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

Pearl Roxan Delos Santos [1], Rick Donald Sy Manzon [2], Joefil Jocson [2]

[1]*Student, Graduate School, Master of Engineering Management, Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines.*

[2]*Professor, Graduate School, Master of Engineering Management, Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines.*

Corresponding Author: pearlroxan0307@gmail.com

Abstract: - The construction industry has dramatically improved its use of technology during the previous three decades. The most recent and enticing in the said developments is the use of Building Information Modeling (BIM). This study assesses the acceptance level of BIM for the respondents who classify as contractors that were based in District III in Nueva Ecija alongside with its strengths, weaknesses and barriers. The aims of the study are to give awareness for users and potential users who are directly involved in the construction industry, of the benefits of BIM in achieving a better construction project. The research is based on web-based closed ended survey online questionnaire and hand to hand distribution of survey questionnaire. The data are analyzed through frequency count, percentage and weighted mean. The results showed that the overall acceptance for BIM in construction industry in District III in Nueva Ecija is "Acceptable". Furthermore, BIM facilitates better coordination and clash detection and also improving sequencing or scheduling while the primary purpose of contractors for using this was for 3D Modeling. However, the high cost of BIM software and, lack and high cost of training schools for BIM are the top reasons why the implementation of BIM is avoided in the construction industry in District III in Nueva Ecija. The study concludes that most of the contractors are willing to try BIM but there are many key factors that obstruct the implementation of BIM.

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

I. INTRODUCTION

1.1 Background

Building Information Modeling (BIM) is a well-known concept in the construction business, with many researchers and practitioners striving to comprehend its complexities. Technology is transforming the way a team works, generates outcomes, and uses information in the field of construction management.

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For architecture, engineering, and construction (AEC) professionals, Building Information Modeling (BIM) provides knowledge and a tool to effectively plan, design, construct, and manage buildings and infrastructure using a model-based process (Anandh, 2020).

Thompson and Miner (2007) have a good explanation of the core concept for building information modeling. If all necessary project data was housed in a single online system, the project might be run first in a virtual environment. When time (schedule) and cost dimensions are added to the model, a cost-time-benefit analysis of various solutions can be done practically instantly.

According to Kim et al. (2018), BIM provides a process for designers, contractors, and owners to improve decision-making, quality, and timeliness. BIM is also expansive in nature (Turk, 2016). Turk's study discusses the structural, functional

and behavioral attributes of BIM which indicate its complex nature.

Consequently, BIM is defined as the replacement of 2-dimensional (2D) drawings as an architectural design with a 3-dimensional (3D) model that is entangled with contextual, data-rich building components and elements, according to Lathifi et., al. (2015).

One of the determinants of a country's booming economy is the building industry. Construction is a fuel for development. It refers to an area's growth, improvement, and productivity. Progressive and more advanced countries nowadays, use contemporary project management techniques with advanced engineering software tools in an effort to enhance and ideally ease the construction process.

In comparison to industrialized countries, the construction sector is considered to be one of the most essential contributor key aspects in the economy of any country. (Gerges, 2015). The construction industry is an important part of the Philippine economy. According to Statista Research Department (2021), the construction industry is generating around 336 billion Philippine pesos in gross value added in the fourth quarter of 2020. This results to a more competitive construction environment making technological integration in project management a must in becoming the catalyst in a successful project (Khalfan and Raja, 2012).

Construction activity in the Philippines is increasing, as seen by the various construction projects targeted at improving and expanding infrastructure in various cities across the country. In fact, expenditures on public infrastructure surged in May 2021. Data published from the Department of Budget and Management revealed that the infrastructure expenditure amounted to 78.9 billion pesos which is a 102.5 percent spike from the 38.9 billion spent in May 2020. (Manuel, 2021).

Following this growth, the Philippines' economy promotes more construction activity. According to the Philippine Statistics Authority, construction activities in the Philippines increased by 2.6 percent in the first quarter of 2018 as more nonresidential buildings were constructed.

The construction industry has dramatically improved its use of technology during the previous three decades (Fisher et al. 2006). The most recent and enticing in the said developments is the use of Building Information Modeling (BIM).

Building Information Modeling's use has spread to other countries, and the benefits are impressive in terms of time, cost, and material waste reduction. The Philippines, on the other hand, has been exposed to the BIM concept, but it is not generally employed or used to leverage the benefits of producing an effective and efficient construction management process. (Rodriguez, 2019). Despite the fact that Building Information Modeling (BIM) can improve the efficiency of sustainable building projects, it is nevertheless plagued with impediments to adoption. (Manzoor et.al., 2021). BIM software instruction is now available at vocational and training colleges such as Microcad, which offers Autodesk products like Revit Architecture, Structure, and MEP.

In 2005, a few architectural design firms in the Philippines began incorporating BIM tools, such as Revit software, into their operations. As a result, engineering and consulting businesses have followed suit and adopted BIM concepts in order to keep up with the industry's growing trends. A recent study conducted by Bagcal et.al. (2018) reveals that currently, the Philippines has a 64.8% acceptance level to BIM. BIM users regard parametric modeling, area and volume extraction from models, clash detection, and simultaneous drawing of plans and elevations to be the most leveraged areas, which might affect overall satisfaction with BIM.

Construction is considered to be a labor-intensive sector. Large-scale production, open job sites, and substantial process fragmentation characterize this area's production. As a result, the building industry has traditionally been considered as a wasteful business. The industry's low productivity compared to other sectors, such as manufacturing, has caused clients and decision-makers to be concerned about its performance. (Elazzazy, 2020).

When compared to other industries, the Construction Industry has historically had a poor rate of productivity growth. Many people have suggested BIM as a solution to this problem, however despite the fact that BIM has been in development for many years, acceptance is still slow. (Lindblad, 2013).

1.3 Objectives Of the Study

The economic and environmental benefits of BIM is considered to be recognized in our modern society (Eastman et. al., 2011). However, the acceptance and adoption of this new technology has been very slow (Gu and London, 2010). The purpose of this study was to see how well BIM is accepted in the Construction Industry in the District III of Nueva Ecija. The strengths and weaknesses of using BIM was also assessed and studied.

1.4 Statement Of the Problem

This study entitled "Acceptability of Building Information Modeling in Construction Industry in District III Nueva Ecija: Strengths, Weaknesses and Barriers" aimed to identify the acceptance level of Building Information and Modeling in the Construction Industry in District III, Nueva Ecija. Specifically, it sought to answer 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 III, Nueva Ecija?

1.5 Significance Of the Study

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

To the Civil Engineers. This study will help them cope with the needs of the time specifically in meeting the demands for globalization of the civil engineering profession.

To the Community. This will instill awareness to the community on the status of the acceptance level of BIM in Construction Industry

To the Curriculum Planners. This study will guide them in their future curricular revisions towards a more holistic and effective civil engineering curriculum.

To the Instructors/Professors. They will be provided with insights and awareness on how to meet the demands of the industry by modifying and upgrading their method of instruction and instructional materials in relation to BIM

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. Results of this study will provide them information and knowledge on the acceptance level of Building Information Modeling and its strengths and weaknesses in the present time, from which many researchable issues will be discovered and further explored in search for the truth and as a contribution to knowledge.

To the Future Researchers. This study will serve as a guide and will help the future researchers on their researches with relevance to this study.

1.6 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.

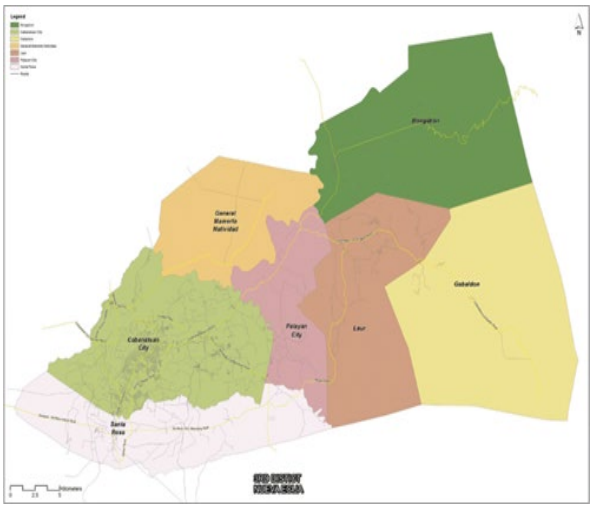
This study was delimited in finding the Acceptance level of BIM in Construction industry in District III of Nueva Ecija along with its strengths, weaknesses and barriers.

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 III, 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 III, 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 III, Nueva Ecija which were in Cabanatuan City, Palayan City, Laur, General Mamerto Natividad, Gabaldon, Bongabon, and Sta. Rosa. 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 III, 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:

Table.1. Respondents of the Study

Types of Respondents	**n**	**%**
BIM Users	14	35%
Non-BIM Users	26	65%
Total	**40**	**100%**

2.3 Sampling Procedure

The data for this research study was gathered using the web-based survey questionnaire made by the researchers. The survey questionnaire aimed to determine the acceptance level of Building Information Model to use in construction site by Engineers and Architect in District III, Nueva Ecija.

The researchers used the non-probability sampling technique, specifically the purposive or judgment sampling. A sampling method which not all members of the population have an equal chance of participating in the study. A purposive sampling was used in this study as a sampling procedure enable to obtain data, they could be representing the population in selecting the number of respondents of this study. According to (Palinkas et.al., 2013), Purposive sampling is widely used in quantitative research for the identification and selection of information-rich cases related to the phenomenon of interest.

Judgment sampling is a non- probability sampling method in which the researcher selects the sample based on his belief that the respondents can provide accurate responses and that the chosen sample is a true reflection of the full population.

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 (III) were the benefits resulting from using Building Information Modeling, Part Four (IV) was the Highest leverage areas in using Building Information Modeling. Part Five (V) 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 4-point Likert Scale which are the 1-Strongly Disagree, 2-Disagree, 3-Agree and 4-Strongly Agree.

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

Table.2. Likert Scale

Assigned Weight	Rating Scale	Verbal Interpretation
4	3.25– 4.00	Strongly Agree
3	2.50– 3.24	Agree
2	1.75 – 2.49	Disagree
1	1.00 – 1.74	Strongly Disagree

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

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

3 Where:

N = Number of Point of Likert Scale

2.5 Validation And Reliability of The Instrument

The web-based closed ended survey questionnaire was submitted to their research adviser for correction and suggestion. Once checked, all corrections and suggestions were incorporated on the questionnaire for content validation. The researchers gathered 10 BIM User and 10 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 0.8044 and 0.8214 respectively and the N of Item is 10 which means that it has good internal consistency and good reliability. In part V of the closed ended questionnaire which has a respondents of non-BIM user the reliability statistics of Cronbach's Alpha is 0.7407 and the N of Item is 10 which means that it has an acceptable internal consistency and acceptable reliability.

2.6 Data Gathering Procedure

The letter was given to different municipalities and cities under District III in Nueva Ecija to get the total number of registered contractors and companies. After getting the complete list of contractors and companies, the researchers used a purposive and judgmental sampling to choose the respondents that will be part of the study.

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 III, Nueva Ecija, the researchers used the power of social media to distribute survey questionnaire through Google Form and also, 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 III in Nueva Ecija. The answer in all question is tallied and shown in each table 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

III. Results And Discussion

3.1 Demographic Profile

Table.1. Workplace of the Respondents

Workplace	Frequency	Percentage (%)
Bongabon	5	12.5
Cabanatuan City	15	37.5
Gabaldon	0	0
General Mamerto Natividad	5	12.5
Laur	3	7.5
Palayan City	9	22.5
Sta. Rosa	3	7.5
Total	**40**	**100%**

Table 1 shows the workplace of the respondents. As can be gleaned from this table, the number of respondents in Bongabon is 5 or 12.5%, in Cabanatuan City is 15 or 37.5%, in Gabaldon 0 or 0%, in General Mamerto Natividad is 5 or 12.5%, in Laur 3 or 7.5%, in Palayan City is 9 or 22.5% and Sta. Rosa is 3 or 7.5%.

It is evident that the highest number of contractors are based in Cabanatuan it is because Cabanatuan is the one of the leading cities in Nueva Ecija in terms of infrastructure.

As the researcher gathered the total registered contractor in District III in Nueva Ecija, it shows that the highest total number are based in Cabanatuan with the total number of 114 registered contractors.

Table.2. Company Designation of the Respondents

Company Designation	Frequency	Percentage (%)
Project Manager	10	25
Project Engineer	8	20
Structural Engineer	1	2.5
Safety Engineer	0	0
Site Engineer	5	12.5
Office Engineer	0	0
Architect	9	22.5
Architect Apprenticeship	6	15
Others	1	2.5
Total	**40**	**100%**

Table 2 shows the Company Designation of the respondents that are based in District III in Nueva Ecija. As can be gleaned in the table above the number of Project Manager is 10 or 25%, Project Engineering is 8 or 20%, Structural Engineer is 1 or 2.5%, Safety Engineer is 0 or 0%, Site Engineer is 5 or 12.5%, Office Engineer is 0 or 0%, Architect is 9 or 22.5%, Architect Apprenticeship is 6 or 15% and lastly others are 1 or 2.5%.

These shows that the highest number of registered contractors in District III in Nueva Ecija are designated as Project Manager it is because most of the construction firm and Construction project are handled by Project Manager.

Table.3. Company Category

Company Category	Frequency	Percentage (%)
AAA	2	5
AA	0	0
A	6	15
B	1	2.5
C	2	5
D	8	20
E/ Trade	0	0
DTI Register Only	21	52.5
Total	**40**	**100%**

Table 3 shows the Company Category of the respondents that are based in District III in Nueva Ecija. As can be gleaned in the table above, the number of respondents that answered AAA is 2 or 5%, AA is 0 or 0%, A is 6 or 15%, B is 1 or 2.5%, C is 2 or 5%, D is 8% or 20%, E/ Trade is 0 or 0% and DTI Register Only is 21 or 52.5%.

These shows that most respondents who are working in their respective companies that are based in District III 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	25	62.5
6-10	10	25
11-15	3	7.5
16-20	0	0
20+	2	5
Total	**40**	**100%**

Table 4 shows the years of experience of the respondents in construction industry that are based in District III in Nueva Ecija. As can be shown in the table above, the number of experience years of the respondents in 0-5 years is 25 and 62.5%, in 6-10 years is 10 or 25%, in 11-15 is 3 or 7.5%, in 16-20 is 0 or 0% and 20+ is 2 or 5%.

These shows that most of the respondents that answered in the survey has 0-5 years of experience in construction industry.

Table.5. Building Information Modeling Experience of Respondents

Building Information Building Experience	**Frequency**	**Percentage**
BIM User	14	35
Non – BIM User	26	65
Total	**40**	**100%**

Table 5 shows Building Information Modeling Experience of the respondents who are based in District III in Nueva Ecija. As can be gleaned in the table above, the number of BIM user is 14 or 35% while the number of Non – BIM user is 26 or 65%.

These shows that most of the respondents that answered in the survey are non-BIM users.

3.2 Level of Acceptance in Building Information Modeling

Table.6. Level of Acceptance in Building Information Modeling

	Mean	RANK	VD
1. I am familiar in Building Information Modeling (BIM).	3.5	3	Strongly Agree
2. I think learning to operate BIM is easy to do.	2.86	9	Agree
3. I am using BIM in every project that I do.	2.71	10	Agree
4. I think BIM enhances efficiency and effectiveness on the job.	3.57	2	Strongly Agree
5. I think using BIM raises our chances to increase our profits.	3.07	8	Agree
6. I think using BIM improves quality of project delivery.	3.50	3	Strongly Agree
7. I think using BIM provides help us make better decision.	3.50	3	Strongly Agree
8. I will recommend to the others to use BIM in construction projects.	3.50	3	Strongly Agree
9. I think the advantages of using BIM software outweighs the disadvantages.	3.14	7	Agree
10. Overall, I like the idea of using BIM.	3.64	1	Strongly Agree
Average of Weighted Means	3.30		Highly Acceptable

Table 6 shows the level of acceptance of Building Information Modeling in the Construction Industry in District III, Nueva Ecija. As shown in the table, the statement “Overall, I like the idea of using BIM” got the highest rank with a weighted mean of 3.64 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements “I am using BIM in every project that I do” got the lowest rank with a mean of 2.71 which has a verbal description of Agree that signifies Acceptable.

The average weighted mean is 3.30 which has a verbal description of strongly agree from the respondents. This result implies that the overall acceptance level for Building Information Modeling (BIM) in the Construction Industry in District III in Nueva Ecija is Highly 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.	3.43	3	Strongly Agree
2. BIM provides model-based cost estimation.	3.36	5	Strongly Agree
3. It visualizes the project in preconstruction.	3.21	8	Agree
4. It has better coordination and clash detection.	3.50	1	Strongly Agree
5. BIM mitigates risk and reduce cost.	3.36	5	Strongly Agree
6. It improves scheduling/sequencing.	3.50	1	Strongly Agree
7. It increases productivity with Prefabrication.	3.21	8	Agree
8. It provides better safety on construction sites	3.36	5	Strongly Agree
9. BIM executes overall better builds.	3.14	10	Agree
10. It strengthens building handover and facility management.	3.43	3	Strongly Agree
Average of Weighted Means	3.35		Strongly Agree

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 III in Nueva Ecija, As shown in the table, the statement "It has better coordination and clash detection" and "It improves scheduling/sequencing" got the highest rank with a weighted mean of 3.50 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "BIM executes overall better builds" got the lowest rank with a mean of 3.14 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) are it has better coordination and clash detection and also it improves scheduling or sequencing. While the least benefit of using BIM for the respondents (BIM user) are BIM executes overall better builds.

3.4 Highest Leverage Areas in Using Building Information Modeling

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

Leverage Areas	Frequency	Percentage (%)	Rank
1. Clash Detection	7	50%	**3.5**
2. 3D Modeling	14	100%	**1**
3. BOQ Estimate	8	57.14%	**2**
4. 3D Model for Fabrication	7	50%	**3.5**
5. Coordination Efficiency	6	42.86%	**5**

Table 8 shows the highest leverage areas in using Building Information Modeling (BIM). As can be gleaned from the table, 3D Modeling got the highest rank selected by 14 respondents or 100%. Bill of Quantities Estimate has been rank second selected by 8 or 57.14% of the respondents. For the third and fourth rank, Clash Detection and 3D Model for Fabrication has the same percentage of 50% or 7 respondents and lastly Coordination Efficiency has been selected by 6 which is 42.86% 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 in 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.	3.88	1	Strongly Agree
2. Other software is enough to sustain business.	3.04	6	Agree
3. I am not aware or familiar with the software.	2.81	9	Agree
4. It needs long learning curve for employees.	3.04	6	Agree
5. BIM is not suitable for the projects that we do.	2.69	10	Agree
6. It is time consuming to set up new software.	3.00	8	Agree
7. It is possible to have incompatibility with partners.	3.08	5	Agree
8. It lacks in resources and expertise in construction industry.	3.50	3	Strongly Agree
9. It lacks and high cost of Training Schools for BIM.	3.58	2	Strongly Agree
10. There is a weak support from organization environment and culture in implementation of BIM.	3.35	4	Strongly Agree
Average of Weighted Means	**3.20**		**Strongly Agree**

Table 9 shows the issues in implementing Building Information Modeling in Construction Industry in District III 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 3.88 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the

statements "BIM is not suitable for the projects that we do" got the lowest rank with a mean of 2.69 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 due to BIM is not suitable for the projects that we do.

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 III, Nueva Ecija along with its strengths, weaknesses and barriers.

A total of forty (40) contractors were selected from District III, 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 III, 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:

4.2.1 Demographic Profile:

The contractor who served as the respondent of the study were thirty-seven and five tenths' percent are based in Cabanatuan City. Twenty-Five percent were designated in their respective company as Project Manager. Fifty-Two and Five Tenths percent has a Company Category that was DTI Register Only. Sixty-Two and Five Tenths percent has 0-5 years of experience in construction industry. Sixty-Five percent were non-BIM users.

4.2.2 *Level of Acceptance in Building Information Modeling:*

The statement "Overall, I like the idea of using BIM" got the highest rank with a weighted mean of 3.64 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "I am using BIM in every project that I do" got the lowest rank with a mean of 2.71 which has a verbal description of Agree that signifies Acceptable. The overall weighted mean is 3.30 which has a verbal description of Highly Acceptable.

4.2.3 Benefits in Building Information Modeling in construction industry:

The statement "It has better coordination and clash detection" and "It improves scheduling/sequencing" got the highest rank with a weighted mean of 3.50 which has a verbal description of Strongly Agree which also signifies Highly Acceptable for the respondents while the statements "BIM executes overall better builds" got the lowest rank with a mean of 3.14 which has a verbal description of Agree that signifies Acceptable.

4.2.4 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.

4.2.5 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.

V. Conclusions

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

Demographic Profile of the Respondents: The workplace of the respondents has mostly located in Cabanatuan City it is because most of the company are operated in Cabanatuan City. 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 non-BIM user.

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 think the overall idea of BIM can make the project more beneficial.

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 for Coordination and Clash Detection, and Improves scheduling/sequencing.

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

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 has 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 Modeling 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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