Acceptability Of Building Information Modeling in Construction Industry in District IV, Nueva Ecija: Strengths, Weaknesses and Barriers

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Abstract: - Over the past three decades, the construction sector has significantly enhanced its use of technology. The application of Building Information Modeling is the most current and alluring of the innovations (BIM). This study evaluates the extent of BIM acceptability among respondents who identify as contractors and who are based in District IV of Nueva Ecija, as well as its advantages, disadvantages, and barriers. The study's objectives are to raise awareness of the advantages of BIM in creating a better building project among current and potential users who are directly involved in the construction sector. The research is based on a hand-to-hand distribution of survey questionnaires and a web-based closed ended survey online questionnaire. The frequency count, percentage, and weighted mean are used to analyze the data. The findings indicated that BIM is generally "Acceptable" in District IV of Nueva Ecija's building sector. While 3D modeling was the main reason contractors used BIM, it also helps with better coordination, clash detection, and enhancing sequencing or scheduling. However, the high cost of BIM software and the lack of or expensive nature of BIM training institutions are the main deterrents to BIM adoption in the district IV building sector of Nueva Ecija. According to the study's findings, most contractors are eager to experiment with BIM, but there are numerous important factors that hinder its adoption.

Key Words*: — BIM, Contractors, 3D Modeling, Clash Detection, Sequencing, Scheduling.*

I. INTRODUCTION

1.1 Background

In the field of construction, Building Information Modeling (BIM) is a well- known concept, and many researchers and professionals are working to understand its depths. In the realm of construction management, technology is transforming whether a team collaborates, produces results, and makes use of data.

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Building Information Modeling (BIM) is a technique that enables professionals in the fields of architecture, engineering, and construction (AEC) to easily plan, design, build, and manage infrastructure using a model- based method (Anandh, 2020).

The fundamental idea behind developing information modeling is well- explained by Thompson and Miner (2007). The project might be conducted immediately in a virtual environment if all relevant project data were stored in a single online system. When time (schedule) and cost dimensions are added to the model, a cost-time-benefit analysis of potential options can be performed almost immediately.

Kim et al. (2018) claim that BIM gives designers, builders, and owners a method to enhance decision-making, quality, and timeliness. BIM is also broad in scope (Turk, 2016). The

structural, functional, and behavioral characteristics of BIM are discussed in Turk's research, indicating how complicated it is.

Consequently, BIM is described by Latif et. al. as the substitution of 2-dimensional (2D) drawings for 3- dimensional (3D) models that are intertwined with contextual, data-rich building components and parts (2015).

The construction industry is a key factor in a nation's booming economy. Building is what promotes development. It speaks about the expansion, development, and productivity of an area. Modern project management approaches and cutting-edge engineering software are used in more developed and progressive nations nowadays to improve and, ideally, simplify the construction process.

The construction industry is regarded as one of the most vital contributors to the economy of any nation, especially when compared to industrialized nations. 2015 (Gerges). The Philippine economy greatly depends on the building sector. The construction industry generated about 336 billion Philippine Pesos in gross value added in the fourth quarter of 2020, according to Statista Research Department (2021). As a result, the construction industry is now more competitive, making technological project management integration essential for becoming the project's driving force (Khalfan and Raja, 2012).

The numerous construction projects choose at enhancing and expanding infrastructure in various cities around the country and they serve as evidence that construction activity in the Philippines is rising. In May 2021, spending on public infrastructure increased. According to data released by the Department of Budget and Management, the amount spent on infrastructure increased by 102.5 percent from May 2020's,

38.9 billion to 78.9 billion pesos.

After this expansion, the economy of the Philippines encourages more building activity. The Philippine Statistics Authority reports that more nonresidential buildings were built in the first quarter of 2018, which led to a 2.6 percent increase in construction activities in the Philippines.

Over the past three decades, the construction sector has significantly enhanced its use of technology (Fisher et al. 2006). The application of Building Information Modeling is the most current and alluring of the innovations (BIM).

Building information modeling is now being used in other nations, and the advantages in terms of decreased time, expense, and material waste are considerable.

On the other hand, although the BIM idea has been introduced in the Philippines, it is not frequently applied or utilized to provide an effective and efficient construction management process. 2019 (Rodriguez). Building information modeling (BIM) is hampered by adoption barriers even though it can increase the effectiveness of sustainable building initiatives. (2002) (Manzoor et al.). At vocational and educational institutions like Microcad, which sells Autodesk products including Revit Architecture, Structure, and MEP, BIM software training is now offered.

A few architectural design companies in the Philippines started implementing BIM tools, like the Revit software, into their processes around 2005. As a result, in order to stay up with the evolving trends in the industry, engineering and consulting firms have adopted BIM ideas. A recent investigation by Bagcal et al. (2018) shows that the Philippines now accepts BIM at a rate of 64.8%. Users of BIM believe that conflict detection, simultaneous drawing of plans and elevations, area and volume extraction from models, parametric modeling, and clash detection to be the most exploited areas, which may have an impact on overall satisfaction with BIM.

The industry of construction is thought to require a lot of labor. The production in this region is characterized by extensive process fragmentation, open job sites, and large- scale production. Building businesses have always been viewed as being wasteful because of this. Clients and decision-makers are worried about the industry's performance because of its low productivity when compared to other industries, like manufacturing. 2020 (Elazzazy).

The construction industry has historically had a low rate of productivity growth when compared to other sectors.

Although BIM has been in development for many years and has been proposed by numerous people as a solution to this issue, adoption is still slow. 2013 (Lindblad).

1.2 Objectives Of the Study

In our contemporary society, the advantages of BIM in terms of both the economy and the environment are acknowledged (Eastman et. al., 2011). However, this new technology's acceptance and uptake have been exceedingly slow (Gu and London, 2010). The goal of this study was to determine how effectively BIM is adopted in the District IV of Nueva Ecija's construction industry. BIM's advantages and disadvantages were also evaluated and researched.

1.3 Statement Of the Problem

In order to determine the level of acceptance of building information and modeling in the construction industry in District IV, Nueva Ecija, a study entitled "Acceptability of Building Information Modeling in Construction Industry in District IV Nueva Ecija: Strengths, Weaknesses and Barriers" was conducted. It specifically aimed to respond to the following questions:

How may the profile of the respondents be described in terms of

- Workplace
- Respondents' Company Designation
- Company Category
- Years' experience in Construction Industry
- Building Information and Modeling Experience

What is the acceptance level of BIM by the respondents working in Construction Industry?

What is/are the benefits resulting from using BIM in building processes?

What are the highest leverage areas for BIM users?

What are the key factors that obstruct BIM implementation in the construction industry in District IV, Nueva Ecija?

1.4 Significance of The Study

The result of this study will be valuable and significant to the following:

To the Civil Engineers. About the demands for the globalization of the civil engineering profession in particular, this study will assist them in adjusting to the needs of the present.

To the Community. The community will become more aware of the extent of BIM acceptability in the construction industry as a result of this.

To the Curriculum Planners. Their future curriculum adjustments will be guided by this study in order to create a civil engineering program that is more comprehensive and successful.

To The Instructors/Professors. They will receive knowledge and awareness on how to adapt their teaching style and instructional materials in connection to BIM in order to satisfy industry demands.

To The Students. This study will give them awareness of the need to develop early their skills and competencies to make them ready and prepared for the possible wide adoption and use of BIM.

To The Researchers. The findings of this study will inform them about the current level of acceptance of building information modeling as well as its advantages and disadvantages, and from these findings, numerous researchable issues will be identified and further investigated in the pursuit of the truth and as a contribution to knowledge.

To The Future Researchers. This study will act as a reference and aid future researchers in their studies that are related to this subject.

1.5 Scope and Delimitation of The Study

The study used respondents directly or indirectly working in the construction industry. A survey was conducted about the evaluation of the respondents regarding the acceptance of Building Information Modeling in construction practices.

This study was conducted to determine how well BIM is being accepted in the Construction Industry. The Acceptance level of BIM was measured through a series of situations and identifications on the questionnaire. The strengths and weaknesses of using BIM was also assessed and studied.

This study was delimited in finding the Acceptance level of BIM in Construction industry in District IV of Nueva Ecija along with its strengths, weaknesses, and barriers.

II. METHODOLOGY

This study was conducted following a quantitative research design specifically a descriptive evaluation approach. According to Leedy and Ormrod in 2009, what constitutes a quantitative research method involves a numeric or statistical approach to research design. This research design helped the researcher to get enough data coming from a contractor (Engineers or Architects) that are based in District IV, Nueva Ecija on level of acceptance of Building Information Modeling.

A descriptive evaluation approach was used in this study to assessed the level of acceptance of a contractor (Engineers or Architects) that are based in District IV, Nueva Ecija on their experience or assumption of using Building Information Modeling on their managerial approach in construction site. As cited by Salaria (n.d), descriptive research is devoted to the gathering of information about prevailing conditions or situations for the purpose of description and interpretation. The researcher identified the results quantitatively.

2.1 Locale Of the Study

This study was conducted at the municipalities and cities of District IV, Nueva Ecija which were the city of Gapan and adjacent municipalities in southern Nueva Ecija, namely Cabiao, General Tinio, Jaen, Peñaranda, San Antonio, San Isidro, and San Leonardo. This location was selected to be the subject area in determining the acceptance level of Building Information Modelling along with its strengths, weaknesses, and barriers as this is a place where many construction companies operate.

2.2 Respondents Of the Study

The respondents were individuals who were working in architectural and structural companies, design firms, general contractors, and developers that are based in District IV, Nueva Ecija who were involved directly in the construction process. The respondents were architects and engineers who were technically and technologically literate. The number of respondents is given below:

Types of Respondents	n	%
BIM Users	19	65%
Non-BIM Users	11	35%
Total	**30**	**100%**

Fig.1. Respondents of the Study

2.3 Sampling Procedure

The web-based survey questionnaire created by the researchers was used to collect the data for this research investigation. The purpose of the survey was to find out how many engineers and architects in District IV of Nueva Ecija were comfortable using building information models on construction sites.

Purposive or judgment sampling, a non-probability sampling technique, was adopted by the researchers. It is an approach to sampling in which not every person of the population has an equal chance of taking part in the research. Purposive sampling was utilized in this study as a sampling technique that made it possible to collect data and pick a sample that might be representative of the community. Purposive sampling is frequently employed in quantitative research to find and choose cases with plenty of relevant information on the phenomenon of interest, according to Palinkas et al. (2013).

2.4 Description Of the Questionnaire

The researcher used a closed ended survey questionnaire which is composed of five (5) parts. Part One (I) is Demographic Profile of each respondent. Part Two (II) is the acceptance level of Building Information Modeling by the respondents working in Construction Industry. BIM Users were subjected in Part Three and Four. Part Three were the benefits resulting from using Building Information Modeling, Part Four were the Highest leverage areas in using Building Information Modeling. Part Five was for Non-BIM User which was about the key factor that obstructed the implementation of Building Information Modeling in the construction industry.

The researchers made several revisions on the questionnaires according to the need of the study. The questionnaire used a 5-point Likert Scale which are the 1- Strongly Disagree, 2-Disagree, 3-Neutral and 4-Agree, 5-Strongly Agree.

Scoring. The scoring and interpretation of the responses were arranged using the Likert-five-point scale given below.

Assigned Weight	Rating Scale	Verbal Interpretation
5	4.25-5.00	Strongly Agree
4	3.25–4.24	Agree
3	2.50–3.24	Neutral
2	1.75 – 2.49	Disagree
1	1.00 – 1.74	Strongly Disagree

Fig.2. Likert Scale

The researcher interprets the range of rating scale using the formula denote as:

$$\frac{N-1}{N}$$

Where:

N = Number of Point of Likert Scale

2.5 Validation And Reliability of The Instrument

The researchers gathered 5 BIM User and 5 non-BIM user for reliability test. In part II and part III of the closed ended questionnaire which has a respondents of BIM user the

reliability statistics of Cronbach's Alpha are 0.72 and 0.70 respectively and the N of Item is 5 which means that it has good internal consistency and good reliability. In part V of the closed ended questionnaire which has a respondent of non-BIM user the reliability statistics of Cronbach's Alpha is 0.76 and the N of Item is 5 which means that it has an acceptable internal consistency and acceptable reliability.

2.6 Data Gathering Procedure

The researcher used a web-based closed ended survey questionnaire and hard copy. Through this survey questionnaire, the researcher assessed the acceptance level of Building Information Modeling along with its strengths, weaknesses, and barriers.

To gather data in determining the acceptance level of Building Information Modeling for Contractors (Engineers & Architects) in District IV, Nueva Ecija, the researchers used the power of social media to distribute survey questionnaire through Google Form and, the researchers conducted face-to-face survey and distributed hard copy of the survey questionnaire in some of the construction companies.

2.7 Data Analysis and Technique

The survey questionnaire was distributed in each respondent that are chosen to determine their workplace, company designation, company category, years working in construction industry, and BIM experience, acceptance level, benefits of Building Information Modeling, the use of Building Information Modeling, and key factor that implemented to obstruct the used of BIM. Respondents were from different municipalities and cities in District IV in Nueva Ecija. The answer in all question is tallied and shown in each tables including the interpretation.

2.8 Statistical Tools and Statistical Treatment

Responses from the survey questionnaire were analyzed using the descriptive statistics of frequency counts and percentage and mean. descriptive statistics of frequency counts and percentages were used in analyzing the demographic variable while mean is used in Part II, Part III, and Part V respectively.

The ranking of each answer in the questionnaire is based on the number ordered among all answers the highest value is the rank 1 and the least value also the least rank as well.

The researcher used frequency count and the percentage in describing the profile of each respondent. The formula is denoted as:

$$P = \frac{F}{N} x\ 100$$

Where:

F= Frequency

N= Number of respondents P = Percentage

To analyze and interpret the data that are gathered using Likert-four-point scale. The researcher used mean and interpret the data using the legend that has rating scale. The formula was denoted as:

$$M = \frac{FV}{N}$$

Where:

M = Mean

FV = Frequency x Value

N = Number of Respondents

III. RESULTS AND DISCUSSION

3.1 Demographic Profile

Table.1. Workplace of the Respondents

Workplace	Frequency	Percentage (%)
Gapan City	6	20
Cabiao	6	20
General Tinio	2	6.7
Jaen	3	10
Peñaranda	1	3.3
San Antonio	1	3.3
San Isidro	2	6.7
San Leonardo	9	30
TOTAL	**30**	**100**

Table 1 shows the workplace of the respondents. As can be gleaned from this table, the number of respondents in Gapan City is 6 or 20%, in Cabiao is 6 or 20%, in General Tinio is 2 or 6.7%, in Jaen is 3 or 10%, in Peñaranda is 1 or 3.3%, in San Antonio is 1 or 3.3%, in San Isidro is 2 or 6.7% and San Leonardo is 9 or 30%.

It is evident that the highest number of contractors are based in San Leonardo, Nueva Ecija.

Table.2. Company Designation of the Respondents

Company Designation	Frequency	Percentage (%)
Project Manager	8	26.7
Project Engineer	6	20
Structural Engineer	1	3.3
Safety Engineer	1	3.3
Site Engineer	4	13.3
Office Engineer	0	0
Architect	7	23.4
Architect Apprenticeship	3	10
Others	0	0
Total	**30**	**100%**

Table 2 shows the Company Designation of the respondents that are based in District IV in Nueva Ecija. As can be gleaned in the table above the number of Project Manager is 8 or 26.7%, Project Engineering is 6 or 20%, Structural Engineer is 1 or 3.3%, Safety Engineer is 1 or 3.3%, Site Engineer is 4 or 13.3%, Office Engineer is 0 or 0%, Architect is 7 or 23.4%, Architect Apprenticeship is 3 or 10% and lastly others are 0 or 0%.

Table.3. Company Category of the Respondents

Company Category	Frequency	Percentage (%)
AAA	3	10
AA	0	0
A	4	13.30
B	1	3.30
C	2	6.70
D	6	20
E/ Trade	0	0
DTI Register Only	14	46.70
Total	**30**	**100**

Table 3 shows the Company Category of the respondents that are based in District IV in Nueva Ecija. As can be gleaned in the table above, the number of respondents that answered AAA is 3 or 10%, AA is 0 or 0%, A is 4 or 13.30%, B is 1

or 3.3%, C is 2 or 6.7%, D is 6 or 20%, E/ Trade is 0 or 0% and DTI Register Only is 14 or 46.7%.

These shows that most respondents who are working in their respective companies that are based in District IV in Nueva Ecija are part on a company category which determined to be DTI Register Only.

Table.4. Years of Experience of the Respondents in Construction Industry

Years of Experience in Construction Industry	Frequency	Percentage (%)
0-5	19	63.30
6-10	8	26.70
11-15	2	6.70
16-20	0	0
20+	1	3.30
Total	**30**	**100%**

Table 4 shows the years of experience of the respondents in construction industry that are based in District IV in Nueva Ecija. As can be shown in the table above, the number of experience years of the respondents in 0-5 years is 19 and 63.3%, in 6-10 years is 8 or 26.70%, in 11-15 is 2 or 6.70%, in 16-20 is 0 or 0% and 20+ is 1or 3.30%.

Table.5. Building Information Modeling Experience of Respondents

Building Information Building Experience	Frequency	Percentage
BIM User	19	67.30
Non – BIM User	11	36.70
Total	**30**	**100%**

3.2 Level Of Acceptance in Building Information Modelling

Table.6. Level of Acceptance in Building Information Modeling

	Mean	RANK	VD
1. I am familiar in Building Information Modeling (BIM).	4.11	2.5	Agree
2. I think learning to operate BIM is easy to do.	3.95	5	Agree
3. I am using BIM in every project that I do.	3.89	6	Agree
4. I think BIM enhances efficiency and effectiveness on the job.	3.68	10	Agree
5. I think using BIM raises our chances to increase our profits.	3.84	7	Agree
6. I think using BIM improves quality of project delivery.	3.74	8.5	Agree
7. I think using BIM provides help us make better decision.	4.11	2.5	Agree
8. I will recommend to the others to use BIM in construction projects.	4.16	1	Agree
9. I think the advantages of using BIM software outweighs the disadvantages.	4.05	4	Agree
10. Overall, I like the idea of using BIM.	3.74	8.5	Agree
Average of Weighted Means	**3.93**		**Acceptable**

Table 6 shows the level of acceptance of Building Information Modeling in the Construction Industry in District IV, Nueva Ecija. As shown in the table, the statement "I will recommend to the others to use BIM in construction projects" got the highest rank with a weighted mean of 4.16 which has a verbal description of Agree which also signifies Acceptable for the

respondents while the statements "I think BIM enhances efficiency and effectiveness on the job." got the lowest rank with a mean of 3.68 which has a verbal description of Agree that signifies Acceptable.

3.3 Benefits In Building Information Modeling in Construction Industry

Table.7. Benefits In Building Information Modeling in Construction Industry

	Mean	Rank	VD
1. BIM improve Onsite Collaboration and Communication.	4.26	2	Strongly Agree
2. BIM provides model-based cost estimation.	4.05	5.5	Agree
3. It visualizes the project in preconstruction.	4.05	5.5	Agree
4. It has better coordination and clash detection.	4.00	7.5	Agree
5. BIM mitigates risk and reduce cost.	4.16	3.5	Agree
6. It improves scheduling/sequencing.	3.89	9.5	Agree
7. It increases productivity with Prefabrication.	3.89	9.5	Agree
8. It provides better safety on Construction sites	4.00	7.5	Agree
9. BIM executes overall better builds.	4.16	3.5	Agree
10. It strengthens building handover and facility management.	4.32	1	Strongly Agree
Average of Weighted Means	**4.08**		**Acceptable**

BIM users are subjected to part three (III) to determine the benefits of using Building Information Modeling. The BIM user respondents has been chosen for this part since they are the ones who has experience in using it and can assessed its benefits.

Table 7 shows the benefits of Building Information Modeling in Construction Industry in District IV in Nueva Ecija, As shown in the table, the statement "It strengthens building handover and facility management." got the highest rank with a weighted mean of 4.32 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "It improves scheduling/sequencing and it increases productivity with Prefabrication." got the lowest rank with a mean of 3.89.

which has a verbal description of Agree that signifies Acceptable.

This result implies that the highest benefits from using BIM for the respondents (BIM users) is it strengthens building handover and facility management. While the least benefit of using BIM for the respondents (BIM user) is It improves scheduling/sequencing and it increases productivity with Prefabrication.

3.4 Highest Leverage Areas in Using Building Information Modelling

Table.8. Highest Leverage Areas in using Building Information Modeling (BIM)

Leverage Areas	Frequency	Percentage (%)	Rank
1. Clash Detection	12	63.16	**1**
2. 3D Modeling	8	42.11	**5**
3. BOQ Estimate	13	68.42	**2.5**
4. 3D Model for Fabrication	13	68.42	**2.5**
5. Coordination Efficiency	11	57.89	**4**

Table 8 shows the highest leverage areas in using Building Information Modeling (BIM). As can be gleaned from the table, Clash Detection got the highest rank selected by 12 respondents or 63.16%. Bill of Quantities Estimate and 3D Model for Fabrication has been ranking second and third selected by 13 or 68.42% of the respondents. For the fourth rank, Coordination Efficiency selected by 57.89% or 11 respondents and lastly 3D Modeling has been selected by 8 which is 42.11% of respondents.

The result signifies that the BIM user respondents used BIM for the purpose of 3D Modeling, BOQ Estimate, 3D Model for Fabrication, Clash Detection and Coordination Efficiency

3.5 Issues Implementing Building Information Modeling (BIM) In Construction Industry

Table.9. Issues in Implementing Building Information Modeling (BIM) in Construction Industry

	Mean	RANK	VD
1. The cost of BIM software is high.	4.27	1	Strongly Agree
2. Other software is enough to sustain business.	4.00	3	Agree
3. I am not aware or familiar with the software.	4.09	2	Agree
4. It needs long learning curve for employees.	3.91	4	Agree
5. BIM is not suitable for the projects that we do.	3.73	7	Agree
6. It is time consuming to set up news of tware.	3.82	5	Agree
7. It is possible to have incompatibility with partners.	3.64	9.5	Agree
8. It lacks in resources and expertise in construction industry.	3.73	7	Agree
9. It lacks and high cost of Training Schools for BIM.	3.73	7	Agree
10. There is a weak support from organization environment and culture in implementation of BIM.	3.64	9.5	Agree
Average of Weighted Means	3.85		Acceptable

Table 9 shows the issues in implementing Building Information Modeling in Construction Industry in District IV in Nueva Ecija, As shown in the table, the statement "The cost of BIM software is high" got the highest rank with a weighted mean of 4.27 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "There is a weak support from organization environment and culture in implementation of BIM and it is possible to have incompatibility with partners" got the lowest rank with a mean of 3.64 which has a verbal description of Agree that signifies Acceptable.

This result implies that the issues in implementing BIM for the respondents (non-BIM users) are due to cost of BIM software is high. While the least issues in implementing BIM for the respondents (non-BIM users) for the respondents are there is a weak support from organization environment and culture in implementation of BIM and it is possible to have incompatibility with partners.

IV. Summary Of Findings And Conclusions

4.1 Summary

This study was conducted to identify the acceptance level of using Building Information Modeling of the contractor in District IV, Nueva Ecija along with its strengths, weaknesses, and barriers.

A total of thirty (30) contractors were selected from District IV, Nueva Ecija served as respondents for the purpose of the study. The study utilized the descriptive method of research to determine the acceptance level of using Building Information Modeling of the contractor in District IV, Nueva Ecija. Mean, Frequency Distribution, and Percentage were used as statistical treatment. The study used a web-based closed ended survey questionnaire as the main tool of the study in data gathering.

4.2 Findings

Based on the specific problems of the study, the following findings were obtained:

Demographic Profile. The contractor who served as the respondent of the study were 30% are based in San Leonardo, 26.7 percent were designated in their respective company as Project Manager, 46.70 percent has a Company Category that was DTI Register Only, 63.30 percent has 0-5 years of experience in construction industry, and 63.30 percent were BIM users.

Level of Acceptance in Building Information Modeling. The statement "I will recommend to the others to use BIM in construction projects" got the highest rank with a weighted mean of 4.16 which has a verbal description of Agree which also signifies Acceptable for the respondents while the statements "I think BIM enhances efficiency and effectiveness on the job" got the lowest rank with a mean of 3.68 which has a verbal description of Agree that signifies Acceptable. The

overall weighted mean is 3.93 which has a verbal description of Acceptable.

Benefits in Building Information Modeling in construction industry. The statement "It strengthens building handover and facility management" got the highest rank with a weighted mean of 4.32 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "It improves scheduling/sequencing" and "It increases productivity with Prefabrication" got the lowest rank with a mean of 3.89 which has a verbal description of Agree that signifies Acceptable.

Highest Leverage areas in Using Building Information Modeling. The contractor who served as the respondents of the study used Building Information Modeling for the purpose of 3D Modeling, BOQ Estimate, 3D Model for Fabrication, Clash Detection and Coordination Efficiency.

Issues in Implementing Building Information Modeling in Construction Industry. The contractor who are classify as non-BIM user determine the issues in

implementing Building Information Modeling in the industry. As due to the high cost of BIM software.

4.3 Conclusions

Based on the summary of findings, the following conclusions were drawn:

4.3.1 Demographic Profile of the Respondents

The workplace of the respondents has mostly located in San Leonardo it is because most of the company are operated in San Leonardo. The Company Designation of the respondents are mostly Project Manager. The Company Category of the respondents are mostly DTI Register Only. A significant big number of respondents were 0-5 years' experience in construction industry. Most of the respondents were BIM user.

4.3.2 Level of Acceptance in Building Information Modeling

The level of acceptance in Building Information Modeling of the respondents; they classify Building Information Modeling to be Acceptable because they will recommend the BIM to others to adapt it in construction projects

4.3.3 Benefits in Building Information Modeling in Construction Industry

The benefits for the respondents in using Building Information Modeling in Construction Industry specify mostly for use the Building Information Modeling to strengthen building handover and facility management

4.3.4 Highest Leverage Areas in Using Building Information Modeling

The highest leverage area for the respondents in using Building Information Modeling are classified as Clash Detection, 3D Model for Fabrication, BOQ Estimate, 3D Modeling, and Coordination Efficiency.

4.3.5 Issues In Implementing Building Information Modeling in Construction Industry

The issues in implementing Building Information Modeling in Construction Industry for the respondents are classify as due to the high cost of software because most of the respondents has only 0-5 years of experience it is evidently that the respondent have not enough budget to maintain the BIM in their managerial since BIM software is costly

Recommendations:

Based on the conclusion, the following recommendations are formulated:

- A comparative study must be conducted to test the acceptability of AutoCAD Desk Software versus Building Information Modeling Software in Construction Industry.
- Determine the correlation of Age and Sex on the Acceptance level of using Building Information Modelling in Construction Industry.
- Conduct a case study of Building Information Modeling Implementation in Infrastructure Project that are based in Nueva Ecija
- Conduct a review of Building Information Modeling for Construction in Developing Municipalities in Nueva Ecija

For future researcher, conduct and determine the acceptance level of using Building Information Modeling for the Contractors who are based in Nueva Ecija.

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