Vol. 08, No. 1 (2026) 469-474, doi: 10.24874/PES08.01B.005

Proceedings on Engineering Sciences

www.pesjournal.net

IMPLEMENTING PROFESSIONAL PROJECT MANAGEMENT ACCORDING TO THE (PMI) WITH BUILDING INFORMATION MODELING (BIM) AS A SOLUTION TO SOLVE PROJECT DELAYS IN IRAQ

Hussein Sadiq Latief [1]

Received 05.05.2025.
Revised 30.07.2025.
Accepted 11.08.2025.

Keywords:

Project Management Institute (PMI), Project Management Professional (PMP), Building Information Modelling (BIM), Planning and Scheduling, Global System, Local System, Progress Measurement System (PMS)

A B S T R A C T

The study focused on a real project that was implemented using the local system in Iraq-Maysan. In this study, the success of BIM technology in adopting building information was evaluated by comparing the local system in Iraq with the global system according to PMI. Multiple programs were utilized to elucidate the dimensions of BIM and integrate them with the system. Global professional project management, where Autodesk AutoCAD was utilized as the application, according to BIM. We were also shown the dimension using the Primavera p6 application. In order to minimize the evidence for the fourth 4D it is necessary to link the ideal values taken from Revit with the precise computation of the time period with the schedule. Genuine, on-the-ground execution the different rate for planning was (300 %).

Additionally, the difference in prices between the project's actual cost and the cost estimated using Rivet was 15.5 %.

As well as the difference between the cost of the original project and change order compared to the cost calculated from the Revit was (6.5%).

This difference in prices and quantities were retrieved using the MS Excel application, and it was discovered to vary between (-71 % to +64.5 %).

1. INTRODUCTION

The application of efficient construction management methods and instruments is becoming crucial in construction practice, particularly as project sizes rise To ensure successful implementation, the construction project team harmoniously manages the tasks scope time cost risk and quality Large-scale projects in particular present difficulties for the industry because of the quantity of tasks parameters, and restrictions to be taken into consideration rises the interplay between these tasks and parameters also makes the complexity higher. (Autodesk, 2013) BIM is now necessary in the construction sector in order to manage projects more successfully. Now that they are aware of the advantages of BIM contractors wish to use it to manage their projects. (Abdirad, 2015), (Bagdonas, 2014) Robert Aisha (1986) is credited for coining the phrase "building modeling" in the modern sense. The phrase "Building Information Model" was initially used in writing by Van

[1] Corresponding author: Hussein Sadiq Latief
Email: hussein.sadiq.latief@stu.edu.iq

Intervene and Tolman. publications in 1992, and the word "BIM" was initially used and made popular by Jerry Liseran. (Eastman et al., 2008; Project Management Institute, 2006). Its use of project management is thought to be the most effective approach, and its use in real-world situations is growing globally. The sub-sciences of the science of project management, such as activity planning, the science of researching and assessing risks, business development, and others, developed as a result of the growing need for specialization, the advancement of the science of project management, and the complexity of projects (Nielsen & Madsen, 2010), (Garel, 2013), (Project Management Institute, 2017), (Radujković & Sjekavica, 2017).

1.1 THE AIM OF THE PROJECT

- Solve the problem of delayed projects in Iraq.
- Reducing project implementation time.
- Reducing the cost of the project.
- Set a correct Schedule.
- Solve design problems in the planning stage.
- Mastering the implementation of work according to quality requirements.
- Preventing errors during work execution.

2. THE METHODOLOGY

Using an integrated suite of tools from a single software firm, a 3D model was constructed with a data set of quantities, costs, and timelines in order to meet the objectives of this study. Initially, the BIM authoring system was used to model the building. The model was transferred to project review software in order to perform Clash Detection, which identifies conflicts before construction begins. A spreadsheet was used to create the BIM-based Scheduling (4D Model), which was then connected to the project review software to create a Gantt chart. Additionally, cost estimation (5D) and quantity take-off schedules were produced. By connecting the BIM system with structural analysis software, the efficacy of the BIM approach in terms of structural analysis was examined. The project is carried out in phases to meet the objectives of this study. Table 1 lists the key phases and pertinent software along with relevant details for each phase. Using Autodesk Revit, the architectural 3D model was first created in accordance with the technique. The model had project information stored with it. Following the construction of the architectural columns, walls, floors, doors, railings, windows, and roof, the structural analysis was carried out by connecting the Revit model to Autodesk Robot Structural Analysis (RSA). The addition of Robot's foundation and reinforcing features finished the structural 3D Revit model. A Gantt chart was created using an Excel work schedule that. The quantity take-off schedules were exported from Revit and generated automatically. The benefit of importing the model with the same company's software is to exchange all data almost without losing any information (Azhar et al., 2012), (Cao et al., 2015), (Acebes et al., 2015), (Jankowski et al., 2015).

Table 1. Summarizes the Case Study's (Mihic et al., 2014)

Project phase	Detail	Related software
3D Modeling	Develop a 3D Model which includes a data set of quantities, costs.	Autodesk Revit
Clash Detection	To determine the conflicts prior the construction stage	Autodesk Revit
BIM-based Scheduling (4D Model)	Time estimation and visualization of the project according to the schedule	Revit, MS Excel, Primavera P6
BIM-based Cost Estimation (5D Model)	Provide a quantity take-off and cost estimation at the design stage.	Autodesk Revit 2024
Structural Analysis	Concrete structural framing	Autodesk Robot Structural Analysis Professional 2024
Synchro model	The appearance of a flute	Autodesk Revit 2024; Primavera P6 20.12.0

3. CASE STUDY

The purpose of this thesis is to carry out an integration between PM and BIM, implement a case study based on the literature review, and identify potential practical limits. A case study aims to create a functional structure that complies with BIM design guidelines. It should be mentioned that the case study was done to provide insight into how applicable BIM is These leads to a case study in which several tasks are performed using the BIM model of a three-story building project.

3.1 DESCRIPTION OF THE MODEL

In order to illustrate the benefits of using the BIM process for project management, a case study is presented in which the BIM model of a three-story building project. A mat foundation for the project was established with a depth of 50 cm, and a building space of 2000 m2 was utilized in its construction. On the ground floor, 115 columns of five types were built, Dimensions: C1= 50 × 50 cm, C2= 75 × 25 cm, C3=50 × 25 cm, Columns C4 and C5 are circular in diameter C4= 15cm, C5= 20cm.There are fifteen different types of bridges, which are arranged inside the hallways and along all of the walls. While the dimensions of each of these bridges are the same B1=70×30 cm or B2=50×30 cm they varied because different reinforcements were utilized and C=35 concrete was used. The remaining levels follow the same design as seen in Figure 1, which displays the building's layout in AutoCAD.

Models are shown in Figures 2, 3 and 4.

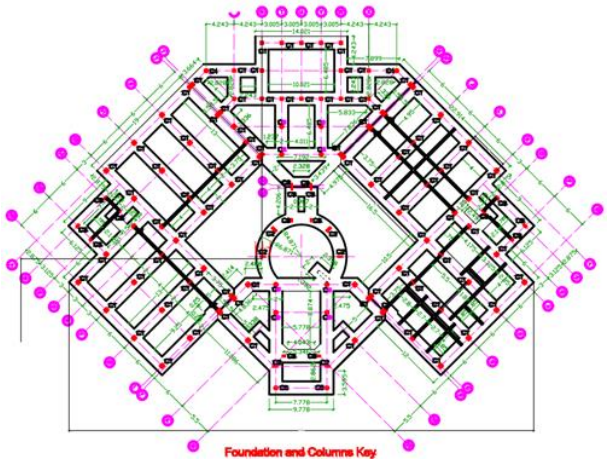

Figure 1. Ground level structure plan view

Figure 2. 3D Modeling by RIVIT 2024

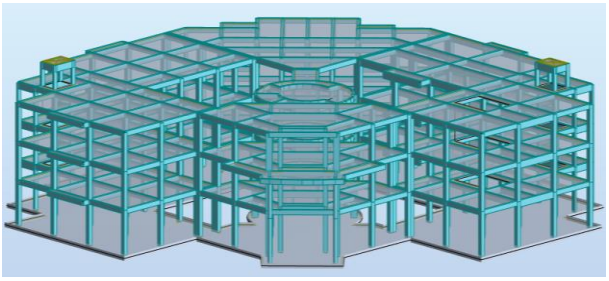

Figure 3. 3D Modeling by ROBOT S.A.P.2024

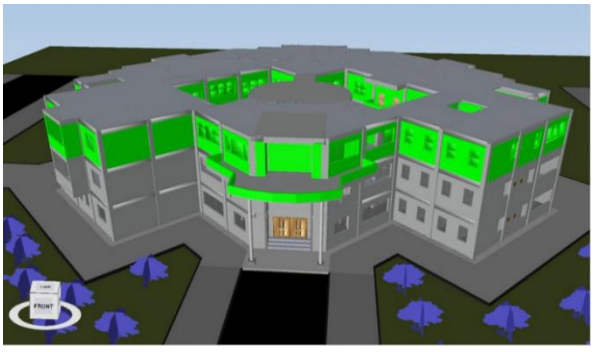

FIGURE 4. 3D & 4D SYNCHRO model

3.2 CLASH DETECTION

The 3d architectural model was converted to refit in order to perform conflict detection. Autodesk refit, that stores various data from many project disciplines, is used to generate 4d analysis. The primary benefit of 4d models is their capacity to supply the primary distinction lies in the "timelier" feature, which facilitates the integration of project coordination and the timetable through clash detection. The prohibition on changing the model, which offers coordination and visualization opportunities, is another important element that shouldn't be overlooked. (Merschbrock & Munkvold, 2015), (Van Berlo & Krijnen, 2014), (Rumane, 2017), (Velasco, 2013), (Tarandi, 2015)

4. RESULTS AND DISCUSSION

BIM software programs fall short in helping to identify eligible project stakeholders conduct risk assessments, and allocate resources. Additionally, it should be mentioned that creating a model with all the necessary data poses difficulties for novice users in terms of training and education to become proficient with BIM software. Even though the initial cost of using BIM on a project will go up because of the BIM software, there are still fees associated with education and training. However, this rise will stay negligible in comparison to the advantages of BIM This case study essentially illustrated the procedure for integrating BIM technology into building projects (Latief & Eassa, 2024).

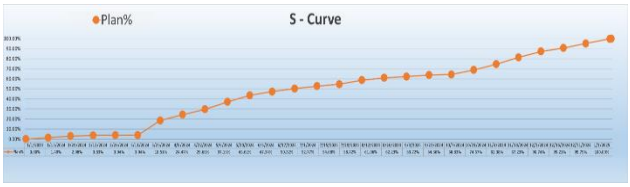

Figure 5. S-Curve for Planning Percentages of Project

Table 2. Percentages of the difference between the original price and the price calculated according to the Revit program

Difference ratio for Original tender with Change Request	Difference ratio for Original tender	Items	NO
CPC.1-Under ground			WBS
CPC.1.1 Civil work			I
-5.6 %	-5.6 %	Badlo (10 cm)	1
-3.5 %	44.5 %	Foundation	2
-67 %	-67 %	Brick work	3
-71 %	-71 %	Backfilling ground	4
CPC.2-Above ground			WBS
CPC.2.1 Civil work			I
-17.25 %	0 %	Blinding (10cm)	1
1.7 %	40.4%	Steel columns	2
-4.8 % 13 % -6.3 %	25 % 16 % -6.3 %	Steel, slab, beams, + lentil stairs	3
52.5 %	52.5 %	Brick work	4
Finishing			WBS
32 %	58.5 %	Plastering & whiteness & prose	1
62.3 %	----------	External stone faced	2
64.5 %	64.5 %	Ceramic Wall	3
35 %	34.5 %	Ground Marble	4
50 %	50 %	Painting columns internal	5
31.7 %	31.7 %	overalls	6
34.5 %	34.5 %	Stair marble	7
6.36 %	27.7 %	Secondary ceiling	8

Table 2 shows the percentage of activities in which a discrepancy was discovered as we found a difference in some activities through the Rivet program, including the percentage of price differences in the quantities of tender and also the percentage of price differences between the tender and change orders. In the first column, we found the difference between the prices of the rivet and the prices of the tender, and from there we found the percentage, as well as the same thing in the second column, which contains the percentage difference between the tender + change orders and the prices of the quantities of the rivet.

Then, the cost difference was determined by 15.5 % as the difference between the cost of the original project compared with the cost calculated from the Revit program. As well as the difference between the cost of the original project and Change order compared to the cost calculated from the Revit program was (6.5%), indeed, the delay in change orders that's take very long time because all the documents and drawings dependent on the traditional method and delay the project (300 %) more than the allow planning schedule.

5. CONCLUSION

1By using BIM technology in five dimensions (5D), architectural and construction plans were produced that were adequate for professional execution without requiring seriousness and that prevented the majority of errors measured in the local system by not cross-checking the data with standard plans in traditional design firms. According to PMI, utilizing the professional project management system (PMP) enables projects to be completed within the allotted budget and time frames while meeting quality standards.

The project was planned to take only one year, but it took more than three years to implement in the conventional manner after planning it in the global system using PMI_PMP and working on the Primavera P6 program. As a result, the different rate was (300 %) compared to the planed schedule.

Using the Rivet 2024 program, which is regarded as one of the tools for BIM technology, to model the building in three dimensions and calculate quantities. This program also complies with 5D of this technology's cost-related calculations, which show that the cost difference was determined by (15.5 %) as the difference between the cost of the original project compared with cost calculated from the Revit program, As well as the difference between the cost of the original project and change order compared with cost calculated from the Revit program was (6.5 %).

The difference in the quantities and price calculated using the traditional method and comparing them to the calculations based on the global system was within the limits of (-71 % to +64.5 %).

References:

Abdirad, H. (2015). Advancing in building information modeling (BIM) contracting – Trends in the AEC/FM industry. In AEI 2015: Birth and Life of the Integrated Building, Milwaukee, Wisconsin, March 24–27, 2015.

Acebes, F., Pereda, M., Poza, D., Pajares, J., & Galán, J. M. (2015). Stochastic earned value analysis using Monte Carlo simulation and statistical learning techniques. *International Journal of Project Management, 33*(7), 1597–1609. https://doi.org/10.1016/j.ijproman.2015.06.012

Autodesk. (2013). Rekabetçi kalmak BIM olmadan ayakta kalabilir misiniz? In BIM İş Özetleri 04| Rekabetçi Kalmak. Autodesk.

Azhar, S., Khalfan, M., & Maqsood, T. (2012). Building Information Modeling (BIM): Now and beyond. *Australasian Journal of Construction Economics and Building, 12*(4), 15–28.

Bagdonas, P. (2014). How does BIM influence CDM work flow? [Bachelor's dissertation, VIA University College].

Cao, D., Wang, G., Li, H., Skitmore, M., Huang, T., & Zhang, W. (2015). Practices and effectiveness of building information modelling in construction projects in China. *Automation in Construction, 49*, 113–122. https://doi.org/10.1016/j.autcon.2014.10.014

Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2008). *BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors* (1st ed.). John Wiley & Sons Inc.

Garel, G. (2013). A history of project management models: From pre models to the standard models. *International Journal of Project Management, 31*, 663–669. https://doi.org/10.1016/j.ijproman.2012.12.011

Jankowski, B., Prokocki, J., & Krzemiński, M. (2015). Functional assessment of BIM methodology based on implementation in design and construction company. *Procedia Engineering, 111*, 351–355. https://doi.org/10.1016/j.proeng.2015.07.100

Latief, H. S., & Eassa, M. A. (2024). Manual and software-based analysis and design of multi-story building using Robot Structural Analysis Professional. *Nanotechnology Perceptions, 20*(S3), 472–480. https://doi.org/10.62441/nano-ntp.v20iS3.35

Merschbrock, C., & Munkvold, B. E. (2015). Effective digital collaboration in the construction industry – A case study of BIM deployment in a hospital construction project. *Computers in Industry, 73*, 1–7. https://doi.org/10.1016/j.compind.2015.07.003

Mihic, M., Sertic, J., & Zavrski, I. (2014). Integrated project delivery as integration between solution development and solution implementation. *Procedia - Social and Behavioral Sciences, 119*, 557–565. https://doi.org/10.1016/j.sbspro.2014.03.062

Nielsen, A. K., & Madsen, S. (2010). Structural modelling and analysis using BIM tools [Master's thesis, Aalborg University].

Project Management Institute. (2006). *Practice standard for work breakdown structures (WBS)* – Second edition (Reaffirmed). Project Management Institute.

Project Management Institute. (2017). *A guide to the project management body of knowledge (PMBOK® Guide*) (6th ed.). Project Management Institute.

Radujković, M., & Sjekavica, M. (2017). Project management success factors. *Procedia Engineering, 196*, 607–615. https://doi.org/10.1016/j.proeng.2017.08.048

Rumane, A. R. (2017). *Handbook of construction management: Scope, schedule, and cost control.* CRC Press, Taylor & Francis Group.

Tarandi, V. (2015). A BIM collaboration lab for improved through life support. *Procedia Economics and Finance, 21*, 383–390. https://doi.org/10.1016/s2212-5671(15)00190-2

Van Berlo, L., & Krijnen, T. (2014). Using the BIM collaboration format in a server based workflow. *Procedia Environmental Sciences, 22*, 325–332. https://doi.org/10.1016/j.proenv.2014.11.031

Velasco, A. U. (2013). Assessment of 4D BIM applications for project management functions [Master's thesis, University of Cantabria].

Hussein Sadiq Latief Al Jumaily
Building and Construction Department,
Engineering Technical College of
Missan , Southern Technical University
Missan,
Iraq
hussein.sadiq.latief@stu.edu.iq
ORCID 0009-0000-4898-5185