Building information modeling and data generation

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ABSTRACT

In the industry of construction, projects are increasing more day by day and are also become complex in the methods of construction technologies which is considered as rapidly developing. The construction projects generated several different kinds of data. Particularly, many input resources are required by the construction phase and it generated a multiple set of data. When so many Information Technology techniques are established for the management of information at the phase of construction, it measured for creating the databases for such data and for linking the various kinds of data jointly are still inadequate. This research aims for suggesting the database system about construction data depend upon the technology of BIM for enabling management of data site generated at the phase of construction. This research analyzed the data generated at the site of construction and then the system of categorization to structure the generated data with a model of the database for structured information storing. By these efforts, confirmations are done that this system of database utilized for the accumulation and construction data. It is supposed that, later on, continuous accumulation and construction management data will be allowed for the accumulation of corporate-level knowledge which opposes the accumulation of individual level.

Keywords: Building Information Modelling, Construction Data

1. INTRODUCTION

In the industry of construction, projects are increasing more and complex. Through the new methods and technologies in construction, it is developed rapidly. The construction project owners are increasingly made the multiple set of demands that are related to the rules and regulations. This results in new advancements and growing complexity in the technology of construction. It is necessary to increase the efficient diverse management data generated at the construction projects. In specific, at the construction phase, the buildings started by taking the blueprints, and then the best projects need comprehensive management with more amount of data for allowing the success of the construction phase [1]. Due to the data management importance, the industry of construction uses an array of diversity in the IT techniques and different methods and studies like Project Management Information System (PIMS), Continuous acquisition of Life-cycle Support (CALS), and then Computer Integrated Construction (CIC) are existed for managing the data which is generated at the construction course. As the result, it was difficult for using the data due to the data generated in the industry of construction was collected as e-documents which is known as one data. Focusing is on the data visualization and establishment of the linkages within the information.

BIM existed for resolving the trouble connected with the techniques of the data construction management BIM technique uses the parametric technique modeling of three dimensional for consolidating the generated data at the phase of construction into a fact, hence the connections made among the data points. Nowadays, it is utilized to make different assessments and analyzing the usage of 3D models like energy analysis, area of viewing analysis, sunshine analysis, and interference analysis [2]. BIM is used to analyze the models of 3D. And then this won't be used for construction management of data by the consolidation of construction data and then by the building database. In BIM due to the insufficiency of the system of the database, it lacks for effectively linking the non-figure and figure data.

This research proposed effectively the connected figure data that is a planning data and non-figure data, also a construction data with a BIM-related database system by an accumulation of enhanced data management and construction data [3]. For achieving the purpose of this research, analyzing the generated data at the phase of construction is utilized for proposing the system of categorization data which ordered the database system of uncategorized data that assembles the construction data.
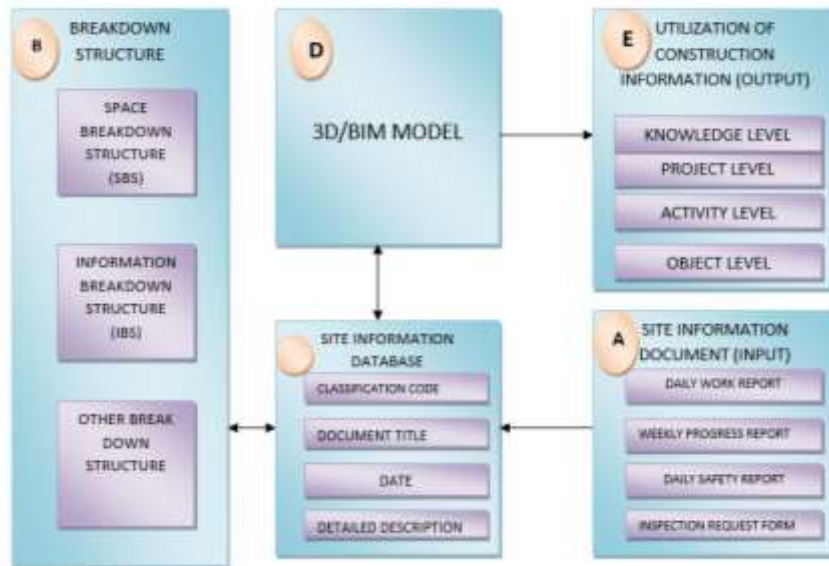
Figure 1: BIM based system of construction database

2. CONSTRUCTION SITE PROBLEMS OF DOCUMENTED DATA

Through documenting, the gathered information of construction sites were managed the data at the phase of construction. These data having more diverse and numerous overlapping data [25]. Some of the examples of the generated document at the construction sites were reports of the labor having common information about the projects like construction project name, temperature, weather, and data at the same time having progress of construction details, cautionary notes about the project, output details of the contractor, equipment and material inputs current state [4]. The reports of the safety contain the common data like construction project name, weather, date, work details completed at the given date, records about safety inspection, details about safety training, and site manager. Hence, the special data about the cautionary notes of the safety are also included.

Reports about the daily labor and safety overlap the common data with the construction project name, details about the completed work on the given date, weather, and date [26]. Generated data at the site of construction were managed by the different documents often the data contains were linked by each other and thus overlapped [5]. The construction site-generated document was handled as an individual document therefore it is very tough for utilizing the data presented in the document which is an overall consolidated structure.

Hence, it is archived onsite on a form of document archive which is presented as a physical document otherwise in a format of computer files and a person is responsible for the prepared document.

By analyzing the overall previous studies it is obtained that the present methodology about the management of construction was proposed as a measure for enhancing the works effective analysis. Hence the document management is for improving the tasks efficiency or the exchange of documents [27]. The lack of works obtained at the management site and then the utilization of overlapped data which having the onsite generated documents. insufficient data about the documents limited the use, consistency, and search of the data [6]. The systematic methods are diverse to gather the data of documented which having the construction site data. This is for facilitating the construction data effectively accumulating and for improving its consistency and usefulness therefore for increasing the use of documented data it is compulsory for visualizing both linked and structural data like BIM. For the direct searches and usages, the documented data are very useful.

3. MANAGEMENT OF CONSTRUCTION INFORMATION BIM

In the year of 1970s BIM is dependent upon the descriptive system ofEastmans building and the technique is developed which incorporated the virtual building concepts to enable data analysis and consolidation by 3D modeling through the stage of planning this to maintain and repairing.

BIM advantages are including the ability for allowing the construction data accumulation by the model information this is turned to allow the easy standardization of the assets knowledge and the ability for allowing the accumulation of information by a 3 D model which contributes to the linkage among the different parties that involves at the construction phase to share and procure the materials among them. Hence to improve the cooperation and effective data management the 3D model was utilized [7]. Therefore, establishing the automated environment for the management of data and reducing the needed resources to prepare the different aspects of management construction, drawings, and quantity calculations. The suggestions are made that the information resources depend on the system of database and then user interface for combining the MS project and auto CAD to develop the database for allowing the simulation process of 4D/VR [8]. A system of data connects to linking the documented data and then model information which depends on the automatic documented categorizing that uses the file system of IFC and master format of systematic analysis for linking this to BIM and suggests a connected structure among the model of 2D and documented data.

The system of data converts to the structural data compatibility among the file system of IFC and the American standard system of BIM for facilitating smooth data sharing by a model of BIM [28]. A measure among the BIM compatibility of a data model with

the system of maintenance data for applying the developing phase data model of BIM. This is for enhancing BIM usefulness at the phase of management and maintenance. For applying the BIM data to the system of chinas bidding structured a mapping process. and framework to link the data of BIM model and the data wanted for the analysis of bidding based system and the verification is done at the useful process of algorithm and mapping [9]. A system of BIM-based is proposed for the construction management knowledge at the phase of construction which enables to store of the relevant data for the phase of construction that uses the model of BIM.

Previous studies are depending on the BIM managing information. It is focused on the data compatibility among every phase of the construction project. Hence, for instance, studies are related to how the data are exchange for utilizing the design data phase of BIM having BIM structural and the BIM equipment [10]. Also, the previous studies are related to the building lifecycle and exchange of compatibility data framework done entirely for all phases of the construction.
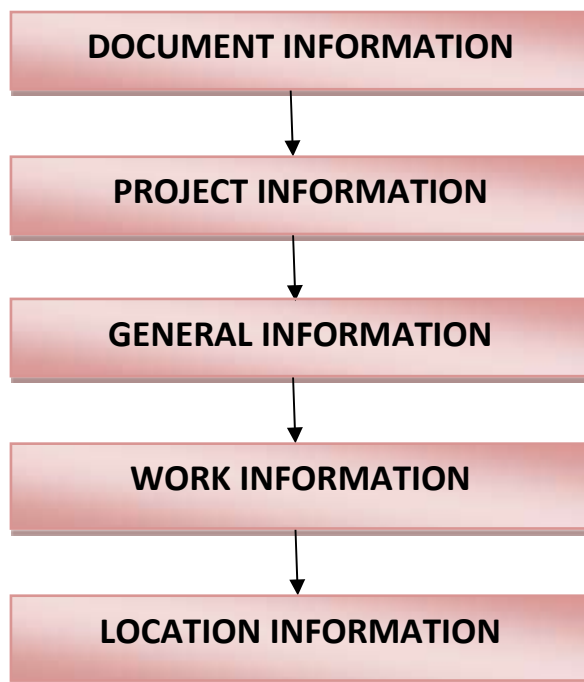

Figure 2: SITE-generated document information

A.   Establishment Measurement of Construction Database BIM

The accumulation of effective with documented management data in the site of the construction exerts an impact on the construction progress. For managing the construction data this research suggested a system of the database for the construction data [11]. The construction database BIM rearrange and then accumulated the generated document data in the site of construction by a system of categorization and then links the data to the model of BIM for enabling the construction data usage.

Part A shows the database depicts the generated document at the site of construction. The document preparer has used the documents that were rearranged by a system of categorization designed for categorizing the data that is presented in section B further information about rearranged document site was stored in a database format in part C. This stored data are managed through connecting by the model of BIM are provided at part D and then the data are constructed are connected for the model of BIM and then stored and used through the construction managers are provided in part E.

For explaining the system of construction database in detail for understanding the different documents sites are provided in part A. the documents are the reports of daily works and data structured, common data about the project and data related to the construction project and then space data were included [29].

Figure 2 shows the information presented in the generated document at the site of construction. Such documents of the site generated having the arrays of diverse data and such data overlapped with other documents. this is compulsory for managing the construction data to highlight consistency [30].

The information presented in the document of site generated wanted to gather and categorize the system of categorization which is described in figure 1 of part B for properly framework of data. For this uses, these researches categorize the documented data having Space Breakdown Structure (SBS) with Information Breakdown Structure (IBS) that is proposed in the previous researches [12]. The categorizing of the data contains the journals of daily construction by the system of categorization are depicted.

The data categorization presented in the report of daily work facilitates the construction journal categorization themselves by IBS having" Documented Information-Building Plan" category. Particularly work data, common construction data, with space data are categorized and assigned as the element of the project by SBS. When the general data construction is connected to the element of the SBS project which is categorized as " Project-General Construction Information (date, weather, temperature, etc.,)". The space data are stored and categorized as the system of space-based [13]. This categorized documented information was stored at the

database is provided in Figure 1 of section C, hence, stored data are used as categorized data documented format or an electronic record format. Illustrations made that the method of storing construction data classified by categorization framework at the database [31]. Categorized data from the database is reordered into a new combination of data, increasing the usefulness of the information. Further, electronic information document saved at a format of the electronic document was saved in its entirety, therefore, allowing to accumulate the nonstandard information document at the database, likewise providing a solution for problems associated with storage document with management in the sites of construction ("such as destruction or loss of documented information").

Information about the documentation was saved to the database was managed in linking it to the model of BIM that is shown in Figure 1 of section D. Classified data from the database is reordered to the new configuration data expanding information's usefulness [14]. Furthermore, document management information saved during a digital document format is saved in its entirety, enabling for both the buildup of variable documented user information, providing an answer to the crisis associated with document creation and processing at the sites of construction (like devastation or failure of documentation) [32].
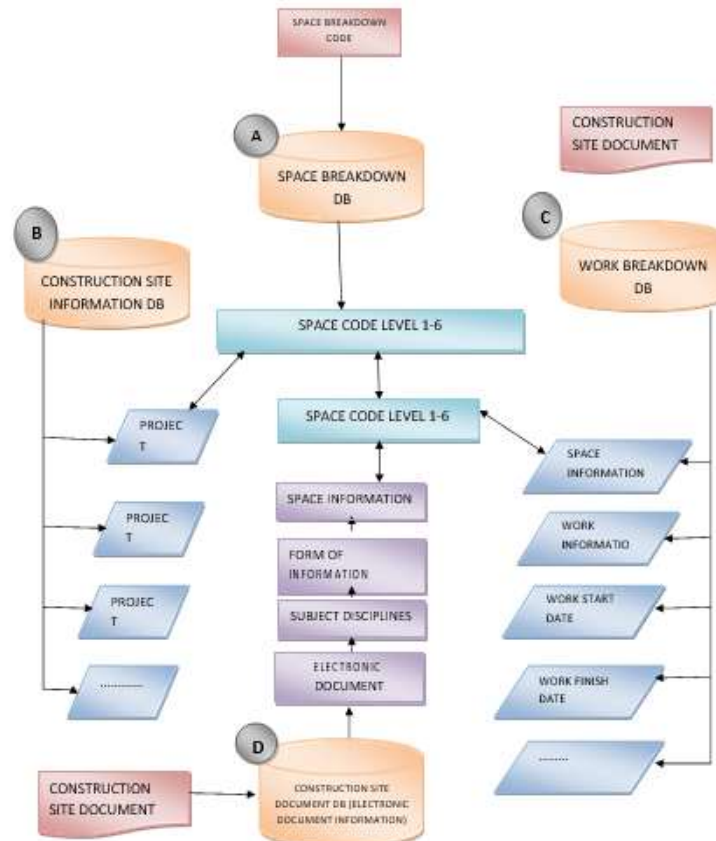

Figure 3: BIM based construction information database system

Detailed report stored in the database was attempted through linking this to the model of Bim, which is shown in Figure 1 Part D. The building information file was connected by using Space-Based Structure and then it is paired one to one for the specific Items of its model of Bim, enabling the processing of the construction data via the model of BIM model [15]. There are several methods besides connecting the model of BIM and then the system of the Space-Based for the construction project, including one that establishes links through specific IDs inside IFC documents of the model of BIM, another one that uses the Entity IDs supplied by a Software package, another which uses the Surface ID of entity, and then so on [33]. Hence, illustration made that the principle of connecting the model of BIM to the data of construction.

After connecting the model of BIM and then the construction information database, material handling equipment could be accrued on every entity of BIM, are shown in figure 1 of Part E and then construction data is verified by the model of BIM [16]. Besides illustration, even before dislocations shape on such a ceiling, the relevant framework's material handling equipment, construction management information, and more could be checked using the system of SpacedBased and applicable information-Based building work. Following the above figure shows how to use a BIM- based building database [34].

Such a construction information database can be used to maintain the building's construction information background by collecting information on the construction process; additionally, storing the documentation produced during the construction process that uses this model makes for simple confirmation with construction work and during the construction process, or in general, may dispute and when other situations happen.

B. Creation of a BIM-based database information system
The BIM database of building data is categorized with space categories, developing, data work on the structural structure and an on-site database to assemble relevant documentation on the construction through linking the systemic as well as non-structural data and by connecting the space categorized file only with the site-data bank.

Figure 3 shows the interlink between a BIM Building Information System of database system In the case of on-site documentation which will be tough for structuring the database format file itself is converted to the management of e-document [17]. The documents themselves may be linked to and administered by structural information, which is shown in figure 3 of Part D, as electronic documentation, and incorporating space data into these electronic materials by the system of space categorization. Possibly create framework while information produced in the sites of construction was gathered using this method to collect both standard and then data of nonstandard from both generated documents in the site of construction.

Moreover, the documents that contain the information is kept as e-documents in the case of unusual information, thus enabling the relation among all recorded information which is relevant with construction and thus enabling a review, through a connection with the BIM model, of the documented information that is included in a specific structure framework [35].

4. APPLICATION OF SCENARIO BASED CONSTRUCTION DATABASE INFORMATION

The established effectiveness of BIM-based construction database information was tested in this portion. Although it was hard to apply a construction knowledge database to a real-world project site, another attempt has been made for determining the likelihood of using a scenario as a reference, which introduces the database system [18]. An attempt is made for determining the implementation which is a possibility for construction database information by a comparison process among implementing conventional methods with applying data management database, thus evaluating the effectiveness including its construction information system, depending mostly on implemented situations concerning a collection and sharing of the records [19]. The specifics of how to use the construction database also were suggested. The accumulation and then storage of the recorded information produced through construction sites, as well as claiming which occur just after completion of a design project, were the scenarios for which the building information system would be used.

The building information database was assessed in two phases: at first, the method for maintaining details provided from construction sites, and then second, utilizing a retained method to assess its appropriate documents within the event of a dispute [20]. Here, the first phase, which seems to be the method of handling construction site documents, composed of its steps in Figure 1 of Sections A to D, and it was fully focused on such a situation in which construction site documents are stored as processed information and then electronic documents which reproduced relevant documents. The steps in figure 1 of Part E made up the second phase, which involved deciding relevant documentation regarding claims. It's a scenario including a method of determining information of document which is relevant.

a)   **Scenario 1 SITE generated management documents**
Scenario 1 dealt with the collection and management with documentation provided by building sites, but it was through the scenario that a distinction is made among conventional site-document project management or a database-based process, as well as specifics on the information contained in the information security database.

b)   **Scenario 2 relevant documents derivation**
After a construction project is completed, lawsuits for building defects are often filed against it. For pursuing such claims, one must first perform an assessment, then track down and then secure evidence documents, examine evidence equipment, validate the claim's basis, measure costs, compile required documentation, and eventually file the claim [21]. As a consequence, for the ability to succeed raise or support the case, sufficient evidence documents must be collected, and then "tracking down evidentiary materials" was thus deemed quite necessary for each step of a claim. Besides that, "tracking down evidentiary materials" necessitates a considerable amount of time and effort; during this process, the recorded evidence relating to the argument that's been produced at the construction process was gathered.

5. CONCLUSION

The industry of construction was increased more complexly. When the number of scale and participants at the projects are continually growing which leads to a wide amount of information generated with the need for managing such data [22]. In specific, the phase of the construction is formed depend upon the generated different data kinds and blueprints which are needed by the management. Being that more data at the construction phase are generated like documents. Now, gathering the generated data is effectively very difficult.

BIM proposed a system of database that is designed to gather data and then highlight the links among nonstructural and structural data of the construction data with effective accumulation. For this reason, a system of a database having the management of information depends upon the system of categorization by which the documented data are proposed [23]. This proposal was made for linking the nonstructural and structural data. In this research, the implementation of a database system is evaluated by several scenarios. The evaluations showed that the documented data from the documents are extracted that is generated at the sites of construction. This would form the database. In which the documents related to the database are extracted by the gathered data usage.

The results are shown that it would enable the system formation to gather the data of construction through connecting the nonstructural and structural data. The construction of a BIM-related information database is proposed in this research is formed depend upon the generated construction site data and the system of categorization with the site-generated data [24]. The viability is evaluated by the scenario's utilization alternatively by the direct application in the sites of actual construction and then quantitative analyses are done for such applications. Further to verify the effects of the anticipated models it is necessary for analyzing the direct application in the actual sits of construction.

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