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Management of sustainable building project using BIM-Analysis and control

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ABSTRACT

The present study focused into the utilization of Building Information Modelling (BIM) in the status of Sustainable Building Project Management (SBPM). It seeks to study the integration of BIM and sustainable principles of design might enhance the benefits for project managers to reach the optimum solution. The goal of present work is to investigate the exploitation and identify the decisive elements of the BIM in the status of SBPM discuss to explore the connection methodology between BIM and sustainable principles of design might improve the avails for project managers. (9 pt).

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1. INTRODUCTION

Building Information Modeling (BIM) and sustainable design deal with the novel methodology to reaching several stages, commencing with the conception of an idea and progressing through feasibility assessment, programming, preliminary research, plan development, first investigative layout, and production. This process culminates in the delivery of the project, its subsequent operation, and ultimately concludes with the destruction phase. The claim on sustainable building has developed, and this claim is enough to mitigate the increase in the exhaustion of natural resources, rising costs of energy, and pollution resulting from greenhouse gases. There is a general awareness that sustainable development is beneficial, refers to inter-temporal justice, and serves multiple elements to achieve useful life after several life cycles (Kiselakova et al., 2020). The procedure for building anything. Due to the fragmented nature of the architecture, engineering, and construction (AEC) industry, participants confront an ongoing challenge to present effective projects despite limited labor, budgets, and hastened timeframes, in addition to the problems inherent in waste issues (Olkiewicz et al., 2017). Eastman et al., (2008) have, on the one hand, asserted that (BIM) is a mechanism that enables representatives of the project team to gain a unique collaborative capacity, not only a method during the whole project from the initial planning phases to execution and work. This is in contrast to the notion that (BIM) is only a method during the execution and work phases of the project. (BIM) is a line of work that intricately intertwined with the administration of the numerous work cultures and habits (Ahmad, 2018). While implementing BIM, there are numerous challenges that past studies have indicated in the fragmentation of the AEC business, and this all connects with the many distinct barriers that represent an obstacle to efficient BIM implementation. BIM is an abbreviation for Building Information Modeling (Akram et al., 2019). The Building Information Modeling (BIM) approach is now standard practice in all stages of the building lifecycle (design, planning, and construction), and interest in BIM is consistently on the rise (Disney et al., 2022). A result of this advancement, the engagement with models from diverse fields of Architecture, Engineering, and Construction, abbreviated as AEC, is continually advancing and moving toward integration into a digital environment that includes data about, for instance. Locations, Building codes, Specifications of Materials, and Consumption

Characteristics (Akram et al., 2019). It allowed for reduced schedule and budget overruns, which made it possible to examine design possibilities before starting construction, and it increased site safety. Despite the fact that there were still obstacles, it made it possible to mitigate those overruns (Disney et al., 2022). On the other hand, while doing a return on investment study, it can be challenging to take into account intangible aspects of a firm or project that are equally as significant as the tangible measures. Another issue is that it can be time consuming and expensive, and there is no model or standard for calculating the investment's return (Sun et al., 2017). Sustainable construction is a strategy commonly applied to the construction industry in order to improve sustainable growth. When looking at the construction industry, it's defined as a whole community of individuals who create, establish, manage, design, construct, change, or save the current environment, and consists of providing the materials and producers for those clients, or users. The sustainability framework can be got as a subcategory of sustainable growth, covering things such as the design of things, the purchase of things, the planning of the locations, the choice of things it is being recycled, and the minimum waste requirements (Lin et al., 2015). Gerner, (2019) defines another SC as the holistic method through the principles of sustainable growth, from the extraction and use of raw materials to the preparation, design, and construction of buildings and infrastructures to the potential final demolition, and the management of events waste. The more recent definition of SC is a way of looking at construction company operations that incorporates environmental, social, and economic concerns in their values. Pollution from manufacturing and other economic actions on habitats have detrimental effects not only on the environment but also on humanity itself. A number of studies have found that water, environmental, and earth emissions cause about (40%) of the world's deaths. Furthermore, (15-37%) of whole animals and plants would face a danger of extinction if emissions of greenhouse gasses continue at their current pace by 2050 (Alwan et al., 2017). Since the industry is not completely accountable and does not eliminate climate change and its associated consequences, this contributes especially to other industries' range of effects. The distinction among various issues in regards to problems like population rise, environmental destruction, and technology evolutions in the past and present is that these changes have all taken place slowly and make the changes only perceptible by means of an individual lifestyle (Gorner, 2019). Moreover, the sluggish speed of progress meant that the time had not been right for all problems to overcome or for any solutions to vanish, not in the past two centuries, when the SD problem existed as above and the response rate of the planet was greater than its potential. The consumption of resources increases, there is not chance that we will be able to satisfy this demand in the coming decades. The ability to respond to the needs of the future populations with current economic and social changes and higher living requirements was therefore highly doubtful (Cruz et al., 2019).

The aim of the present study is to investigate the exploitation and identify the decisive elements of the BIM in the status of SBPM.Discuss to explore the connection methodology between BIM and sustainable principles of design might improve the avails for project managers.

2. METHOD

Many researchers' examined of the interplay between BIM and environmentally friendly or green building practices, as well as their respective connections with project management. The main performance indicators established by a comprehensive analysis of existing research in the field.

The adopted questionnaire in present study to verify the assumption and collect the empirical evidence touching with the effect of the utilizing BIM technologies in the SBPM. The distribution of the questionnaire was conducted through multiple channels, including email, the online (specifically, Google Form), and direct distribution in printed form (by hand). The questionnaire itself consisted of a concise explanation of the BIM application, accompanied by a request for participants' collaboration and provision of information, all with the aim of facilitating research. The primary aim of distributing the questionnaire was to establish a correlation between research data and hypothetical studies regarding the influence of utilizing BIM systems on the factors that affect SBPM.

The utilization of BIM technologies makes it possible to accomplish sustainable building through the implementation of a sustainable design at every stage of the building process, beginning with the preliminary design and initial planning stage of a project and continuing through the building project, as well as the usually operated and demolition phases of the structure. Based on Aladag et al., (2016), BIM can utilized in several stages of building projects. These stages of building projects and associated BIMs include the following such as (1) a consideration of both requirements and targets. (2) The criteria model includes the specifications for the project as well as the requirements of the relevant authorities. (3) Modeling of alternatives, innovative masses, and spatial configurations designed. (4) Phase of placing bids; a detailed planning and building model that has been given final approval. (5) Construction and initial operational testing. (6) Building model as well as the final model once it was finished. (7) Management and upkeep of the facility and (8) maintenance framework.

Total of nine stages were adopted in present study lists below in which each stage represents a different step.
•First step: involves coming up with a title that is appropriate given the goals that the study was carried out to achieve.
•Second step: formulation of a proposal, that involves an explanation of the objectives as well as the methodology that will be applied to matching the required amount of time and the location where the study will be carried out.
•Third step: literature review, including encompasses both the current state of the construction sector in Iraq and the priority research that dealt with applying BIM to obtain the targeted advantage from SBPM.
•Fourth step: planning of the questionnaire and the preparation of the questions.
•Fifth step: choose a sample, and have the specialists who will be working on the construction project be a part of this sample.
•Sixth step: the point at which the questionnaire is made available to engineers, managers of companies.
•Seventh step: the information that have been assessed by the statistical software (SPSS) are now being evaluated in the seventh and final step of the process.
•Eighth step: the establishment of a structure and a model that assists in enhancing construction innovation and increasing project management proficiency.
•Ninth step: the results and conclusions of the study are presented.

In present study, Documentation and questionnaires are two of the strategies that have been chosen for the purpose of acquiring information. The research required the use of an exploratory developing approach, which included the gathering of qualitative details first, followed by data from a quantitative perspective.
It was the initial phase in the study, and it consisted of collecting qualitative data on sustainable construction elements from associated literature and documents. This was done in order to acquire as much information as possible about these building components. Obtaining statistical information was the focus of the second stage. The questions on the questionnaire that was made were designed with the help of the findings from the acquired material. Various fields of expertise, such as the following, were given the questionnaire to complete:
1-Engineering management, civil engineering, architectural engineering, mechanical engineering, and BIM experts were polled.
2-Statistics experts will evaluate the questions to determine whether or not they are suitable for statistical assessment.

2.1: Reliability Approaches

The reliability demonstrates the quality and consistency of the measures, which allows it to differentiate itself based on the quality and consistency of the measurements in question. The Alpha Cronbach approach is one of the many approaches that can employed to determine the reliability of any questionnaires. This model utilized in present study based on equation (1).

$$\alpha = \frac{n}{(n-1)}\left[1 - \frac{\sum_{i=1}^{n} \sigma_{yi}^{2}}{\sigma_{x}^{2}}\right] \quad (1)$$

Where:
α = alpha Cronbach
n = refer to the number of scale items
σ_{yi}^{2}= refer to the variance associated with the item i
σ_{x}^{2}= refer to the variance associated with observed total scores
According to Taber, (2018), a high level of reliability can inferred from an indicator of Alpha Cronbach that is quite near to one (lists in Table 1). It is a measurement of the inside consistency. Whenever the findings of the test are more than 0.70, the assessment of the test has been deemed accurate, and the value is accepted.

Table 1: Levels of Cronbach's Alpha Values

Value of Cronbach's alpha	Level of Reliability
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

2.2: Relative Importance Index (RII)

To identify the purpose of evaluating applications, utilizing evaluation relative importance index in as well as t-test, which represents the mean for a component that gives it significance in the perceptions of participants. RII is helpful since it takes into account the size of the overall population as well as the relative disadvantages encountered by various groups. Therefore, in order to determine the relative classification of the level of utilizing applications and the limits, the importance index, which is based on the accompanying equation (2) and Table (2):

$$RII = \frac{5n_5+4n_4+3n_3+2n_2+1n_1}{5(n_5+n_4+n_3+n_2+n_1)} \quad (2)$$

Where:
n_5 =no. of respondents which replied with "Strongly agree"
n_4 = no. of respondents which replied with "Agree"
n_3 = no. of the respondents which replied with "Neither agree nor disagree"
n_2 = no. of respondents who replied with "Disagree"
$n_{1=}$ no. of respondents which replied with "Strongly disagree".

Table 2: Level of RII

RII Ranges	Rank
$0.8 < RII \leq 1$	High
$0.6 < RII \leq 0.8$	High -Medium
$0.4 < RII \leq 0.6$	Medium
$0.2< RII \leq 0.4$	Medium-Low
$0 < RII \leq 0.2$	Low

2.3:Statistical Evaluation

Finding a suitable measurement approach that can be used to evaluate the findings of the study is one of the fundamental needs for any type of study. The following statistical methods were utilized in the analysis for the purpose of this research:

- **Descriptive Analysis (Explanatory Assessment):** This demonstrates the distribution and rates of respondents for every questionnaire question, as well as the mean as well as the standard deviation associated with each of them.

- **Relative Importance Index (RII):** Performed by SPSS in order to do a more in-depth analysis of the benefits and limitation of BIM application that utilized.
- **Alpha Cronbach:** The association between the relevant factors in one group can measured using a coefficient known as the alpha parameter.

2.4: Methodological Hypothesis Evaluation

The mathematical approach to evaluating descriptive information were adopted by first converting the statistical information to the program Excel, and then using SPSS to produce the tables and illustrate the factors that express the methodology of evaluation. The methodology of descriptive evaluation commonly used to characterize as the statistical approach or process of describing descriptive information. A p-value <= 0.05 was considered to be indicative of statistical accuracy. In light of the fact that there is a less than 5% likelihood that the default hypothesis is correct, this points to strong evidence against it (and the outcomes are randomized). In order to gain a more in-depth grasp of the BIM application techniques and applications that are deployed by construction businesses during the building phase, a questionnaire has been designed to serve the goal of serving that objective.
The questions were posed to ensure the dependability and to enable the formation of a comprehensive picture regarding the BIM application situation in the companies (strengths and weaknesses), application drivers, and the anticipated government's involvement from the point of view of the participant, as well as the types of projects and BIM's place in environmentally responsible building from the claimant's personal experience. The material that was missing from the earlier literature analysis served as the inspiration for the questions that were formulated in order to achieve the objectives of the research project. Table 1 and 2 lists the application of the themes that were received from the questionnaire questions was intended to be used in order to meet the goals of the questionnaire questions, which were to accomplish the gap in the previous research that had been concerned the use of BIM. More specifically, it was intended that these goals will be accomplished:

1. Considerations that go into deciding whether a consulting firm will make use of BIM.
2. Challenges that must overcome before businesses and organizations may successfully utilize BIM.
3. Elements that, when combined, helped to make the application a complete and compelling whole.
4. The level of BIM competence present in each of the companies.
5. The BIM guidelines and procedures that were followed in the construction projects.
6. A selection of the effects that the installation of BIM has had on the business as a whole.
7. The mandated necessity for the involvement of the government in the process of implementing BIM.
8. The implementation of BIM can assist produce a sustainable construction projects sector, according to the perspectives expressed by the participants in the discussion.

3. Results and discussion

Results from the two surveys that administered to engineers in general as well as BIM professionals. There were a total of 153 professionals that took part in the competition. The results analyzed with the SPSS software to create tables displaying the results of the present investigation. The statistical analysis that done for the information that was gathered. This evaluation contains dependability, relative index profitability for the level of BIM application, the simple percentage evaluation that shows the peoples of respondents and ratios of every query of the questionnaires, and related average and standard deviation and ANOVA test to be carried out in order to determine the extent to which there is an inequality in the respondent's points of view on the elements that are acquainted to them as well. In present study, the reliability was adopted to evaluating the quality of monitoring instruments because it described the degree to which the findings of a test are unaffected by the variation in measurement that is possible whenever something is being tested. If the measurement is off, the significance of the correlation between the factors will be thrown into question. One way for determining dependability knowns as the Cronbach alpha assessment. This test "demonstrates how closely associated a collection of elements are as an entire collection and is a consistent internal metric," according to the author. When the results of the test are more than 0.70, the measurement is regarded correct, and 0.60 has been accepted as the acceptable value.

An investigation into the reliability of the data was carried out on the questions in the survey that contained subsidiary inquiries whose answers, when taken together, constituted the principal inquiry. The findings of the reliability evaluation (Cronbach alpha evaluation) for the overall engineers' questionnaire displayed in Table 3. This table contains the conclusions of the reliability evaluation for every component included in present study.

Table 3: Reliability Rank of Cronbach Alpha Test

Items	**Quentity of Items**	**Cronbach's Alpha Value**	**Reliability Rank**
Advantage of BIM	21	0.908	excellent
Limitation to applied BIM	14	0.778	Very good

It is evident from the data table the fact the reliability of the questionnaire categories with respect to Cronbach's alpha value amounted to 0.908 for the advantage of BIM a component and 0.778 for the limitation to applied BIM component. This indicates the presence of an elevated level of internal consistency and predictability in the answers of those who participated in the questionnaire and permits us to rely on these responses in analyzing the findings.
The questionnaire was made available on the World Wide Web, and an email version of the questionnaire was sent to the individuals who had been chosen for the survey. There were 196 individuals that were asked the question, and there were 153 people who responded. Every single person who responded said that they had some experience with technology used in BIM. The data analyzed as follows:

3.1: Employment Analysis

The majority of respondents in Iraq are employer by firms (public sector), which accounts for 79% of the total number of respondents. Private firms (privet sector) lists in Table 4 employ a 21% of respondents in Iraq.

Table 4: Employment Analysis

Items	Quentity of Respondents	Percentage of Respondents
Public Sector	121	79%
Private Sector	32	21%

3.2: Engineering Specialization

In present study, conducted at building companies, including government organizations and commercial consulting companies. The respondents varied in terms of their engineering specialties as follows: 65.6 participants with a specialization in civil engineering. Which is the highest percentage among the rest of the engineering disciplines, 22.1 participant in an architectural engineering specialty, 6.9 participants in a mechanical engineering specialization, and 4.6 electrical engineering majors and 0.8 participants in other engineering majors as shown Figure 1 showed the details of the distribution of the adopted sample based on engineering disciplines.

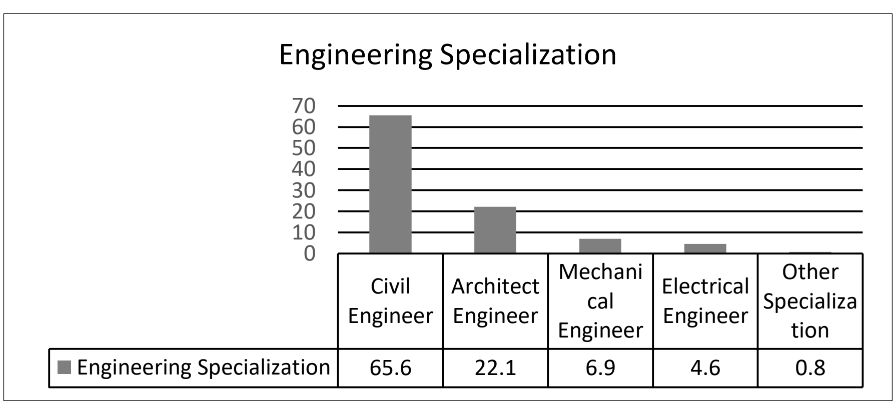

Figure 1: Engineering Specializations

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3.3: Education Background

In present investigation conducted across a variety of educational levels in order to get exhaustive information and clear opinions regarding the utilization of BIM to obtain the desired advantage from sustainable building project management. The study shows years of experiencing the of the different participants as shown in Figure 2, where 71 % of participants with high school education, 28.3 % of participants Diploma education, and 76.8 % Bachelor's Degree education, while Master's Degree within 3.8 % and 1.5 with Doctor's Degree.

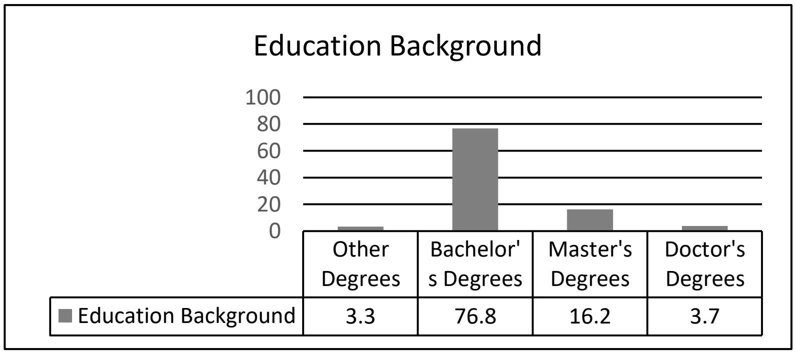

Figure 2: Education Background

3.4: years of expertise

There was a wide range of expertise in engineering among the participants, which included the following level of skill. As can be seen in Figure 3, there were 10.6 respondents who had an experience level that ranged from 0 to 5 years on the job, 13.5 respondents who had an experience level that ranged from 5 to 10 years on the job. 26.6respondents who had an experience level that ranged from 10 to 15 years on the job. 45.2respondents who had an experience level that ranged from 15 to 20 years on the job, and 4.1 respondents who had an experience level that encompassed more than 20 years on the job.

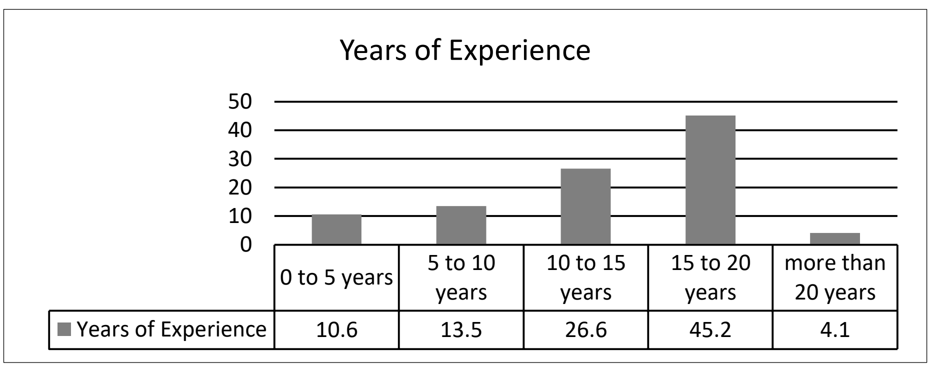

Figure 3: Years of Experience

3.5: Organization Field

Figure 4 depicts the distribution of respondents according to their respective fields of work. The vast majority of these engineers who responded to the survey work in the construction companies sector, which accounts for a percentage of 71.3. This is followed by engineers who work in consulting companies or offices, which account for a percentage of 20.6, and the remaining engineers work in a variety of organizations, which accounts for a percentage of 8.1.

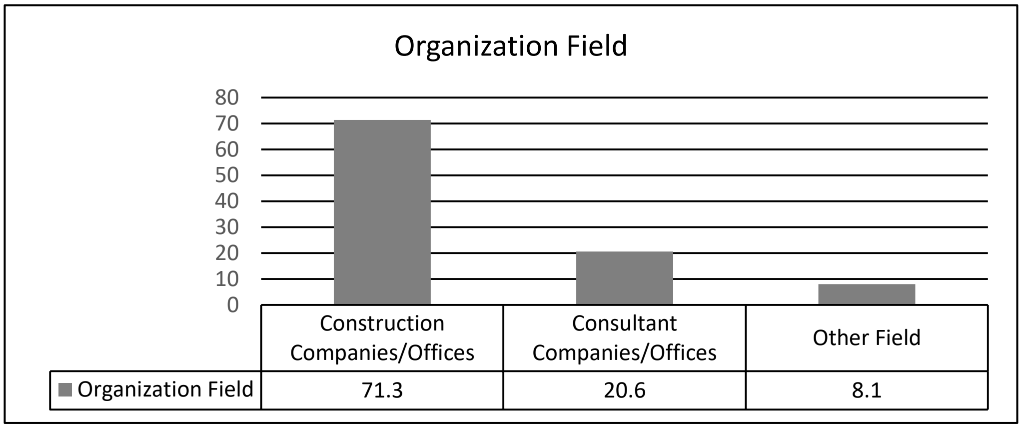

Figure 4: Organization Field

3.6: Position of Participants

The distribution of the questionnaire in relation to the various engineering occupations held by the participants, as shown in Figure 5. The results show that 6.9% of participants held the occupation of executive engineer, 8.6% of participants held the occupation of designer, 44.8% of participants held the occupation of consultant, 12.4% of participants held the occupation of coordinator manager, and 27.3% held general manager.

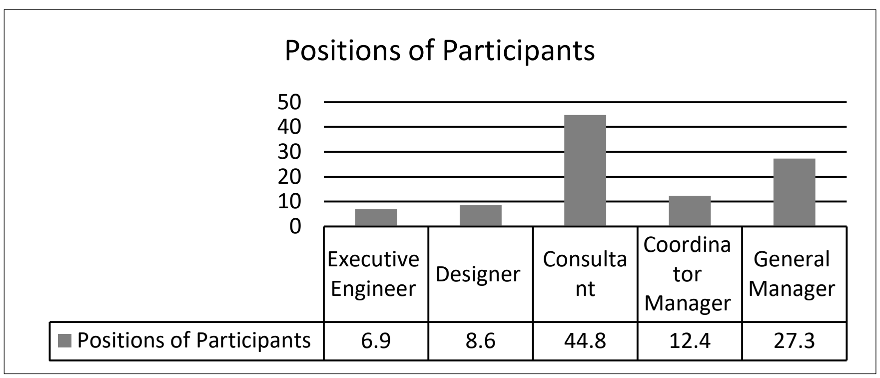

Figure 5: Job Position of Participants

3.7: Knowledge of BIM

Figure 6 describes the level of the knowledge of BIM. It shows the participants gain this knowledge of BIM from “Participating in BIM Workshops” as the maximum value of percentage 46.3% a ranking the first. While 14.6 % from participants gain the knowledge of BIM from “Professional Journal Reading" ranked the second. This is followed by the participants gain these knowledge of BIM from "Researching Online" as third rank with percentage of 13 % while 9.8 % from participants gain the knowledge of BIM from "Talking to Knowledgeable People" ranked the fourth. Finally, the participants gain this knowledge of BIM from "Knowledge Sharing with my Coworkers" as last rank with percentage 3.3 %.

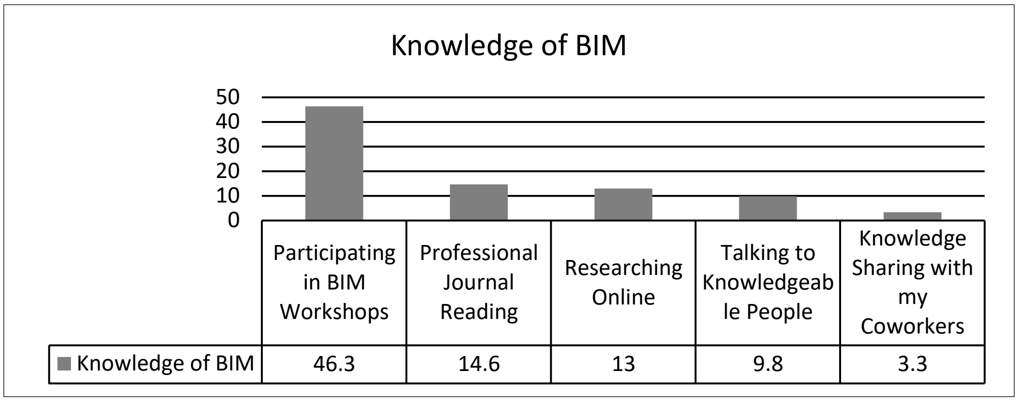

Figure 6: Knowledge of BIM

4. Evaluation of Software in Field of Work

Participants questioned about their level of experience using engineering-related software lists in the Table 5. The assessment was determined by calculating the mean as follows: 1 = Not used, 2 = Poor, 3 = Good, 4 = Very good, and 5 = Excellent. The mean derived based on the responses of the respondents to provide a summary of their responses and to determine their level of proficiency with each software. Furthermore, a Relative Importance Index (RII) evaluation carried out in order to make the software level assessment more reliable. The following is an account of the results;

Table 5: Evaluation of Software in Field of Work

		Frequency	Percent	Mean		Std.D.	RII
				St.	Std.E.		
AutoCAD	Not used	2	1.31	4.29	0.053	0.762	0.86
	Poor	4	2.61				
	Good	23	15.03				
	Very good	43	28.10				
	Excellent	81	52.94				
	Total	153	100%				
3Dmax	Not used	126	82.35	1.25	0.042	0.759	0.25
	Poor	21	13.73				
	Good	2	1.31				
	Very good	3	1.96				

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	Excellent	1	0.65				
	Total	153	100%				
Revit	Not used	16	10.46	3.78	0.056	0.789	0.76
	Poor	10	6.54				
	Good	23	15.03				
	Very good	46	30.07				
	Excellent	58	37.91				
	Total	153	100%				
ArchiCAD	Not used	1	88.24	3.00	0.047	0.694	0.60
	Poor	10	8.50				
	Good	135	1.31				
	Very good	2	1.31				
	Excellent	5	0.65				
	Total	153	100%				
Ms project	Not used	2	1.31	3.76	0.0512	0.547	0.75
	Poor	1	0.65				
	Good	45	29.41				
	Very good	89	58.17				
	Excellent	16	10.46				
	Total	153	100%				
Primavera	Not used	6	3.92	3.71	0.0478	0.734	0.74
	Poor	1	0.65				
	Good	47	30.72				
	Very good	76	49.67				
	Excellent	23	15.03				
	Total	153	100%				

Cont. table	**Frequency**	**Percent**	**Mean**		**Std.D.**	**RII**
			St.	**Std.E.**		

Tekla Structures	Not used	150	98.04	1.03	0.0489	0.0678	0.21
	Poor	1	0.65				
	Good	2	1.31				
	Very good	0	0.00				
	Excellent	0	0.00				
	Total	153	100%				
Green Building Studio	Not used	136	88.89	1.17	0.578	0.0774	0.23
	Poor	9	5.88				
	Good	7	4.58				
	Very good	1	0.65				
	Excellent	0	0.00				
	Total	153	100%				

The mean number of responses with 4.29, and the relative importance index of 0.86, both demonstrate the very good degree of assessment that exists in terms of using the AutoCAD program. Both the overall average of the responses, which is 1.25, and the reliability important index, which is 0.25, point to the fact that there is a low level of assessment involved in the process of utilizing the 3Dmax program. It is clear that there is a high level of evaluation about the utilization of the Revit program, as evidenced by the fact that the mean number of responses is 3.78 and the relative importance index is 0.76. Regarding the use of the ArchiCAD program, both the mean number of responses, which is 3.00, and the relative importance index demonstrates the good degree of evaluation that is present, which is 0.60. With an average response rate of 3.76 and a relative relevance score of 0.75, it is clear that the MS project program being evaluate to a high standard. There was a good level of assessment about the use of the Primavera program, as evidenced by the mean number of replies 3.71 and the relative importance score 0.74.

Based on the overall average of the responses, which is 1.03, and the reliability important index, which is 0.21, it can be conclude that the process of utilizing the Tekla Structures program was characterize by a low level of assessment. When it comes to the process of utilizing the Green Building Studio program, there is a low level of assessment, as indicated by both the overall average of the responses, which is 1.17, and the reliability important index, which is 0.23.

Table 6 lists the ranking of the utilization of BIM to achieve the targeted advantage from sustainable building project management in project steps, with High rank.

Table 6: Advantages BIM to Achieve Targets of Sustainable Building PM in Project Steps

Advantages	RII	Rank
BIM encourages the adoption of methods that, when applied to the design, construction, operation, and upkeep of buildings, result in increased energy and resource effectiveness.	0.90	High
BIM implementation helps to reduce the number of errors and omissions that occur during the construction of sustainable facilities.	0.87	High
Using BIM during the building process of sustainable buildings results in collaboration with the owner/design company.	0.82	High
Enhance recognition of risks so that it is available previously in the construction process, thereby enhancing safety, user convenience, and emergency assessment.	0.86	High
Applying BIM helps with keeping track of and evaluating sustainable building assignments.	0.83	High
The implementation of BIM makes it possible to manage costs in sectors of sustainable improvement that are traditionally view as having expensive building expenses.	0.81	High
BIM allows for improved communication across various professionals during the design and execution phases of a project, which ultimately results in a reduction in both time and money spent.	0.82	High
The implementation of BIM helps to preserve local cultural and historical assets, which has a positive impact on the social environment and results in user satisfaction for environmentally sustainable constructions.	0.81	High
The BIM program prompts users to adapt to the many sustainable building projects' purposes.	0.87	High
BIM delivers knowledge about quantity, expenses, schedule, and resource inventories, which will enable decision-makers in taking quick informed decisions concerning the life cycle efficiency of a construction.	0.8	High
BIM makes for better designs by enhancing their quality and facilitating the verification of their coherence with the design objective, hence avoiding costly delays.	0.84	High
The implementation of BIM promotes energy conservation by reducing organizational energy consumption, monitoring energy consumption, and promoting the adoption of equipment that is more energy sustainable.	0.8	High

5. Conclusion

As a result, there is a need to broaden the scope of the planner's duty to encompass that of a comprehensive venture arranger utilizing the geometric technique. This necessitates modifications in both the execution and comprehension of the activity. According to certain scholars, the implementation of BIM approach may potentially hinder the cognitive abilities of a drafter, limiting their capacity for flexible and innovative thinking, as well as impeding their creative potential. Conversely, a multitude of experts is actively engaged in enhancing society's familiarity with BIM, its construction advantages, and various other benefits.

The effect of utilizing BIM technology on SBPM, the literature review obtained 21 of the advantages and primary factors that are influencing the implementation of BIM in building projects and, at the same time, 14 the limitations that stand in the way of BIM implementation in the building projects. The second stage of the study involved sending a questionnaire to 153 members of the engineers and specialists those working in buildings construction fields. Step 3 includes validating the development of a management system with a view to achieving factors that implementation of BIM in construction projects. The study discovered that the existing conventional methods are inadequate in meeting the necessary requirements as efficient instruments for the process of managing sustainable construction projects. The reason behind this phenomenon can be attribute to the underlying idea of these tools, which relies on autonomous entities and the generation of different representations for a single design. The management of changes necessitates the establishment of a participative and interactive environment. The utilization of a centralized database containing comprehensive project data offers a viable strategy for enhancing operational effectiveness throughout all stages of a project by facilitating efficient project information management. The success of a project hinges upon effectively managing workflow, information exchange methods, technology utilization, and overcoming associated challenges during the design and implementation stages. The failure to adhere to appropriate management practices might result in compromises made by the project stakeholders and ultimately hinder the achievement of desired outcomes. Conclusion posits that the implementation of BIM systems facilitates effective management of sustainable construction. Consequently, one of the primary aims of this study was to assess the influence of BIM systems on various factors, including cost, time, quality, environment, society, and safety. To measure this impact, an electronic questionnaire was employed. The BIM facilitates enhanced communication across many professional disciplines involved in project design and implementation, resulting in a significant reduction of both time and expense, up to 94 percent. BIM enhances the process of identifying faults prior to the commencement of on-site activities through the detection and mitigation of clashes, hence resulting in cost reduction. BIM promotes energy conservation by implementing measures such as regulatory energy reduction, energy monitoring, and the utilization of energy-efficient equipment. The BIM application assesses the environmental impact of buildings and aids in the effective management of material waste. BIM also advocates for the utilization of environmentally sustainable building materials, encompassing both efficient and recycled components. BIM facilitates the adoption of strategies aimed at enhancing sustainability and efficiency throughout the whole lifecycle of buildings, encompassing design, construction, service, and maintenance phases. BIM shown to enhance the overall quality and productivity of construction projects for many enterprises and organizations. BIM plays a significant role in enhancing the quality control of material take-offs, mitigating inconsistencies and errors in schedules, and streamlining the administration of building project outcomes. BIM enhances the quality of design and facilitates the verification of design consistency with project objectives. The study revealed that the expenses associated with the implementation of BIM systems are recognize as a significant hindrance. These costs encompass the procurement of necessary equipment and software, as well as the expenses incurred for training personnel. Furthermore, there is a notable decrease in productivity during the initial training phase.

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