Literature proves that the other issues stated were substantially caused by the major issues such as poor communication, design changes, and poor quality, resulting in additional costs, duration, waste, and issues during project handover. Overall, all 11 issues have RII values above 0.60, which generally indicates that all these issues have medium-high to high importance level and need to be addressed to improve the construction industry [94].

To validate the rankings of the construction issues, the Kendall's W test was performed using the SPSS. The null hypothesis (Ho) states that "*There is no significant agreement among respondents within a group in the ranking of construction issues.*" Since the number of items to be ranked is 11, which is greater than 7, the chi-square statistic is used instead of Kendall's W to decide for the null hypothesis. The calculated λ2 for the respondents is 121.803, and the critical λ2 for n = 11 is 19.675. The calculated asymptotic significance for the group is 0.000, which is less than 0.05. Hence, the null hypothesis should be rejected. According to the result of the statistical test, there is sufficient evidence to conclude that the respondent's groups of rankings for construction issues are interdependent, with a high degree of agreement within each group.

6.3 Current BIM Status and Its Applications

The data from the third part of the survey shows that 35.82% of the respondents are not aware of BIM, 58% are aware but do not have substantial knowledge of BIM, and only 20.90% are knowledgeable and are currently practicing BIM. Overall, 79.10% of the respondents are not BIM users, and 20.90% are BIM users.

For non-BIM users, all respondents stated that instead of BIM, they are currently using computer-aided drawing and design (CADD) to produce drawings and designs for construction. The respondents also stated that currently, spreadsheets and manual calculations are being utilized in preparing material quantity take-offs, cost estimates, and project schedules.

For BIM users, data shows that 64.29% of the respondents use Autodesk Revit, 21.43% use Tekla, 17.86% use ArchiCAD, 35.71% use Bentley, 39.29% use Navisworks, and 10.71% use other software such as Edgewise and Vectorworks. A total of 12 construction-related applications for BIM were presented to the BIM users, and the result of the survey is presented in Table 6.

Table 6. *Current BIM applications status.*

BIM Application	Frequency	Percentage (%)	Rank
Visual presentation	11	39.29	6
Design and analysis	26	92.86	1
Drawing and detailing	22	78.57	2
Projects scheduling and controlling	13	46.43	4
Cost estimation	12	42.86	5
Quantity surveying	10	35.71	7
Tendering	5	17.86	9
Site utilization and lay-out	16	57.14	3
Constructability analysis	7	25.00	8
Collaboration	13	46.43	4
Safety management	5	17.86	9
Facility management	2	7.14	10

The data shows that the top five applications of BIM among BIM users are design and analysis (92.86%), drawing and detailing (78.57%), site utilization and layout (57.14%), collaboration and project scheduling (46.43%), and cost estimation (42.86%). The least common applications of BIM are for tendering and safety management (17.86%) and facility management (7.14%). These show that the current BIM applications among BIM users provide substantial evidence that BIM can improve and resolve the top issues in the construction industry, such as design changes, change orders, and quality issues.

Finally, all respondents were asked about their perceptions of the future of BIM in the Philippines. The majority of the respondents (61.19%) feel that there will be increasing use of BIM, 26.87% feel that there will be a mandatory requirement for the use of BIM, and 11.94% feel that there will be no usage of BIM.

7 CONCLUSIONS

The technological advancement provides multiple opportunities and advantages for construction to further improve its productivity and efficiency and contribute to more sustainable construction. The aim of this study is to identify the common issues and challenges in construction and determine the degree of frequency of each issue among Filipino construction professionals. Furthermore, the study also aims to determine the current status of BIM in the country and identify the current applications of BIM in construction.

The literature review identified 11 common issues and challenges, which include change orders, time and cost overruns, lack of collaboration and poor communication, quality issues and reworks, design changes, safety issues, and construction waste. 12 BIM applications were also identified, which include design and analysis, drawing and detailing, project scheduling, cost estimations, quantity surveying, safety and facility management, collaboration, visual presentation, constructability analysis, site utilization, and tendering.

The study shows that the top five issues that Filipino construction professionals encountered and found most significant in terms of RII were time delays (0.707), change orders (0.694), quality issues (0.660), design changes (0.636), and safety issues (0.627). Overall, all 11 issues proved to be significant among respondents with RII values above 0.50, which indicates a medium-to-highly significant level. Survey data revealed that the current awareness level about BIM is not that high, with 35.82% of the respondents having no awareness and only 20.90% having significant knowledge and skills about BIM. The study shows that the majority of the industry does not implement BIM in their current construction processes and is currently still using traditional methods such as CADD-based drawing and spreadsheets. BIM users generally use Autodesk Revit to perform BIM-related applications, but other software is also being utilized, such as ArchiCAD and Bentley. Currently, data shows that the top five applications of BIM among users include: (1) design and analysis; (2) drawing and detailing; (3) site utilization and layout; (4) project scheduling and collaboration; and (5) cost estimation. Data shows that currently, the Philippine construction industry is starting to realize the opportunities of using BIM to further enhance and improve construction. The majority of the respondents feel that the direction of BIM is towards the adoption of BIM technology.

This study contributes to the promotion of using BIM in Philippine construction and provides insight on the opportunities and advantages that the technology can provide. The findings of this study can help in developing strategies to further increase the awareness of the industry about BIM and provide actions to disseminate BIM education and knowledge among construction stakeholders. Furthermore, a more in-depth study is suggested to explore the topic of BIM adoption strategies in Philippine construction.

Statement of Research and Publication Ethics

The study is complied with research and publication ethics.

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