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THE EFFECTIVE ADAPTATION OF GREEN BUILDING CONCEPT USING BUILDING INDUSTRIALIZED MANAGEMENT WITH (BIM) FOR THE UPGRADED CONSTRUCTION MARKET

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ABSTRACT
The construction business environment is becoming more complex these days, with more issues that must be addressed by teamwork. However, the Building Information Modeling (BIM) innovation is listed as a way to untangle the aforementioned issues in order to deliver a better assignment efficiency. Various issues, such as continuous errors and rework, team misunderstandings, construction waste, energy inefficiency, and many other industry issues, can be improved with the introduction of BIM technology. The BIM feature, in particular, aids in the design and construction process as it necessitates extensive preparation and decision-making. Many studies have been conducted on BIM however, there hasn't been any study that aims at bringing a consensus in regards to the application of the technology for the establishment of green buildings. This research is aimed at investigating the innovative benefits, upper hands and functional adaptability in the concept of Green Building Design with BIM technology. The thesis report has had the decision to discover certain issues related to Construction the load up and functional process. The study is going to utilized both qualitative and quantitative data collection techniques through interview and questionnaires respectively. The qualitative data will be analyzed via content analysis whereas the quantitative data will make use of SPSS as an analyzing tool. The finding of this study confirms the effectiveness of the adaptation of green building concept using building industrialized management with BIM for the upgraded construction market.

Keywords:
BIM technology, Green Building Design, Green Building Concept, Construction Industry, Sustainability

INTRODUCTION

There are often criteria and requirements associated with building construction in the twenty-first century global structure industry. The European Parliament has also instructed each of the 28 member states to use BIM in their 2016 activities to reduce the structure climate. This allows some Scandinavian countries to advance and become more productive in building construction. Time, cost, and quality are important indicators in estimating the success of construction projects. Before the venture begins, an assessment is required to determine the ability to fulfill building requirements. The board will devise a counteraction or reaction plan based on the evaluations after effects at the arranging stage. Digital assets, plan angles, and quality norms are described in the planning cycle by strategies, sketches, and specialized particulars. The AEC (Architectural Engineering and Construction) industry is currently undergoing revolutionary changes, as evidenced by the shift from CAD (Computer various Aided Design) reports to BIM (Building Information Modeling) (Building Data Modeling). Because of the vast amount of data that is packaged and then retrieved from computerized models, BIM opens up possible outcomes. Calculations, relations, and properties can all be shown as an object in a BIM configuration (Nguyen et al., 2021). Creating separate pictures for contract archives and then a new arrangement of itemized pictures is often considered waste.

Environmental change is incredibly stressful in today's world, and its degree of impact on the climate is very stressful anywhere. This is why architects, organizations, and analysts in the construction industry are presenting cutting-edge technologies and energy frameworks that include green solutions to address some of the issues associated with global warming. Nonetheless, the idea behind these innovations is to reduce air pollution caused by other construction projects. The growth

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of BIM engineering and the inspiration behind "making green systems" has renamed the working environment in the western world "Green BIM." Reduce carbon outflows in the structure, boost energy efficiency, improve ecological execution, increase waste management productivity, and improve indoor and outdoor living structures in this way. Furthermore, everyone can see its impact and contribution to public and private development projects. The construction industry is a thriving sector that operates in an environment of vulnerability and rapid change in the area of self-government (Bank et al., 2010).

LITERATURE REVIEW

The Model of Architectural Information is another development in a normalized environment, despite the fact that the utilization of creativity in the fields of design, engineering, architecture, and building management has not expanded recently (Lu et al., 2017a). In the construction industry, advances in cutting-edge technology include 2D and 3D computer illustrations. BIM (Building Information Modeling) is a different plan and period that uses best-in-class PC equipment and programming. In a nutshell, Data Modeling is a configuration model with a high level of execution that improves the quality of life for development and structure projects. The role of BIM Transforming adds nuance to teamwork and collaboration among all partners, while also keeping the business's building plan in mind. As it is constructing another building, BIM encourages collaboration among developers, specialists, contract workers, and building supervisors (Wang et al., 2018).

BIM do not only aids in the reduction of loss of building structure, but also in the reduction of litigation. Instead of human readings aimed at guide changeover, convert the basic documents used in building design and construction into modern machine-readable representations for automation. In the 1990s, building project material was transferred from paper to digital 2D-CAD drawings (Maskil-Leitan et al., 2020). Are moving away from image-based technologies and toward model-based techniques and materials. The models that are created are friendlier than normal. As a result, BIM is becoming more and more relevant in the construction industry.

BIM is a market metric that is supported by creativity. The loop should be completed in order to advance invention use. It's important to note that conventional building methods employ a variety of advancements, but the BIM scheme makes use of this innovation (Kushwaha, 2016). BIM is described as a structural methodology that involves the use of computerized models to enable the investigation of structures made from normalized plan details, and perhaps a dynamic and plan improvement that is fast. For the overall plan of the structure, the BIM software has several points of concern. The current BIM software design employs a precise configuration in which all product and components, as well as the airplane plan and other pertinent documents, examine the object, and the product directs them directly to the item (Chang & Hsieh, 2020). The image indicating the elements of BIM software design is as follows:

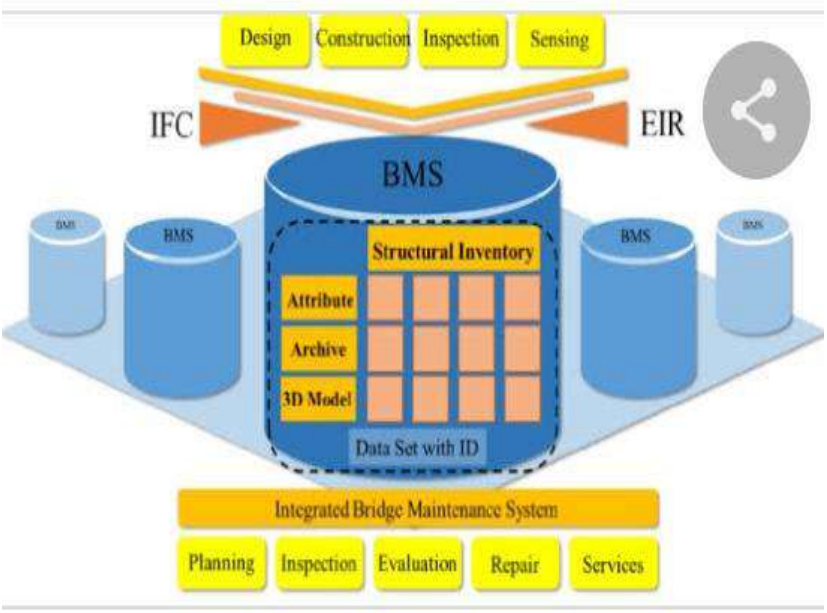

Figure 1: Elements of BIM software design

The rapid automated development of the architectural industry in recent years, such as PC sponsored plan, has enabled the replacement of traditional reports and the coordination of traditional work. In addition, The BIM simple will catapult architecture to new heights of ingenuity. The BIM system provides opportunities to improve maintainability through strands of solid cooperation with different component details. Green BIM" is emerging as a new era in the construction industry, serving as a bridge between BIM and maintainability (Cheng & Das, 2014). While the term "green BIM" has grown in popularity, several studies have been conducted to demonstrate its true significance. Green BIM is seen as a way to achieve fair progress in the project through the methods used in the BIM project in production. The Green BIM initiative has been recognized as a tool for assisting green structure and building configuration.

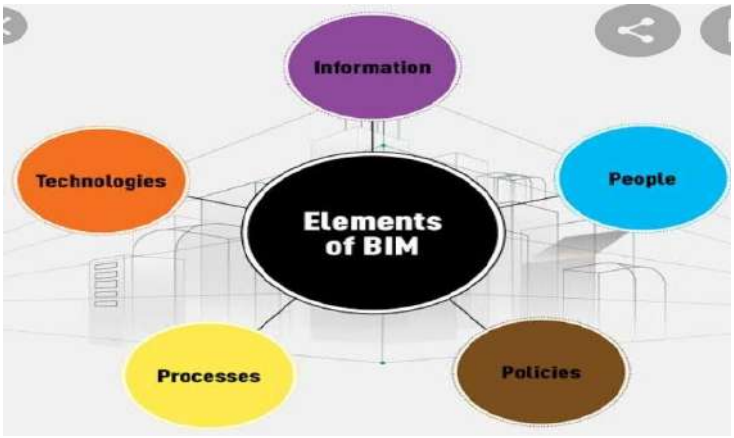

Figure 2: BIM configuration

Green BIM Concept

The principles of Green BIM are normally used to describe sustainable constructing layout and production incorporating the use of BIM technology. In general, sustainable improvement standards entangle the environmental element regarding resources usage, financial element related to the capacity to support financial production, and a social component that establishes mechanisms to characterize social well-being (Mounika & Hema, 2018). Correspondingly, Green building is described as more effective use of resources such as electricity, water, materials, and land than conventional homes or homes built to modern-day codes. In contrast, unsustainable or environmentally friendly construction is characterized as "excessive overall performance constructing", wherein inexperienced strategies should limit or mitigate environmental effect toward land use, constructing layout, production and operation (Lindblad, 2013). Green building goal is to increase performance of herbal sources usage in concurrent with diminishing negative effect at the environment. As a result, the architecture venture community must be accountable for developing and constructing houses that are energy efficient, use natural or recycled materials, and are environmentally friendly (Ilhan & Yaman, 2013).

BIM is been used to domesticate better average efficiency in building business activities, both in terms of the benefits offered and the challenges that must be overcome in order to ensure the business's long-term viability. Hence, the key phrases used to seek related records for this paper essentially epitomize "Green BIM", sustainable layout and construction", "sustainability with inside the construction enterprise", "sustainable BIM", and similarly combinations of those (Lu et al., 2017b). However, it became excellent for those documents in some reasserts to have views on fundamentals, norms, and concepts that define "Green BIM" as a whole. The most relevant documents were eventually given on this paper's conclusion and discussion pages, which recapitulated the sub-subjects of previous Green BIM reports using Green BIM to improve construction enterprise practices.

Figure 3: Benefits of BIM software design

BIM as reported by (Ismail et al., 2019) is a modeling technology associated with processes for creating, communicating, and analyzing a design model that describes the design components as digital representations to create coordinated data. Hence the integration of the BIM mechanism in terms of the climate friendly or maintainable structure. It could mean adapting an advanced technology, with digital models for reference, to facilitate the control of environmental impacts in the

design, construction and operation of buildings resulting from its immense technology Activities to achieve smarter and more efficient ways to sustainability in the construction industry.

RESEARCH METHODOLOGY

Two method of data collection were carried out which is questionnaire and interview. The data collection instrument tool that are used in this study are interview and questionnaires. The target population were individuals who have knowledge about BIM topic. The principal instrument of information gathering in this study was questionnaires. The quantitative data was gathered from the start and toward the finish of the semester through questionnaire form which included 7-point Likert Scale questions regarding self-viability discernments and 5-point Likert Scale questions concerning transformation of Green Building Design Concept. The questions in the questionnaires were both organized (close-ended question) and unorganized (open-ended question). Since it tells a more realistic tale about the actual condition within the enterprise and often reflects on the real conditions for this research, the qualitative methodology is considered to be the best fit for this study. As for the qualitative data, it will be gathered from an interview as data collection method which will involve the contribution of two experts in the upgraded construction market. Through Interview, meaningful data was to be collected to contribute to the validity and reliability of the data used in this research. The interview used opennded questions that allowed the respondents to provide a detailed explanation to the questions they answered. Following patterns in the literature review, this research utilizes a blended technique plan. Methodologies, techniques and strategies are consolidated to get more noteworthy broadness and profundity of comprehension and verification. The study also outline was an expository overview study (Zhou et al., 2018). The figure below summarizes the study overview:

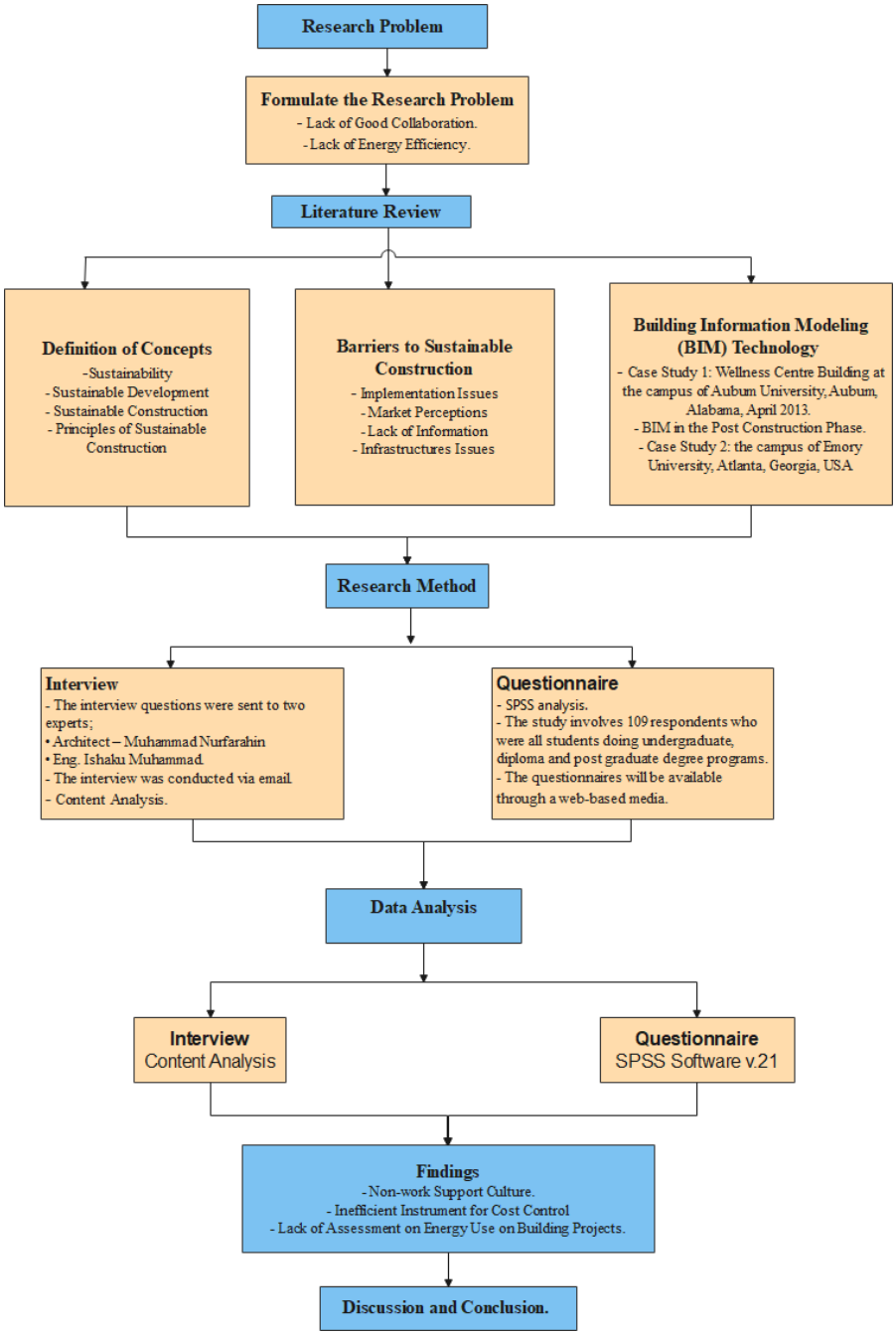

Figure 4: The Study Overview

When it comes to drawing the charts and tables, all gathered data will be recorded in a SPSS sheet. The data will then be examined before separating the findings and afterwards the data will be addressed in its fitting formats. The questionnaire utilized the shut finished inquiry design, which gives a uniform packaging of references for respondents to pick their answers. The questionnaire

utilized five Likert scale with unequivocally concur, concur, nonpartisan, deviate, firmly differ decisions to focus on one develop, "Overseeing variation of Green Building Design Concept with BIM into a New upgraded Construction Market". For the qualitative research, the data collected will be analyzed through content analysis. Content analysis will reveal the intentions and communication trends of the two experts interviewed to come up with the general results. Through relational content analysis, a relationship that exists between concepts given in the interview shall be established.

To quantify the effective variation of green building design concept with BIM into a new construction market, the analysis looked to know whether the transformation was restless while Building Design Concept. Having taken a gander at both the innovative and functional components, we can say that green building design assumes a significant part in preparing the construction market to receive new building plans.

DISCUSSION AND RRESULTS

This provides the conclusion and discussion arrived at from the various student research on BIM technologies in the construction market. Several benefits and challenges were explored from the condition surrounding BIM and the level of expertise needed for the BIM implementation. The data were dissected utilizing the Statistical Package for the Social Sciences (SPSS). This study analyzed 109 respondents who were to provide answers to the questionnaires provided for this study. The interview survey questions were sent to professional impalement scales are used to estimate the reliability and validity of particular items. The scales used to measure reliability were built on Cronbach's alpha and the inside consistency of the items. Cronbach's alpha is a measure used to assess the reliability or internal consistency of a set of scale or test items. In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept, and it is one way of measuring the strength of that consistency. However, it's a measure of internal consistency, how closely related a set of items are as a group. Moreover, Cronbach's alpha was used to calculate and make sure stability coefficient alpha based on the total number of surveys that was send. Therefore, the Cronbach's alpha in this study, standardized items are (.793) this point proved that the items have relatively high internal consistency.

The interview questions where send to two professional individuals, Eng. Ishaku Muhammad and Arch. Muhammad Nurfarahin who are experts in building engineering which are sustainable building and actively participate in the construction of green buildings. The outcomes produced are helpful and practical, based on their professional expertise and priceless experience. Each of the two experts interviewed was given interview questions intended to accomplish specific objectives. The results from both the interview and the 109 respondents predict the effective adaptation of green building concept using building industrialized management with BIM for the upgraded construction market. The outcomes that this preliminary study has obtained can support the applicable research or adaptation of green building concept using building industrialized management with BIM for the upgraded construction market.

CONCLUSION

Housing sustainability in the construction industry could lead to a more intense design environment. Green BIM in conjunction with real estate development platforms can potentially help achieve real estate goals. Development actors benefit from countless advantages when they integrate BIM into their real estate construction projects and without experience. Bugs and Rework through coordinated digital models, fast conventional processes that save time and money, encourage more practical communication and collaboration in interval project teams, and much more. Some challenges that

need to be managed along with the implementation process itself. For costs for additional software, compatibility problems in Knowledge transfer between completely different operating systems, which is unusual for users with the code program.

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REFERENCES

Abdul Rahman, I, Hamdam. H, Ahmad Zaidi A.M. (2009). 'Assessment of Recycled Aggregate Concrete', Modern Applied Science. *Infrastructure University Kuala Lumpur Research Journal Vol.7 No.1 2019 vol 3, 47-54.*

Addo, J.N.T. (2015). Delay and Its Effects on the Delivery of Construction Project Ghana, African journal of Applied Research (AJAR*). Infrastructure University Kuala Lumpur Research Journal Vol.7 No.1 2019 Vol. 1 No. 1, pp.236-241.*

Alwan, Z., & Gledson, B. J. (2015). Towards green building performance evaluation using asset information modelling*. Built Environment Project and Asset Management.7,19.*

Ali, A. J. (2016). Green Initiatives in Kota Kinabalu Construction Industry. Procedia-Social and Behavioral Sciences. *Infrastructure University Kuala Lumpur Research Journal, Vol.8 No.1 2020 224, 626-631.*

Bank, L. C., McCarthy, M., Thompson, B. P., & Menassa, C. C. (2010, December). Integrating BIM with system dynamics as a decision-making framework for sustainable building design and operation. *In Proceedings of the First International Conference on Sustainable Urbanization (ICSU) (pp. 15-17).*

Cheng, J. C., & Das, M. (2014). A BIM-based web service framework for green building energy simulation and code checking. *Journal of Information Technology in Construction (ITcon), 19(8), 150-168.*

Ekasanti, A., Dewi, O. C., & Putra, N. S. D. (2021, March). Green BIM potential in assessing the sustainable design quality of low-income housing: A review. In IOP Conference Series*: Materials Science and Engineering (Vol. 1098, No. 2, p. 022078). IOP Publishing,4.*

Kushwaha, V. (2016). Contribution of building information modeling (BIM) to solve problems in architecture. *Engineering and construction (AEC) industry and addressing barriers to implementation of BIM. Int. Res. J. Eng. Technol, 3(1), 100-105.*

Lu, Y., Wu, Z., Chang, R., & Li, Y. (2017). Building Information Modeling (BIM) for green buildings. *A critical review and future directions. Automation in Construction, 83, 134-148.*

Maskil-Leitan, R., Gurevich, U., & Reychav, I. (2020). BIM Management Measure for an Effective Green Building Project. *Buildings, 10(9), 147.*

Nguyen, T. P., Nguyen, V. A., Pham, D. D., & Do, H. Q. (2021, March). Integrating Building Information Modelling (BIM) and Tools with Green Building Certification System in Designing and Evaluating Water Efficiency of Green Building for Sustainable Buildings. *In IOP Conference Series: Materials Science and Engineering (Vol. 1079, No. 3, p. 032063). IOP Publishing.*

Soggier, T. E., Lim, Y. W., Ahmad, M. H., & Samuel, W. O. (2017). Building envelope thermal performance assessment using visual programming and BIM, based on ETTV requirement of Green Mark and Green buildings. *International Journal of Built Environment and Sustainability, 4,(3).*

Solla, M., Ismail, L. H., & Yunus, R. (2016). Investigation on the potential of integrating BIM into green building assessment tools. *ARPN Journal of Engineering and Applied Sciences, 11(4), 2412-2418.*

Wang, W., Zhang, S., Su, Y., & Deng, X. (2018). Key factors to green building technologies adoption in developing countries: *the perspective of Chinese designers. Sustainability, 10(11), 4135.*