

Building Information Modelling Execution Plan (BEP) Conceptual Framework for Design and Build Project

Syahirah Mat Sahizol Raduan^{1,*}, Juliana Brahim¹, Rumaizah Mohd Nordin¹, Suzila Mohd², Vignes Poniah³

¹ School of Construction and Quantity Surveying, College of Built Environment, Universiti Teknologi MARA (UiTM) Selangor Darul Ehsan, Malaysia

² Faculty of Civil Engineering, Universiti Teknologi Malaysia (UTM), Johor, Malaysia

³ Trafford College Group, Building Services Engineering, Talbot Road, Stretford, Manchester, United Kingdom

ARTICLE INFO

Article history:

Received 27 March 2025

Received in revised form 18 August 2025

Accepted 29 September 2025

Available online 10 October 2025

Keywords:

Conceptual Framework; Building Information Modelling Execution Plan; BIM; BEP; Design & Build

ABSTRACT

The execution of Building Information Modelling (BIM) would require a BIM Execution Plan (BEP), which serves as a guide or reference for contracting parties involved in the BIM project, ensuring its successful implementation. However, the lack of understanding on how BEP should be used has resulted to the improper of BIM implementation. Therefore, this research aims to propose a conceptual framework for the BEP in Design and Build (DB) projects. This research will utilise the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) review methodology. The review has resulted in the proposal of a conceptual framework for the BEP in DB projects, comprising 11 key elements. In summary, this research is expected to enhance the implementation of BEP practices among construction professionals in the BIM execution for DB projects, thus could assist construction professionals to reap full benefit of BIM.

1. Introduction

Building Information Modelling (BIM) is one of the disruptive technology components in the Fourth Industrial Revolution (IR 4.0) that are growing rapidly in the construction industry apart from Digital Twin (DT) construction, Internet of Things (IoT), big data and additive manufacturing [1]. In addition, BIM stands as one of the 12 emerging technologies delineated within the CIDB Construction 4.0 Strategic Plan 2021-2025. It is earmarked for short-term implementation, intended to be integrated within a year, as outlined by Construction Industry Development Board (CIDB) in 2020 [2]. Meanwhile, the Public Works Department (PWD) in the PWD Strategic Plan 2021-2025 has targeted to implement BIM in the 50% of the construction project that worth RM 10 million and above, with additional of 10% in each subsequent year until 2025 [3].

* Corresponding author.

E-mail address: 21010379@siswa.unimas.my

<https://doi.org/10.37934/ard.145.1.222235>

As of 2021, there are twenty-one (21) Design and Build (DB) projects and eleven (11) Design-Bid-Build (DBB) projects [4] and it proved that DB had been used for most of the BIM projects in Malaysia due to the fact that the DBB approach often takes longer time and process than the DB approach [5]. This method alternatives allowing for overlap between the design and construction phases [6], which encourages team collaboration and enables early involvement of contractor to give input and take part in the budgeting, programming, financing, assessing the design for constructability and cost of construction [7]. Additionally, DB has become a well-known procurement method option compared to DBB [8] as it is time-consuming and demand a lot of resources that contributes to a high level of dispute between the client and the contractor compared to DB [9].

To execute BIM, an essential guideline which is BIM Execution Plan (BEP) is needed for planning and monitoring strategy [10]. To added, BIM standards are needed in producing BEP key contents. Current standard used for the BEP creation is BS EN ISO 19650-1 and BS EN ISO 19650-2 by International Organisation for Standardisation. BS EN ISO 19650-1 is for concepts and principles while BS EN ISO 19650-2 is for delivery phase of the assets [11, 12]. As a result, BEP from various countries around the world today are aligned with these two ISO standards and Malaysia is among one of those countries [13].

In addition, BEP is a guideline needed for BIM related projects. However, BEP itself is required to respond to Employer's Information Requirements (EIR) of every project [14]. EIR is a client's requirements which includes technical aspects, managerial aspects, and commercial aspects for the project [11]. Thus, BEP need to be aligned EIR of the project and this depicts that different project would require different BEP as the client's requirements could be different from one to another. Besides that, BEP is a live document that need to be updated throughout the project [15] as it is the main reference for the project teams for BIM information related to the project, such as project goals, project characteristics, project stakeholders and infrastructure required [10]. Hence, this research aimed to propose a BEP conceptual framework for DB projects through the issues with current BEP implementation and potential improvement for the BEP for DB projects.

2. Literature Review

Building Information Modelling (BIM) is a process of preparing, usage and sharing of 3D modelling through digital technology that contains multiple information; which may be utilised by all parties to a project, in achieving objectives throughout the implementation of the project [1]. BIM are under the simulation & modelling for technology clustering, which it is able to be applied through the whole construction project lifecycle, from conceptual, planning & design, procurement, construction, & operation and maintenance [1]. Among the advantages promised by BIM including the enhancement of project planning and adapt future plan, efficient planning & scheduling, ability to be in-line with 3D point cloud scanning & clash detection between trades, ensures time saving and increase productivity throughout project life-cycle [10], improved coordination between client, consultant and contractor, improved collaboration among project team members and improved visualisation of the project [18]. Additionally, the common BIM software used is the Autodesk Revit, which allows the operator to design a facility and structure together in the form of three dimension (3D) or fourth dimension (4D) [3].

Additionally, [19] has mentioned that BIM has common dimensions that varies from three until seventh dimensions (3D, 4D, 5D, 6D & 7D). 3D is the digital representation of physical and functional information of an object, which also allows the different trades integration such as architectural, structural, and Mechanical, Electrical & Plumbing (MEP). Meanwhile, 4D is the construction planning and management that allows integration of 3D with the project scheduling, which linking the time

schedule to 3D model for better visualisation of future and current project progress. In the other hand, 5D is the quantity take off (QTO) and cost management analysis, 6D is the sustainable analysis such as resource efficiency and carbon use. Lastly, 7D is the dimension that focusing on the asset management, specifically life cycle of built asset [19].

CIDB in the Malaysia Building Information Modelling (BIM) Report 2021 has reported that BIM adoption rate recorded stable growth in 2021 at 55%, which has been increasing from 17% in 2016 and 49% in 2019 [20]. This increasing percentage in BIM adoption has been caused by the Construction 4.0 Strategic Plan, increasing demand in BIM application and implementation from construction personnel as well as the relevant government policy. Additionally, it is essential to ensure new construction workforce is highly capable in BIM as we are at the midst of Industrial Revolution 4.0 (IR 4.0) that focusing on digital technology and BIM. Therefore, to align with the BIM implementation for construction industry, BIM Execution Plan is important, which are going to be applied as reference or guideline for projects that are using BIM.

In addition, BEP is a process a project team performs to design the execution strategy for implementing BIM on the project [20]. BEP is a reference document for the contracting parties to execute the BIM project [10]. BEP embodied the process and methodology to deliver the collaborative working practices for BIM project. It is important for a project to have BEP or BIM guideline in executing work related to BIM, which to increase the productivity and keep on the track along the BIM execution. In Malaysian construction industry, consultant or contractor are responsible to prepare BEP for a project that are going to be executed using BIM. There are two stages of document development process which is pre-contract (Pre-BEP) and post-contract (Post-BEP), for DB and DBB construction project delivery method [13], which DB are going to be as reference for this research. In general, pre-BEP are the outline of proposed approach that are going to be evaluate by client. Meanwhile, post-BEP are going to be detailed and submitted by appointed contractor once the contract has been awarded [13].

For DB, phases involved in sequence are planning, tender, conceptual design, detail design, construction and as-built or handover. [15] specified the section for both pre- and post-BEP are similar, which include the project information, key project contacts, BIM objectives & uses, organization function & staff, BIM work process, model information, coordination & collaboration management, quality control, infrastructure needs, model structure & file naming and planning schedule. In addition, PWD has provide sample of BEP content in the *BIM: Garis Panduan JKR*, a guideline which include the project information, key project contacts, BIM objectives & uses, organization function & staff, BIM work process, model information, coordination & collaboration management, quality control, infrastructure needs, model structure & file naming and planning schedule [15].

The difference between DB and DBB BEP are the process workflow. [15] stated that the workflow of BIM for DB project are going to be specified from planning stage until as-built stage. For the planning, the preparation of BIM will include the BIM cost estimation, project brief and BIM related documents. During tender stage, preparation of pre-bid document and BIM evaluation report. During design stage, detail design model from contractor are required, along with contractor BEP outline, detail design drawing and spatial requirement analysis report, which this report is commonly generated directly from the model generated. In the construction stage, the output throughout this stage will be the construction model creation, completed contractor's BEP, construction drawings as well as the 4D model simulation. This workflow are ended with the as-built/handover phase that are going to produce as-built drawing and model, contractor's BEP as well as asset information that are going to be super useful during facilities management later [15].

To propose the BIM conceptual framework for DB projects, four (4) main components has been identified through systematic review, which include Malaysia BIM national agenda, issues related to the current BEP implementation, aspects of BEP framework and proposed BEP key elements as the outcome.

2.1 Malaysia BIM National Agenda

There are few national agendas has been proposed by Government for BIM development and implementation including Construction 4.0 Strategic Plan 2021-2025 by CIDB, PWD Strategic Plan 2021-2025 by PWD, Twelfth Malaysia Plan by Economic Planning Unit (EPU) Ministry of Economy and National Construction Policy 2030 by Ministry of Works (KKR). The concern due to the lag of construction industry has led to the slow adaptation of technological tools such as BIM [21]. BIM are going to be conducted through the second strategy in boosting productivity growth which the strategy is to moving up the value chain. In the moving up value chain section, BIM is mentioned in the improving operational & production process through the One Stop Centre (OSC) 3 plus online platform are going to be integrated with the BIM e-submission system and BIM increasing high value-added activities, which BIM are going to contribute to lower cost and higher product value [21].

Secondly, BIM are also mention as the agenda in the PWD Strategic Plan 2021-2025, target of 50% project using BIM in 2025, with the BIM implementation for project above RM10 million, which 10% increment for every year until 2025 [2].

Thirdly, BIM has been listed by CIDB as the 12 technologies in the Construction 4.0 Strategic Plan 2021-2025. Under the third thrust, which is smart integrated technology, innovation & infrastructure, mentioned that numerous construction project are still adopting conventional method and low number of BIM adapters [1].

Fourthly, BIM has listed as one of the digital technology applications in the National Construction Policy 2023 [22]. Under the fourth thrusts of policy, which to improve quality in construction through technology as a 'game changer', BIM are going to be integrated in all construction projects, which to improve quality, productivity, & minimise construction inefficiency. Furthermore, to embrace new technology in increasing construction productivity by promoting the modern technology such as BIM throughout the country. Finally, to improve project quality management system to ensure consistent high quality project deliverables through increasing BIM application in upcoming projects that will complete technical and structural aspects, space and components of assets within the premises records & information history that will facilitate maintenance, restoration and demolition of the asset [22].

2.2 Issues Related to Current BIM Execution Plan (BEP) Implementation

BIM Execution Plan (BEP) serves as a crucial framework for projects related to BIM. It is essential because it is tailored to meet the specific Employer's Information Requirements (EIR) of each project [13]. However, there are still confusion related to the content of BEP used in a construction project. Below are the four issues that has been identified to the current BEP implementation: -

2.2.1 Ambiguity of BEP Specific Structure

Firstly, there is no specific structure of BEP that fit every project's needs [3, 14, 23-25]. This is due to the lack of detail of BIM national standard [26]. BEP is a guideline to implement BIM platform, which to enhance project delivery in construction [23]. For instance, different type of project such as high-rise, low-rise building, and infrastructure projects require additional contents in the BEP, but to

remain the key elements. Therefore, it is important for the BEP to have key elements such as BIM goals, BIM roles and responsibilities, BIM deliverables, LOD specifications and file naming conventions, which are applicable to every need of construction project. However, the different key elements from one BEP to another could lead to a lack standardisation in implementing BIM in construction projects.

2.2.2 Lack of Understanding in BEP

Secondly, the issue is related to the lack of understanding on BEP among construction personnel [27]. Additionally, CIDB raised concerns on the need to develop national BIM standards and guideline to manage BIM adoption [28]. BEP content commonly contains professional abbreviations and terminology that are puzzling, added with different level of BEP understanding among construction players [29]. For instance, there will be a knowledge gap between those who have knowledge in preparing BEP and the first timer of BEP reader as different reader would have different interest and concerns [10]. BEP author usually would be using terms that are going to make BEP outstanding and include as many information related to BIM and the project. However, readers who are not familiar to BEP will face difficulty in understanding terms in BEP and this gap would lead to different task execution and final output due to the different in understanding level.

2.2.3 Lack of Enforcement on BEP

Thirdly, lack of enforcement on BEP in BIM project [30]. This issue is being worsen by privacy issue of certain companies in the construction industry. It is mandatory to enforce requirement and standardise BIM guideline for BIM implementation [31]. A company need to have a project or joint venture with another private sector company to obtain their BEP. The reluctance among construction companies from private sectors to make their BEP accessible to the public, which are going to make it difficult to standardise the BEP.

2.2.4 Lack of Review of Existing BEP Workflow

Fourth, lack of review of existing BEP workflow [3]. The most valuable BEP elements from BEP templates and standards are examined and identified [30]. Based on the previous systematic review using PRISMA, it clearly depicts that BEP framework review is at low rates. Apart from ambiguity of BEP specific structure, lack of review of existing workflow are going to lead to the ineffective BIM integration [30]. Therefore, it is necessary to have reviews for the existing BEP workflow, which to ensure a good quality of content that are applicable for the construction project.

2.3 Aspects of BEP Framework

These are the aspects selected for the BEP framework which include knowledgeable construction professionals in BIM, process that related to BIM execution, technology for executing BIM-related works, and policy driven for better implementation due to demand from Government.

2.3.1 People

For every construction project, stakeholders are required to promote increased levels of collaboration among teams involved in projects. Therefore, the people or personnel are required to have technical the abilities and knowledge to conduct BIM related-activities and deliver BIM-related outcomes [32].

2.3.2 Process

In BEP, the process is essential for generating and managing construction project information throughout the whole life cycle, which includes preliminary stage, design stage, construction stage, and as-built stage [33].

2.3.3 Technology

The right tools, including software and hardware to conduct BIM activities are important. These tools are going to be use to conduct BIM related activities such as 3D modelling. Additionally, BIM is a process of preparing, usage and sharing of 3D modelling, undertake clash detections, 4D schedules and other types of BIM uses [34].

2.3.4 Policy

The Government formulated numerous BIM policies in Malaysia for better BIM adoption and implementation in the construction industry, including Construction 4.0 Strategic Plan 2021-2025, PWD Strategic Plan 2021-2025, Twelfth Malaysia Plan and National Construction Policy 2030 [1, 2, 21, 22].

2.4 Proposed BEP Key Elements

From the national agendas and the issues with the current BIM implementation identified, a BEP conceptual framework is going to be proposed. The main purpose of this conceptual framework is to list the important key elements of BEP. For the selection of key elements, 12 BEP from different parties including research institute, government agency, and national standard and private companies have been reviewed, as shown in Table I below.

Table 1

List of BEP reviewed

No.	BEP Reviewed		
	BEP Template	Organisation Type	Year
1	UK CIC	Research Institute	2018
2	PSU CIC	Research Institute	2019
3	AEC UK	Government Agency	2015
4	NIBS US	Government Agency	2023
5	US GSA	Government Agency	2016
6	BCA Singapore	National Standard	2013
7	NATSPEC	National Standard	2016
8	Hong Kong CIC	National Standard	2019

No.	BEP Reviewed		
	BEP Template	Organisation Type	Year
9	New Zealand	National Standard	2019
10	Malaysia (PWD)	National Standard	2021
11	BIM Consultant 1	Private Company	2017
12	BIM Consultant 2	Private Company	2022

Table 2
List of BEP reviewed

Publication Year		2018	2019	2015	2023	2016	2013	2016	2019	2019	2021	2017	2022
BEP Template		UK CIC	PSU CIC	AEC UK	NBS US	US GSA	BCA Singapore	NATSPEC	Hong Kong CIC	New Zealand	PWD	BIM Consultant 1	BIM Consultant 2
No.	Information Items/Elements in BEPs												
1	BEP Overview		✓			✓							
2	Project Information	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Key Personnel Contacts	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Project Goals/BIM Uses	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Organisational Roles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	BIM Process Design		✓	✓	✓	✓			✓			✓	✓
7	Information Exchange	✓	✓	✓	✓	✓			✓	✓			✓
8	Data Requirements		✓		✓	✓	✓	✓					✓
9	Collaboration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	Quality Control	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓
11	Technological Infrastructure Needs	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
12	Model Structure	✓	✓	✓	✓	✓		✓	✓	✓			✓
13	Project Deliverables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	Delivery Strategy	✓	✓				✓	✓			✓		
15	Attachments/Appendix		✓			✓	✓	✓	✓	✓	✓		✓
16	Key Performance Indicators						✓						
17	Model Information										✓		

Referring to the information presented in Table 2, a comprehensive review has been conducted on 17 elements of BEP. The details of this review are elaborated below: -

2.4.1 BIM Execution Plan Overview

This section briefly explains the overview of BEP and the sections included in the BEP such as project information, BIM uses and project deliverables [35, 36].

2.4.2 Project Information

This section is essential as the project's information is going to be recorded, including the project owner, project name, project location and address, project delivery method, brief project description and significant project milestones [15, 32, 33, 35-43].

2.4.3 Key Personnel Contacts

This section lists all the contacts of personnel related to the project and could be adjusted according to the needs of project. Most commonly, the required information including role, organisation, contact name, email and phone number to facilitate communication among project stakeholders [15, 32, 33, 35-43].

2.4.4 Project Goals/BIM Uses

This section requires specifying the project goal description and potential BIM uses based on the BIM deliverables, as every project may require different BIM uses and BIM deliverables [15, 32, 33, 35-43].

2.4.5 Organisational Roles

This section will list the BIM roles and responsibilities, commonly including roles of BIM Manager, BIM Coordinator/Engineer, BIM Modeller and other discipline consultants are briefly describe to provide a better understanding of the job scope for the BIM roles in the project. Additionally, the BIM staffing in this section will specify BIM use, organisation, number of total staff for BIM use, estimated worker hours, location and lead contact [15, 32, 33, 35-40, 42, 43].

2.4.6 BIM Process Design

This section will specify the workflow, where the process design is divided into two sections: Level 1 (Overview Map) and Level 2 (Detailed Map, smaller section of the overview map). These process designs define specific Information Exchanges for each activity and provide foundation for the BEP [15, 32, 33, 35, 38, 40, 42, 43].

2.4.7 Information Exchange

This section specifies the platform or Common Data Environment (CDE) that are going to specify platform that will be used for the data exchange and file sharing. Besides, this section commonly lists the file exchange formats for both model preparation and model exchange, considering the different file formats and software used during model creation and the model exchange [32, 33, 35, 37, 38, 40, 41, 43].

2.4.8 Data Requirements

This section is where owners need to specify their BIM requirements, which will be used as guidelines in the BIM project execution [33, 35, 38, 39, 43].

2.4.9 Collaboration

This section is the area where the methods of team collaboration, including communication methods and document management will be discussed. This is important to ensure better communication and proper documentation. Apart from that, this section will discuss about meeting

procedures, specifying frequency of meeting, the meeting participants and location, as well as the model delivery schedule for information exchange submission and approval [15, 32, 33, 35-43].

2.4.10 Quality Control

This section will specify the overall strategy for quality control and quality control checks conducted to ensure the integrity of the model created, along with the model tolerances for each trade such as architecture, civil & structure, and MEP [15, 32, 33, 35-37, 39-41, 43].

2.4.11 Technological Infrastructure Needs

This section is usually very straightforward, where the software to be used for model creation and hardware specifications for software installation will be specified according to the project's needs [15, 32, 33, 35-40, 42, 43].

2.4.12 Model Structure

This section is where the naming convention for the models created will be standardised, to ensure the stakeholders apply consistent naming to their model created. This section also will divide the large building, into building, floors, zone, section, or discipline. Additionally, coordinate system for the project True North and Project North are commonly specified in this section [15, 32, 33, 35-37, 39-41, 43].

2.4.13 Project Deliverables

This is the essential area, where the project deliverables are specified to ensure timely delivery of required information. Stages and model format are among items that required in this section [15, 32, 35-43].

2.4.14 Delivery Strategy

This section considers the additional measures needed for the successful use of BIM with the selected delivery method and contract type. Besides that, this section needs to specify how the BIM will be selected based on the project delivery method and contract type [15, 35, 37-39].

2.4.15 Attachments/Appendix

This is the section where list of attachments attached together with the BEP, such as references or guidelines being referred to along the BEP creation, is provided [15, 35, 36, 38-41, 43].

2.4.16 Key Performance Indicators

This section is used to quantify or measure the productive performance of the BIM project delivery. For instance, time taken to resolve Request for Inspection (RFI) and trend of RFI number over the time are used as leading indicators to measure performance [38].

2.4.17 Model Information

This is the section where the folder management is specified according to trades, facilitating stakeholders to better identify new incoming information and model created, and avoiding hassle and confusion due to numerous documents in the BIM projects [15].

From the BEP templates that has been reviewed, there are 11 proposed important key elements are suggested to be included in a BEP, to ensure better understanding among construction professionals. The proposed key elements of BEP are depicted in the Table 3 below, divided into four categories of aspects: people, process, policy, and technology.

Table 3
Proposed key elements in BEP

No.	Key Element	Aspect
1	Project Information	People
2	Key Personnel Contacts	
3	Organisational Roles	
4	Quality Control	
5	BIM Process Design	Process
6	Information Exchange	
7	Data Requirements	
8	Project Goals/BIM Uses	Policy
9	Technological Infrastructure Needs	Technology
10	Model Structure	
11	Project Deliverables	

2. Methodology

This research uses a systematic review methodology to highlight BEP conceptual framework for DB project in Malaysian construction industry. The systematic review uses the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), which PRISMA guidelines consist of a four-phase flow diagram and a 27-item checklist. The flow diagram describes the identification, screening, eligibility and inclusion criteria of the reports that fall under the scope of a review [16]. The flow of systematic review using PRISMA starts with identification, which 78,189 articles with 'Building Information Modelling' keywords has been applied from year 2019 to 2023, both from Scopus and Web of Science (WoS), two prominent peer-reviewed online databases generally accepted as the most comprehensive data sources for various purposes [17] and from Google Scholar has been listed. Next, followed by screening stage by using 'BIM Execution Plan' as keywords, 2,054 articles found and the rest from previous search has been excluded. In the eligibility stage, 'BIM Execution Plan Conceptual Framework' keywords has been applied, which 55 articles found that related to the keywords applied. For the last stage in the PRISMA, inclusion stage, 'BIM Execution Plan Conceptual Framework for DB project' keywords have been applied which only one result of search appeared, as depicted in the Figure 1.

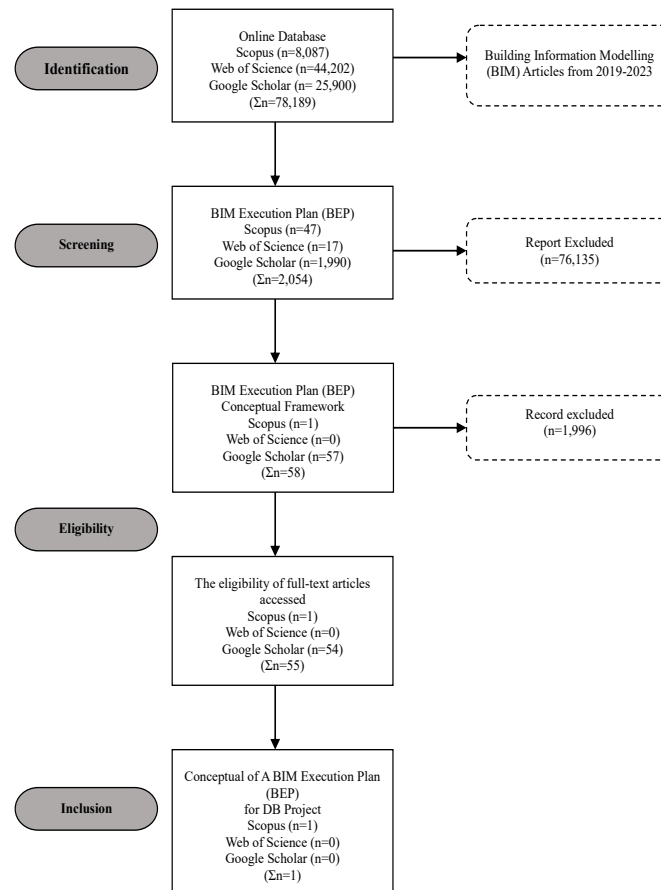


Fig. 1. Process of systematic review using PRISMA method

3. Results and Discussion

Based on the national agenda and systematic literature review, this conceptual framework was developed to establish connections between the national agendas, issues identified in research findings, and proposed key elements of BEP. Figure 2 depicts the proposed BEP conceptual framework for DB projects. The first box of the conceptual framework consists Malaysia's national agendas for BIM, encompassing the Construction 4.0 Strategic Plan 2021-2025, PWD Strategic Plan 2021-2025, Twelfth Malaysia Plan and the National Construction Policy 2030. This proves that the government is taking serious steps to leverage BIM applications in the Malaysian construction industry.

From the national agendas that related to BIM mentioned above, BIM needs to be applied extensively in Malaysian construction industry. This depicts that BEP is important to be enhance as it is a guide for every BIM projects. Consequently, the national agendas mentioned above are aligned with the current BIM implementation issues such as ambiguity of BEP specific structure, lack of understanding on BEP, enforcement of BEP and review of existing BEP framework. These issues have been detailed in the research methodology section.

From the national agendas and issues with the current BIM implementation identified, a BEP conceptual framework has been proposed which the primary aim is to outline the important key elements of BEP with the elements encompassing people, process, technology, and policy aspects. For the selection of key elements, 12 BEP from various parties have been reviewed, as presented in

Table 2. As a result, the outcome is the BEP that consists of essential BEP elements, as it will going to be use as a guideline for construction professionals to conduct DB projects that are applying BIM.

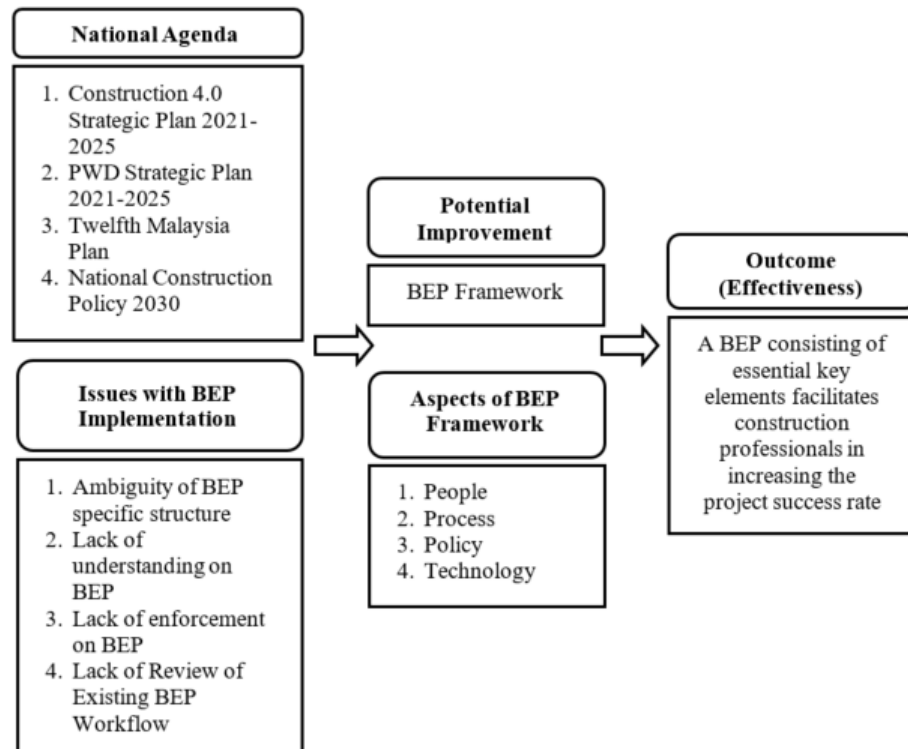


Fig. 2. Proposed BEP conceptual framework

4. Conclusions

To conclude, this research is essential for construction professionals as BIM is an integral part of construction projects that must be executed well to avoid unnecessary costs and time expenditure. The research aims to promote the utilisation and standardisation of BEP among construction professionals for BIM construction projects. The proposed key elements are going to benefit the construction professionals through the comprehensive aspects of BEP framework which only necessary and essential elements are being listed, for the construction professional's reference. Additionally, this would also facilitate DB projects, especially those related to the process design, improving clarity in the workflow and information exchange, as DB projects would require numerous documents and drawings and clarity is crucial. Other than that, quality control element is needed to monitor the quality of the construction and project deliverables, ensuring all the project stakeholders are on the same page. Moreover, the rapid growth in BIM implementation in the construction sector needs guidance from the BEP, which will serve as a guideline for executing upcoming BIM construction projects and assist in enhancing the knowledge of BEP among construction professionals, especially in DB projects. Finally, this research is going to enhance BIM awareness, as a deeper knowledge level of BIM is needed in the creation process of BEP, considering that different projects may involve distinct BIM executions.

Acknowledgement

This work was supported / funded by the Ministry of Higher Education under Fundamental Research Grants Scheme (FRGS/1/2022/SS04/UTM/02/7 (5F550)).

References

- [1] CIDB. Construction 4.0 Strategic Plan 2021-2025. CIDB (in English), 2020.
- [2] PWD. Pelan Strategik JKR 2021-2025. PWD, 2020.

- [3] Bakar, A. R. A., A. T. Haron, and R. A. Rahman. "Building Information Modelling Execution Plan (BEP): A Comparison of Global Practice." *International Journal of Engineering Technology and Sciences (IJETS)* 7, no. 2 (2020): 63-73. doi: 10.15282/ijets.7.2.2020.1005.
- [4] Yusof, S. N. S., J. Brahim, R. M. Nordin, and C. Preece. "Assessing Building Information Modelling (BIM) Maturity Level in Design and Build Public Projects: Case Studies of Public Projects in Malaysia." *International Journal of Sustainable Construction Engineering Technology (IJSCT)* 14 (2023): 241-251. doi: 10.30880/ijscet.2023.14.05.019.
- [5] Eastman, C., P. Teicholz, R. Sacks, and K. Liston. *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors*. 2nd ed. New Jersey: John Wiley & Sons, Inc (in English), 2011.
- [6] Park, J., and Y. H. Kwak. "Design-Bid-Build (DBB) vs. Design-Build (DB) in the U.S. public transportation projects: The choice and consequences." *International Journal of Project Management*, 2016: 280-295. doi: 10.1016/j.ijproman.2016.10.013.
- [7] Azhar, N., Y. Kang, and I. U. Ahmad. "Factors Influencing Integrated Project Delivery In Publicly Owned Construction Projects: An Information Modelling Perspective." *Procedia Engineering*, 2014: 213-221. doi: 10.1016/j.proeng.2014.07.019.
- [8] Saaidin, S., I. R. Endut, S. A. A. Samah, and A. R. M. Ridzuan. "The Current Practice of Design and Build Procurement Process in Malaysia." *Social and Management Journal*, 2016.
- [9] Aandahl, S. H., P. A. Wondimu, J. Lohne, and O. Lædre. "Managing the room of maneuver in design build contracts – a comparative study of Norwegian road projects." *Procedia Engineering*, 2017: 187-194. doi: 10.1016/j.proeng.2017.07.190.
- [10] CIDB. *BIM Guide Book 4*. CIDB, 2017.
- [11] ISO. *Information management using building information modelling. Part 1, Concepts and principles*. London: British Standards Institution, 2018.
- [12] ISO. *Information management using building information modelling. Part 2, Delivery phase of the assets*. London: British Standard Institution, 2018.
- [13] CIDB. *BIM Guide 5: BIM Project Guide*. Kuala Lumpur: CIDB, 2019.
- [14] Gadi, M. "Evaluating BIM Execution Planning Elements and Their Alignment to International Information Management Standards." PhD diss., The Graduate School, Pennsylvania State University, 2022.
- [15] PWD. *BIM: Garis Panduan JKR*. Kuala Lumpur: PWD, 2022.
- [16] Palacios, C. M., O. C. Márquez, and R. P. Lohan. "Review of employment and disability: bibliographic analysis." *Journal of Enterprising Communities: People and Places in the Global Economy* 16 (2022). doi: 10.1108/JEC-05-2021-0074.
- [17] Prancute, R. "Web of Science (WoS) and Scopus: The Titans of Bibliographic Information in Today's Academic World." Publications, 2021. doi: 10.3390/publications9010012.
- [18] Latiffi, A. A., S. Mohd, N. Kasim, and M. S. Fathi. "Building Information Modeling (BIM) Application in Malaysian Construction Industry." *International Journal of Construction Engineering and Management*, 2013. doi: 10.5923/s.ijcem.201309.01.
- [19] Doukari, O., M. Kassem, and D. Greenwood. "Building Information Modelling." *In Disruptive Buildings*, 2023.
- [20] CIDB. "Malaysia Building Information Modelling (BIM) Report 2021." CIDB, Kuala Lumpur, 2022.
- [21] EPU. *Twelfth Malaysia Plan 2021-2025*. Putrajaya: Prime Minister's Department, 2021.
- [22] National Construction Policy 2030, KKR, 2021.
- [23] Hadzaman, N. A. H., R. Takim, A.-H. Nawawi, and M. F. Mohammad. "An Exploratory Study: Building Information Modelling Execution Plan (BEP) Procedure in Mega Construction Projects." *Malaysian Construction Research Journal*, 18, 2016.
- [24] Ganah, A., and G. Lea. "A Global Analysis of BIM Standards across the Globe: A Critical Review." *Journal Of Project Management Practice* 1 (2021): 52-60.
- [25] Panagiotidou, N., M. Pitt, and Q. Lu. "Building information modelling execution plans: a global review." *Proceedings of the Institution of Civil Engineers - Smart Infrastructure and Construction* 176, no. 3 (2022): 126-147. doi: 10.1680/jsmic.22.00012.
- [26] Kah, K. S., and H. M. Qin. "Barriers of Applying Building Information Modelling (BIM) According to BIM ISO." *INTI Journal*, 2021.
- [27] Othman, I., Y. Y. Al-Ashmori, Y. Rahmawati, Y. H. M. Amran, and M. A. M. Al-Bared. "The level of Building Information Modelling (BIM) Implementation in Malaysia." *Ain Shams Engineering Journal* 12 (2020): 455-463. doi: 10.1016/j.asej.2020.04.007.
- [28] Jamal, K. A. A., M. F. Mohammad, N. Hashim, M. R. Mohamed, and M. A. Ramli. "Challenges of Building Information Modelling (BIM) from the Malaysian Architect's Perspective." *MATEC Web of Conferences*, 2019.

- [29] Lozinski, I. "Why most BIM Execution Plans fail?," ed: BIM Corner, 2020.
- [30] Chan, D. W. M., T. O. Olawumi, and A. M. L. Ho. "Critical Success Factors for Building Information Modelling (BIM) Implementation in Hong Kong." *Engineering, Construction and Architectural Management*, 26, 2019. doi: 10.1108/ECAM-05-2018-0204.
- [31] Jamaludin, S. Z. H. S., N. A. A. Ismail, I. H. Ibrahim, and N. Jalpun. "The Emerging Challenges of Adopting BIM in the Construction Industry: Evidence from Sabah, Malaysia." *Journal of Smart Science and Technology* 2, no. 1 (2022). doi: 10.24191/jsst.v2i1.19.
- [32] AEC (UK) BIM Technology Protocol, A. UK, 2015.
- [33] Project BIM Execution Planning Standard, NIBS, 2023.
- [34] Kjartansdóttir, I. B., S. Mordue, P. Nowak, D. Philp, and J. T. Snæbjörnsson. Building Information Modelling BIM. Iceland: Civil Engineering Faculty of Warsaw University of Technology, 2017.
- [35] BIM Project Execution Plan, PSU, 2019.
- [36] GSA Region 5 BIM Execution Plan, GSA, 2016.
- [37] Building Information Modelling (BIM) Protocol Second Edition, C. UK, 2018.
- [38] BIM Essential Guide, BCA, 2013.
- [39] NATSPEC BIM Management Plan, NATSPEC, 2016.
- [40] CIC Building Information Modelling Standards, C. H. Kong, 2019.
- [41] The New Zealand BIM Handbook BIMAC, 2019.
- [42] BIM Project Execution Plan (BEP), BC1, 2017.
- [43] BIM Execution Plan, BC2, 2022.