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Improving the quality of design documents: Towards sustainable Indonesian government project performance

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Abstract

The quality of design documents in government projects is very important due to state interests and the substantial funds required. The delays often experienced are due to the poor quality of design documents, which leads to a high frequency of change orders. Therefore, this study aimed to identify significant factors influencing the quality of design documents in order to improve government project implementation. A Schematic Literature Review (SLR) and Focus Group Discussion (FGD) were conducted through the Delphi method for two rounds to produce a matrix of factors to be considered in improving the quality of design documents in government projects. The results are expected to be useful for enhancing the quality of design documents to ensure sustainable government projects with high performance in terms of cost, quality, time, safety, and environment. Moreover, government project contractors can use this study to improve the quality of design documents and project performance.

Keywords: Government projects, Integration design, Project performance, Quality of design document, Sustainability project.

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1. Introduction

The preparation of project documents and information by owners from the start is capable of assisting in the design phase [1]. Integrated collaboration design is a lean principle often implemented to reduce waste in the design and construction phases [2-4]. Moreover, several indicators have been developed to measure design readiness and maturity in construction projects [4, 5]. It was observed that integrated design led to good performance in terms of cost, quality, time, safety, environment, and client satisfaction Nikou Goftar, et al. [6]. Al Fath, et al. [7] also stated that design should be integrated from the start and considered an important part of procurement and implementation to drive long-term and sustainable performance in government projects.

There are different classifications of government projects, from small to large, in Indonesia. This is in line with the Government Regulation of Building No. 16 of 2021 formulated to regulate building management. The regulation requires that complex buildings above four floors and with a minimum area of 5000 m^2 be supervised by Construction Management companies appointed. However, there is no provision for buildings less than four floors high and an area <5000m2. Some government projects are not in the large and complex categories that require using technologies and have high uncertainty.

The process of implementing government projects is based on the participation of very complex teams and stakeholders [8]. Successful delivery of the projects is expected to have an impact on society at large but there is the current challenge of providing a very clear definition for the objectives [8]. There are also no formal project management processes, leading to the difficulty in measuring and justifying the costs and benefits [9]. Moreover, government projects tend to have long durations, large budgets, multiple stakeholders, and many uncertainties capable of causing difficulty in planning, implementing, and managing effectively. This is mainly because governments around the world are now under increasing pressure to meet public needs on ever-tighter budgets [10].

The other problems include the lack of clarity in the needs and vision to be achieved Anthopoulos, et al. [11] design changes Koskela, et al. [12] reliable resource provision capabilitySapuay [13] and Alwi, et al. [14] the inability to define customer satisfaction [4, 15]. These problems can cause delays in execution and handover, leading to high cost overruns [16-18].

Design is very important in achieving the success of the project and 75% of project problems are caused by imperfect design [19]. Moreover, communication between contractors, designers, and owners is highly needed to ensure the design has good quality and matches the objectives of the owners [20, 21]. Each project has a unique design that is different from the others. Therefore, there is a need for a designer who can translate the objectives of the owners in order to provide value to the design [19]. This is necessary because owners often do not have the time and competence to correct the design. The trend is observed from the fact that most designs used in tenders and construction are often inappropriate with different variation orders [22]. The existence of design changes and variation orders can cause delays and cost overruns with subsequent decreases in the quality of the project when delivered.

Some 21st projects studied were organized by a government agency and at least 100% experienced change orders which caused a late handing over of 66%. The value of change orders varied significantly with some reported to have experienced cost overruns up to 168% due to variations in contract items caused by poor quality of design documents. This showed the need to integrate the preparation of design documents into every project life cycle starting from initiation and design to implementation.

The owner of the project (government) needs to have an in-depth interaction with designers when preparing design documents to ensure conformity with the intended desires [23, 24]. Therefore, this study aimed to define factors influencing the preparation of design documents for government projects to ensure long-term sustainability.

2. Theoretical Background

2.1. Project Life Cycle

A project life cycle is a series of activities conducted to achieve success in a project based on several phases. The concept was explained by previous studies to generally contain four phases, including initiation, design, implementation, construction, and closing or handover [23]. Moreover, Bigwanto, et al. [24] reported that each stage contained a lean indicator as early detection in measuring project performance.

Figure 1 shows the interpretation of the project life cycle from various previous studies with the agreement that the concept consists of activities in the pre-construction, construction, and post-construction phases.

2.2. Design Document Quality

Minato [31] showed that quality design could be associated with several factors. Some of the factors identified in the study are presented as follows:

a. Consideration of whole life cycle cost issues
b. Material efficiency, ensuring the efficient use of materials
c. Economy, ensuring design solutions are cost-effective
d. Relevancy, ensuring project requirements are met
e. Constructability, considering constructability and safety aspects
f. Innovation, incorporating innovation in the design solution
g. Expressiveness, provides symbolic expression and feeling
h. Aesthetics, the finished product is visually pleasing
i. Consideration of ecological sustainability
j. Site compatibility, effectively uses and makes due allowance for site conditions

k. Material selection, ensuring the availability, suitability, and compatibility of materials
l. Functionality, effectively serves the purpose for which it was intended

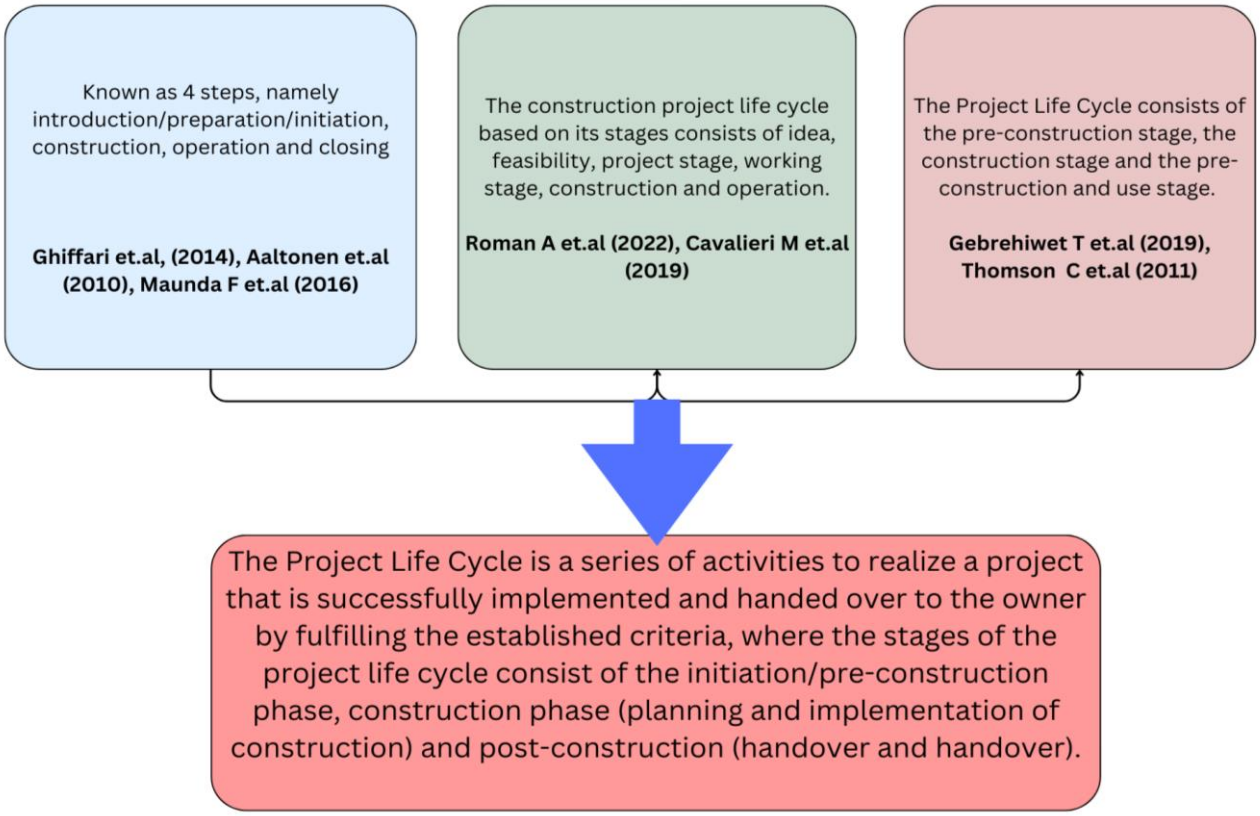

Figure 1.
Definition of Project life Cycle.
Source: Rahmi, et al. [25]; Aaltonen and Kujala [26]; Roman, et al. [27]; Cavalieri, et al. [28]; Gebrehiwet and Luo [29] and Thomson, et al. [30].

Both designers and contractors often consider the low cost of design. However, the absence of incentives for the designers who successfully conducted Value Engineering could lead to the application of traditional methods of design [30]. Designers also consider the tendency of the client to consider low cost as the most important factor affecting the quality of design documents. Therefore, there is a need for comprehensive interaction to ensure the interests of the owner and design quality are achieved. This is necessary because design document quality determines the direction of the project. Minato [31] reported that 73% of defects in projects were caused by poor contract drafts and design quality. This showed the several purposes of design documents in construction project management Emmanuel and Windapo [32] such as programming and resource allocation Mbugua and Winja [33] tender pricing, cost control, and determination of contractor profitability [34]. Previous studies have also discussed the important role of good design documents in achieving construction project goals with a focus on quality, cost, and time. For example, Malinda [35] identified poor documentation as a significant source of risk in infrastructures.

The ability to improve the quality of design documentation often enhances the value for money [36]. Quality can be defined as the degree of fulfillment of a set of inherent requirements characteristics which is categorized as poor, good, and excellent. This is often determined through completeness, relevance, clarity, timeliness, accuracy, coordination, final inspection, certainty, standardization of documentation, and conformity. Poor documentation can lead to inaccurate cost estimates and an increase in project markups. Therefore, it is necessary to improve the quality of design documentation in an effort to improve project efficiency.

2.3. Project Performance

Project performance is described as an iron triangle consisting of cost, quality, and time [37]. Safety is another concept considered important in the development of construction projects [38].

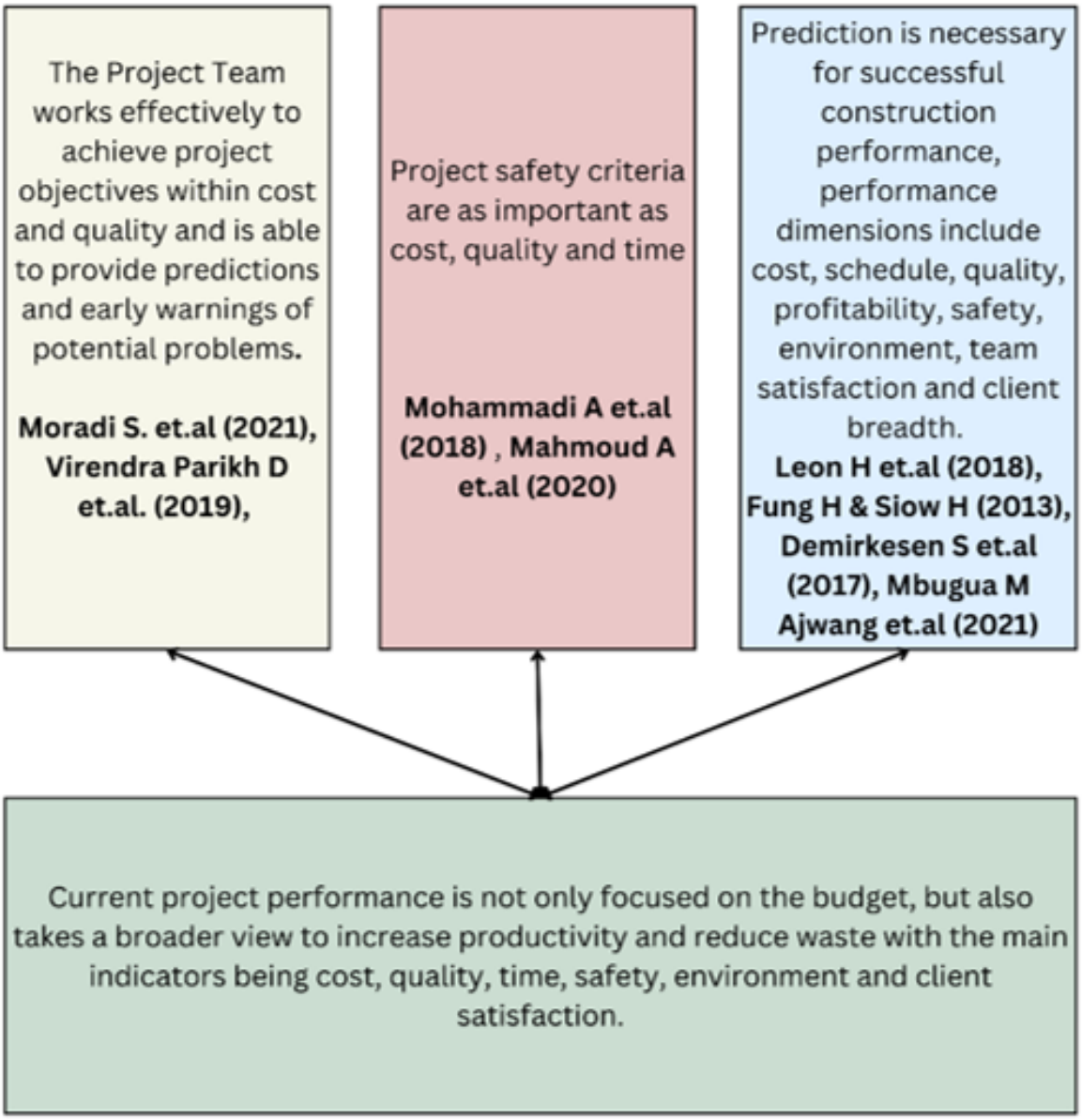

Figure 2.
Project Performance Mohammadi, et al. [38]; Moradi, et al. [39]; Virendra Parikh and Phugat [40]; Mahmoud, et al. [41]; Leon, et al. [42]; Siow and Fung [43]; Demirkesen and Ozorhon [44] and Mbugua and Winja [33].

Figure 2 shows the definition of project performance in previous literature and the concept is generally interpreted as the achievement of project objectives with a focus on cost, quality, time, safety, environment, team, and client satisfaction. Project performance is expected to be capable of predicting risks and presenting early warning to different potential problems [39].

3. Materials and Method

The qualitative method was implemented through Focus Group Discussion (FGD) using 11 experts to validate the quantitative processing. The step-by-step process of conducting this study is described and subsequently explained in Figure 3.

Step 1: Conducted Schematic Literature Review (SLR) to map factors influencing the quality of design documents in government projects.

Step 2: Identified study novelty in the form of factors and variables influencing the quality of design documents and the impact on the life cycle of each government project.

Step 3: Conducted FGDs to analyze factors influencing the quality of design documents to ensure successful delivery using the Delphi method in order to reach a consensus.

Step 4: Validated the results of the expert FGD and those considered highly valid were included in the study report.

The above methodology is to answer the research question consisting of:

a. What factors are considered important and significant in influencing the quality of design documents in government projects, where some government projects experience delays and high-cost overruns due to poor quality design documents?

b. What recommendations can be offered to improve the quality of government project design documents to significantly improve the quality of design documents so that they can solve the problems that occur?

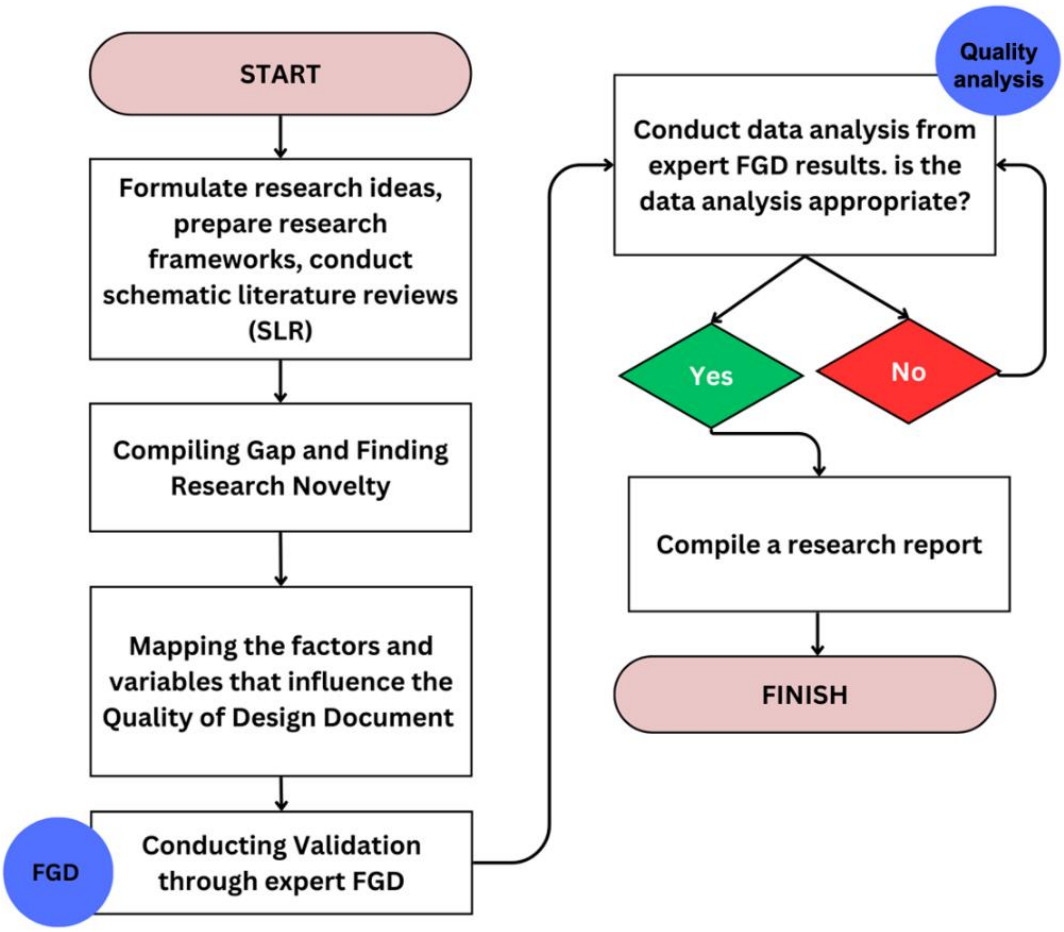

Figure 3.
Research steps.

The experts used [45-47]. Had the following qualifications:

a. The total number was 11.
b. Practitioners or contractors with a minimum of ten years of experience in projects as SPV or Manager.
c. Have an understanding of construction management in government projects.
d. Knowledgeable about the quality of design documents and occupies construction management role in government projects with good governance standards.

The composition of the experts used is presented in Table 2 and the individuals are required to provide insights based on the role of client adviser. The analysis was based on the role of ensuring the success of the project from the initiation phase to closing.

Table 1.
List of Panel Experts.

Actors	Position/Role
Government	Head of Region
	Project Manager Region
Professional Consultant	Senior Consultant Senior Consultant
Contractor	Chief Executive Officer
	Chief Operation Officer Project Manager Project Manager
Academic	Doctoral/PhD level Professor in Construction Management
	Professor in Construction Management

Table 1 shows the profile of the experts used to validate factors and variables that influence the improvement of the quality of design documents in government projects using the Delphi method in FGD. The Delphi method was conducted through the two rounds described as follows:

1. The first round was conducted by providing some questions to the panel of experts concerning the factors believed to be influencing the quality of document design in government projects in line with the list submitted through a SLR. The panel of experts was allowed to add factors considered important, when necessary, based on their experience in handling government projects. All the factors selected were later tabulated.
2. The second round assessed the level of importance of each factor selected and tabulated. The factors considered important and very important through values of more than 50 were selected and analyzed by the panel of experts.

4. Results

4.1. Schematic Literature Review (SLR) factors that influence the quality of design documents

SLR was conducted by mapping previous studies related to the factors influencing the quality of design documents in construction projects. The results obtained are presented as follows:

Table 2.
SLR factors influencing Quality of Document Design.

No	Quality of Document Design Factors	Previous Studies								
		Agbaxode, et al. [48]	Emmanuel and Windapo [32]	Akampurira and Windapo [49]	Al Fath, et al. [7]	Bigwanto, et al. [24]	Tilley [50]	Abdallah, et al. [51]	Ajayi and Oyedele [52]	Govender, et al. [53]
1	Accountability of design consultants									
2	Setting minimum quality and service standards									
3	Collaboration between architectural and engineering design									
4	Integration across design disciplines									
5	Preparation of detailed design									
6	Specialists' involvement									
7	Design documentation coordination									
8	Clients should always allow adequate time for the preparation of construction documents.									
9	Increased documentation standardization									
10	Partnering									
11	Concurrent engineering									
12	Electronic Document Management Systems (EDM)									
13	Independent Reviews									
14	Client Advisors									
15	Increased design documentation fee allowances									
16	Increased constructability education									
17	Effective Communication between the designer and owner									
18	Client Briefing									
19	Lean design concept									
20	Flexible Design									
21	Load Project Resources									
22	Early commencement									
23	Unrealistic time expectations									
24	Quality of project brief									

Table 2 shows that 24 factors are considered to be influencing the quality of document design. The factors were later mapped based on consensus through the two rounds of the Delphi method applied in FGD by distributing questionnaires to experts.

4.2. Focus Group Discussion

The FGD was conducted using 11 individuals from different fields, including the representatives of the government, consultants, contractors, and academics who had met the requirements to become experts. As previously stated, the Delphi method was applied and the experts were provided a questionnaire in the first round to assess the ability of the 24 factors produced in the SLR to influence the quality of design documents in government projects. The experts were also allowed to add other factors apart from those from the SLR.

The second round was used to classify the factors previously assessed by the experts into three categories consisting of "not important", "important" and "very important" based on certain weights. The factors found to have a weight above 50% were placed in the important and very important categories for subsequent consideration in improving the quality of design documents in government projects.

4.2.1. Delphi Round 1

The experts were provided with a questionnaire in Delphi round 1 to classify factors obtained from SLR as “influencing” and “not influencing”. The results from the process are presented as follows:

Table 3.
Results of Delphi Round 1.

No	Factors	References
1	Accountability of design consultants	Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
2	Setting minimum quality and service standards	Emmanuel and Windapo [32] and Agbaxode, et al. [48]
3	Collaboration between architectural and engineering design	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
4	Integration across design disciplines	Al Fath, et al. [7]; Bigwanto, et al. [24]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50] and Govender, et al. [53]
5	Preparation of detailed design	Al Fath, et al. [7]; Bigwanto, et al. [24]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]
6	Spécialiste involvement	Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48] and Govender, et al. [53]
7	Design documentation coordination	Al Fath, et al. [7]; Bigwanto, et al. [24]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50] and Ajayi and Oyedele [54]
8	Clients should always allow adequate time for the preparation of construction documents.	Al Fath, et al. [7]; Roman, et al. [27]; Malinda [35] and Sari, et al. [55]
9	Increased documentation standardization	Al Fath, et al. [7]; Roman, et al. [27]; Malinda [35]; Abdallah, et al. [51]
10	Partnering	Al Fath, et al. [7]; Roman, et al. [27]; Malinda [35]; Abdallah, et al. [51]; Tilley [50]; Sari, et al. [56]; Sari, et al. [20]; Sari, et al. [55]; Sari, et al. [57]; Sari, et al. [58]; Antho Thohirin [59]; Sari, et al. [60] and Al Fath, et al. [61]
11	Concurrent engineering	Al Fath, et al. [7] [7]
12	Electronic Document Management Systems (EDM)	Al Fath, et al. [7]; Roman, et al. [27] and Ajayi and Oyedele [52]
13	Independent Reviews	Al Fath, et al. [7] and Malinda [35]
14	Client Advisors	Al Fath, et al. [7]; Malinda [35]; Abdallah, et al. [51]
15	Increased design documentation fee allowances	Al Fath, et al. [7] and Sari, et al. [55]
16	Increased constructability education	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
17	Effective Communication between the designer and owner	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al.

No	Factors	References
		[51]; Govender, et al. [53] and Ajayi and Oyedele [54]
18	Client Briefing	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
19	Lean design concept	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
20	Flexible Design	Sari, et al. [56]
21	Load Project Resources	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50]; Abdallah, et al. [51]; Govender, et al. [53] and Ajayi and Oyedele [54]
22	Early commencement	Sari, et al. [55]
23	Unrealistic time expectations	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50] and Ajayi and Oyedele [54]
24	Quality of project brief	Al Fath, et al. [7]; Bigwanto, et al. [24]; Emmanuel and Windapo [32]; Agbaxode, et al. [48]; Akampurira and Windapo [49]; Tilley [50] and Ajayi and Oyedele [54]
25	Application BIM in Design	Elghaish, et al. [62]; Park, et al. [63] and Eadie, et al. [64]

Table 3 shows that a factor, BIM (Building Information Modeling) application in the design, is added by the panel of experts. This increased the number of total factors considered to be influential to 25 factors and were subsequently provided suitable weights in Delphi round 2.

4.2.2. Delphi Round 2

The experts were provided with a second questionnaire to assign weights to each factor produced in the first round. The weights were also divided into three categories: very important, important, and not important.

Table 4.
Results of Delphi Round 2.

No.	Factors	Very Important	Important	Not Important
1	Accountability of design consultants	100%		
2	Setting minimum quality and service standards		36.7%	63.3%
3	Collaboration between architectural and engineering design	54.5%	45.4%	
4	Integration across design disciplines	45.4%	54.5%	
5	Preparation of detailed design		100%	
6	Specialists' involvement	18.1%	81.81%	
7	Design documentation coordination		100%	
8	Clients should always allow adequate time for the preparation of construction documents	18.1%	54.5%	27.27%
9	Increased documentation standardization	27.27%	27.27%	45.4%
10	Partnering	45.4%	45.4%	9%
11	Concurrent engineering		45.4%	54.5%
12	Electronic Document Management Systems (EDM)	36.36%	45.4%	18.1%
13	Independent Reviews		45.4%	54.5%
14	Client Advisors	36.36%	36.36%	27.27%
15	Increased design documentation fee allowances	36.36%	36.36%	27.27%
16	Increased constructability education		90.9%	9%
17	Effective Communication between the designer and owner	100%		
18	Client Briefing	54.5%	36.36%	9%
19	Lean design concept		90.9%	9%
20	Flexible Design		45.4%	54.5%
21	Load Project Resources		90.9%	9%
22	Early commencement		9%	90.9%
23	Unrealistic time expectations		9%	90.9%
24	Quality of project brief	54.5%	36.36%	9%
25	Application BIM in Design	54.5%	45.4%	

Table 4 shows that several factors are considered unimportant to improving the quality of design documents in government projects. The factors include setting minimum quality and service standards, concurrent engineering, independent reviews, flexible design, early commencement, and unrealistic time expectations. Moreover, Figure 4 also shows the visual depiction of the factors selected and considered to have a significant influence on the quality of design documents for government projects with clear color differences.

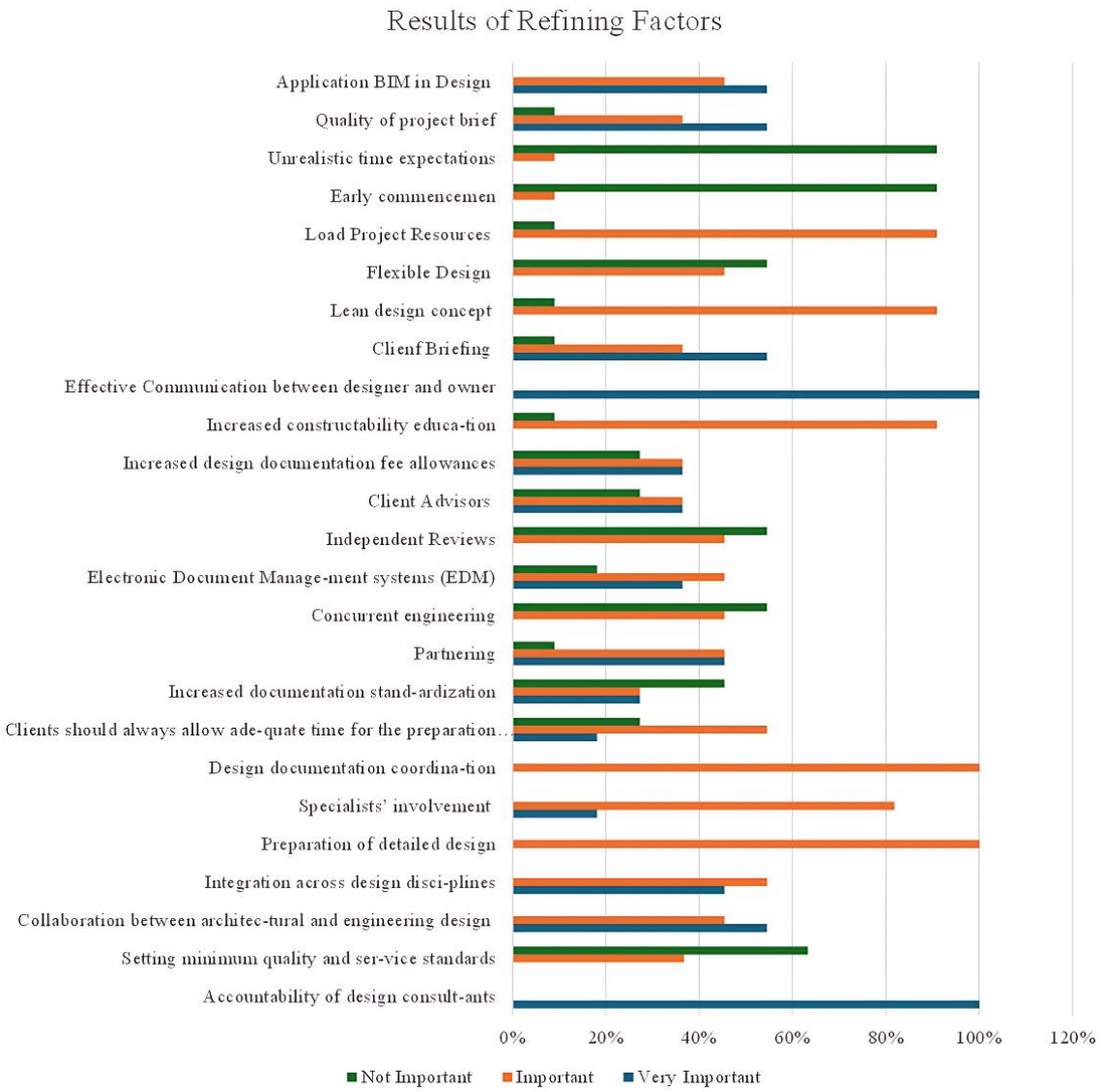

Figure 4.
Results of Refining Factors.

5. Discussion

The results from Delphi rounds 1 and 2 showed the factors considered very important in influencing the quality of design documents. These factors are further discussed in this section as follows:

5.1. Accountability of Design Consultants

The ability and competence of design consultants significantly determined the quality of government design documents both in the DBB (design bid build) or DB (design & build) project delivery systems [6, 36, 57, 65]. The validation conducted showed that 100% of the experts agreed that the factor could determine the quality of design documents. Therefore, design consultants are expected to be recruited through partnership in the form of joint operation (JO) or joint venture (JV) with a design entity. The aim is to recruit good design specialists Sari, et al. [20]; Antho Thohirin [59]; Sari, et al. [58]; Sari, et al. [60]; Thohirin, et al. [66] and Sari, et al. [67] ensure the maximum design cost is 2% of the total project cost [24, 68].

5.2. Collaboration Between Architectural and Engineering Design

The collaboration between architectural and engineering design from the beginning, before participating in the tender Al Fath, et al. [7] and Al Fath, et al. [61] can benefit the procurement process and subsequently the implementation of construction to achieve project performance in terms of cost, quality, time, safety, and environment [56, 58, 60, 61, 69, 70].

However, the contractors need to focus and explore the good track record of each entity in forming collaborations. The principles of good governance and human resources with appropriate competencies are also very necessary in the case of government projects [20].

5.3. Integration Across Design Disciplines

The quality of the design documents prepared needs to be reviewed by different disciplines with a focus on the scope as well as the deep integration of the project asset life cycle [27, 65]. This shows the need for the consideration of the feasibility study (FS), environmental impact analysis, spatial planning, and landscape in compiling design documents. The importance is due to the possible occurrence of design changes when the aspects of the project asset life cycle are not considered. The use of integration platforms such as BIM is very important in the process of implementing cross-disciplinary integration.

5.4. Partnering

Partnering is a deep philosophy often used to generate value in construction projects [20, 57]. The parties associated with the preparation of design documents include designers and other stakeholders related to the project [7, 71]. For example, the objectives of the owner need to be recognized before preparing the basic design. This is necessary considering the frequent occurrence of design changes due to the discrepancies in the design details and the objectives desired by the owner. Thomson, et al. [30] and Sari, et al. [55] divided the partnering level into four and the highest was the collaboration between stakeholders which could be implemented in the process of preparing design documents. Successful partnering can improve the quality and reduce financial risks in the future [56].

5.5. Electronic Document Management Systems (EDM)

Management of design documents in government projects is necessary due to the subsequent usage for inspections by regulators to ensure compliance with the rules set by the government [22, 72, 73]. Electronic management and a good system can assist in tracking processes to ensure appropriate compliance with the standard operating procedures of the government.

EDM is a cloud-based system that ensures online access by all users and does not require a long time to evaluate and correct when necessary. For example, several government projects developed in the new capital city use cloud applications to manage documents electronically. The trend was in line with the submission of Falessi, et al. [2] that collaboration between individuals and teams in managing design documents to ensure an effective management process significantly improved the preparation of design documents in projects.

5.6. Client Advisors

The government is often faced with the decision on the application of construction management practices based on the Government Regulation of Building No. 16 of 2021 which does not include buildings <5000 m^2. The experts suggested that the government should recruit a client advisor Windapo and Cloete [74]; Bowen, et al. [75]; Colvin Jr [76] and Pilote, et al. [77] in the cases of buildings with less than four floors and an area of less than 5000 m^2 to oversee the construction process and review existing design documents. The function of the client advisors is very important because the owner is not technically oriented to master the entire project life cycle. This process is very strategic to ensure the long-term sustainability of government projects.

The client advisors are expected to include planning experts or architects, spatial planning specialists, and master plan analysts. The main task is to provide input and suggestions to the owner to make decisions in addition to the implementation of corrections during the construction process. The client advisor is expected to support the owner from the initiation to the design, implementation, and handover phases.

5.7. Effective Communication Between the Designer and Owner

Effective communication between the designer and owner can improve the quality of design documents and avoid changes during the implementation. This is due to the fact that the vision and mission desired by the owner have been considered in the preparation of the design document [78-82]. The process is important, especially in the DBB project delivery system because the designer and contractor are separate entities [22, 83]. Moreover, DBB projects are generally unit price and the possibility of change orders can be prevented through effective communication between the designer and owner. This is achievable through different methods such as regular progress meetings, dedicated communication channels, or the use of visualization tools to facilitate shared understanding. The provision of actionable steps can significantly enhance the practical value of the results.

5.8. Client Briefing

Client briefing is basically part of the main mission required to be implemented in the process of managing a project. A clean briefing that is clearly delivered and understood by the designer can enhance the process of preparing design documents [84-87]. Moreover, the readiness of the documents before the project is implemented is necessary because some important information not included in the terms of reference needs to be stated by the designer and contractor.

5.9. Quality of Project Brief

Quality of project brief is a communication medium to clarify information not understood by designers and contractors in preparing further design documents. This is important in DB projects because the entity is required to prepare detailed designs according to the desire of the owner in order to participate in the tender process [22, 36]. Moreover, new values are needed to be shown by the DB entity as part of the follow-up project brief conducted.

5.10. Application of BIM In Design

The application of BIM in design is very effective due to the opportunities provided to achieve proportionality and material placement according to actual conditions [62, 88]. The process can improve the quality of design documents prepared in addition to being modern and integrating all aspects as well as the calculation of costs from the start for easy recognition in order to minimize change orders [89].

6. Conclusions

In conclusion, the suggestions formulated based on the results are presented as follows:

1. The quality of design documents was predominantly influenced by several factors, including accountability of design consultants, collaboration between architectural and engineering design, partnering, collaborating, role of client advisor, quality of briefing, implementation of BIM in design, and other factors in that order. Collaboration and integration were needed between owners, designers, contractors, and other parties before the project was initiated to build a common vision and mission towards ensuring completion in accordance with the delivery system. In government projects, a modern open-ended platform should be developed and accessible to individuals in the project team. The aim was to allow collaboration and communication needed to improve the quality of design documents. Moreover, every change should include the individual or agency authorized to provide approval. The principles of good governance also needed to be developed in managing effective design documents. The platform could be cloud-based capable of tracking every change and the authority to provide approval. Furthermore, the government should be able to check every change through a client advisor that provided input to the owner in order to make a very fast decision. The improvement of design documents in government projects could have a significant impact such as waste reduction, changes in job specifications, change orders, errors in work methods, repetitive work, and others capable of causing delays and unpredictable cost overruns.
2. Government projects not designed to apply construction management services were recommended by experts to form a team to serve as client advisors to assist the owner in preparing design documents and ensuring implementation to the handover phase. The client advisors were required to bridge the communication and information gap between the client or owner and the other stakeholders.
3. Long-term sustainability should be controlled in the life cycle of each government project. Moreover, collaboration was required to integrate design into the project asset life cycle to produce quality design documents implementable without experiencing change orders. This should show readiness as well as effective and efficient implementation which were required to achieve long-term sustainability in government projects.
4. The limitation identified for this study was the adoption of a government project with 66% change orders due to poor project document quality as a case study. This showed the need to focus on evaluating the performance of private projects. Moreover, data were collected on 21 government projects currently managed by the team that conducted this study. The trend led to the recommendation to focus on larger-scale projects in future studies.

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