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DESIGN BUILD COMPETITION STRATEGY TO IMPROVE PROJECT EXECUTION IN PT KILANG PERTAMINA INTERNATIONAL

Hendrikawan Mulyadi[1], Santi Novani[2]
School of Business Management, Institut Teknologi Bandung, Bandung, West Java, Indonesia
[1] hendrikawan_mulyadi@sbm-itb.ac.id [2] snovani@sbm-itb.ac.id

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ABSTRACT

PT KPI is the refining & petrochemical sub-holding company of PT Pertamina (Persero) that acts as a strategic holding company. PT KPI makes investments and runs Pertamina's businesses in refining oil and gas and other materials to make high-value fuel, lubricant, petrochemical, and pharmaceutical products. Based on PT. KPI experiences, offently projects suffer delays and cost overruns which affect the quality of the project. This study aimed to evaluate the project execution strategy Design Build Competition (DBC) as strategy to improve project execution. This study starts with the identification of the issue, followed by data collection which covers primary and secondary data, after that the series of data were analyzed using Analytical Hierarchy Process (AHP). The results showed that DBC strategy is the solution for PT. KPI to improve the execution of the project mainly in terms of duration and quality. The conclusion and recommendation of the study are that in order successfully executed DBC, PT. KPI should engage several strategic decisions which include organizational restructuring, resource allocation, and stakeholder management.

INTRODUCTION

The operation of Refining and Petrochemical of PT. Pertamina (Persero) is managed by Sub Holding PT KPI. It is also responsible for running the activities of oil refining process into petroleum and petrochemical products in its operating oil refineries as well as new and ongoing projects (Prabatha & Handoyo, 2022). PT. KPI has prepared several priority projects, namely NGRR, RDMP and other development project which are the answer to strategic challenges to maintain the sustainability of the processing business going forward to make Pertamina's refinery a world class competitive refinery with top quartile performance (Kemenko Bidang Perekonomian, 2022).

Based on PT. KPI previous experiences, change order and cost overruns may occur due to unclear/undefined scope of work, inadequate FEED documents, updated licensor documents, etc. In terms of projecy delay, the delay occur due to to additional time for EPC bidding, project overrun during EPC, etc. Within the construction industry there are several project delivery systems that owners may choose to complete their project (DBIA, Design Build Done Right, April 2015), they are Traditional design-bid-build, Design-build, Construction management at risk, Job Ordering Contracting, Multiple-prime contractors. Considering the nature of the oil & gas industry and benchmarking to other smiliar comapny, above project delivery were adjusted and below are the project delivery system which can be choosen; Design Bid Build (DBB), Dual FEED Competition (DFC), Design Build Competition (DBC), Lump Sump Turn Key (LSTK).

DBB is is a conventional or traditional technique that entails engaging an architect or engineer to create the project's plans and specifications, then advertising the project for bids and choosing a contractor to carry out the project in accordance with the plans and specifications (Ghadamsi & Braimah, 2016; Gransberg & Maraqa, 2022). Design, bidding, contract award, building, and closeout are the traditional five steps of the DBB process (Papajohn et al., 2020; Shrestha et al., 2020; Touran et al., 2009). The owner engages an architect or engineer to develop the project's designs, specifications, and construction papers during the design phase (Porwal & Hewage, 2013). The design team and owner collaborate intensively at this stage to create a thorough plan that satisfies the owner's requirements and financial constraints (Zhao et al., 2015). The design group produces a collection of plans and specifications that serve as the basis for the project. The owner evaluates the offers and chooses the contractor to complete the work during the contract award phase. With the chosen contractor, the owner signs a contract. The project's scope, budget, and timeframe are up for discussion at this phase between the owner and the contractor.

DFC combines Front End Engineering Design work (FEED) with engineering detail work, Procurement, Construction and Installation (EPCI) (de Ligny et al., 2021). This FPCI work covers all engineering design work (FEED & Detail Engineering), procurement, implementation construction work and covers installation (EPCI). In 2015, SKK Migas has issued Work Guideline 007 revisi ke 3 (PTK) 007 revision 3 as a guideline management of the Work Supply Chain in activities upstream oil and gas business, where there are several things newly regulated in this PTK book. One of the topic is regarding the type of construction work Integrated FPCI. Previously, PTK stipulates that the executor of the Contract Preliminary Design Development Services can not take part in the bidding package for EPCI work. However, in the third revision of PTK in 2015, this clause was revised in the form of an FPCI employment contract, which is regulated with several criteria points. Approach this new at first applied especially on the LNG mega project, which is demanding optimization of the design process as well regarding the selection of process technology to generate the most project cost effective and is expected to shorten project schedule and allow for applied to other EPCI projects.

DBC is one of strategy in project delivery system among other traditional design bid build, multiple prime contractors and construction management at risk (Hall et al., 2020; Hansen et al., 2021). In DBC, two contractors enter the competition on providing design solution with scope from design and construction (Kim, 2020). Stage gate is required at the end of design phase to evaluate the commercial proposal and award the contractor to proceed the construction phase (Sommer et al., 2015). Different with traditional design bid build where in every phase of the project there is bidding process to award a contractor and the owner is responsible for overseeing two distinct contracts—one for design and one for construction, in DBC bidding process only at the early stage of the project to award two contractor. In DBC the role and responsibilities of designer and construction are under one roof. One contractor drives one unified flow of work from initial concept through completion.

LSTK A Lump Sum Turnkey (LSTK) is a combination of Lump Sum (LS) contract and Turnkey (TK) contract. It is a contract with a single lump sum price for all of the works, and the contractor is responsible for completing the project within the agreed fixed cost set forth in the contract. If the contractor completes the project under the fixed total cost, then the contractor makes additional profits from the project. The Lump Sum Contract is normally used in the construction industry to reduce the contract administration costs. The Lump Sum Contract is the most recognised agreement form on simple and small projects, and generally appropriate where the project is already well defined in scopes and responsibilities of both parties, and changes are unlikely (Harrison & Lock, 2017). Therefore, the owner must have sufficiently detailed and complete drawings and specifications, and construction documents at the time of the bid to allow the bidders to properly estimate the cost of labour and materials. The Lump Sum Contract can include incentives or benefits for early completion, or can also have penalties, called liquidated damages, for a late completion.

Choosing the right project delivery system is a critical part of the strategic acquisition plan every owner must develop when embarking on a new project. By deliberately and pro-actively planning from the start of the project, owners may influence the desired results from everyone involved.

The business issue that this study is going to evaluate is to propose the alternative execution strategy to improve the quality of the project to meet the company goal. With this proposed alternative, it is expected that it can reduce significantly cost overruns and delay by implementing project execution strategy sole source responsibility/single contract namely Design Build Competition where Project Owner can mitigate the problem being the middleperson and potentially becomes engaged in disputes between the designer and the contractor(s). The research would like to contribute more knowledge to DBC implementation in different sectors, especially in PT Pertamina.

METHOD

The research design used for this study was a cross-sectional survey where the data is collected from primary source and secondary source, with mixed method. After that, the collected data was analysed using Analytical Hierarchy Process (AHP) which is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology. The AHP itself was developed by Thomas L. Saaty in the 1970s. Saaty partnered with Ernest Forman to develop Expert Choice software in 1983, and AHP has been extensively studied and refined since then. It represents an accurate approach to quantifying the weights of decision criteria. Individual experts' experiences are utilized to estimate the relative magnitudes of factors through pair-wise comparisons. Each of the respondents compares the relative importance of each pair of items using a specially designed questionnaire.

In this study, the primary data was collected through Focus Group Discussion (FGD) and interview with experts which has more than 10 years working experiences in project to have broad and deep view of the problems and solutions.

To have alternatif or option solution to the problem and factors affecting it, author generated Value-Focused Thinking (VFT) as follow:

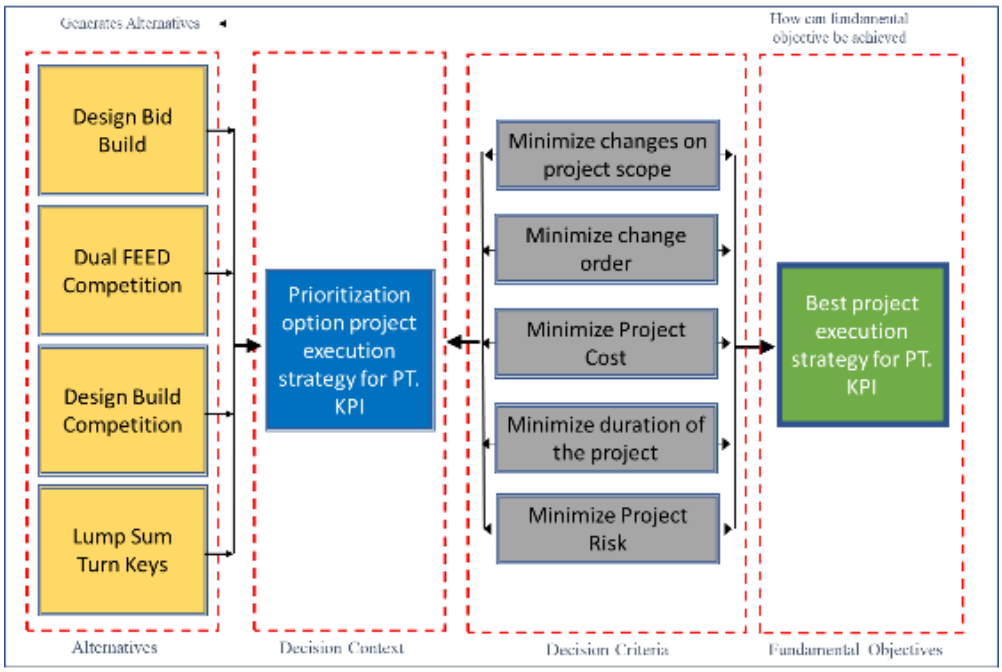


Figure 1. Value-Focused Thinking

The secondary data that author will collect and utilize are data coming from article, journal, company regulations and other online source data. When conducting secondary data collection, it is essential to properly cite and attribute the original sources of the data to ensure ethical research practices. Additionally, researchers should consider the relevance and limitations of the data in relation to their research objectives and critically evaluate its suitability for their study.

As a first step, authors defined structure decision hierarchy as a result of dicsussion with epxerts who were involved directyly to project execution at PT KPI with good amount of experience.

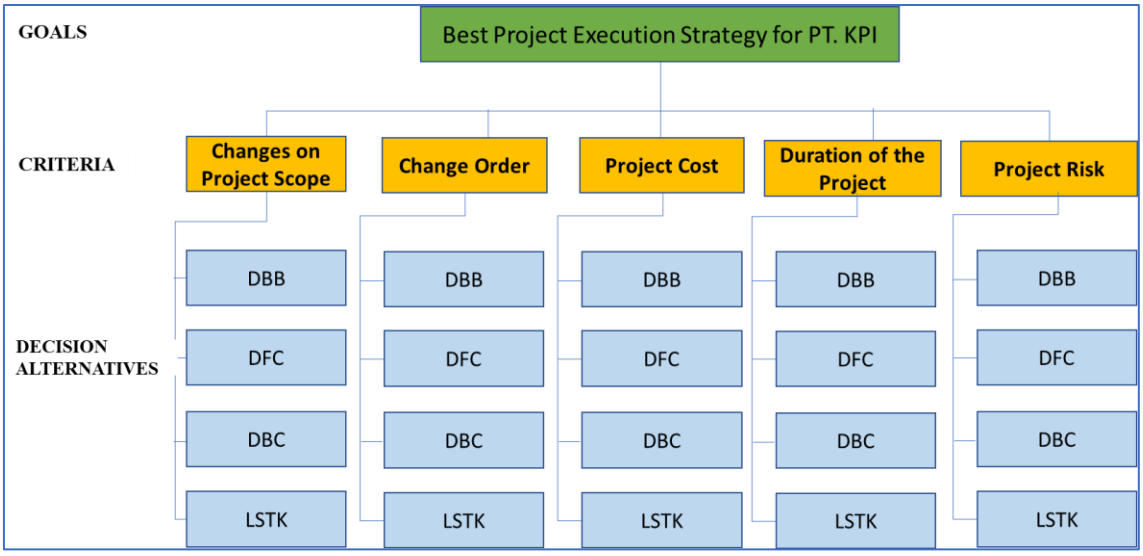


Figure 2. Structure Decision Hierarchy

Following the definition of the hierarchy, the next step is to collect data from subject respondents regarding the relative weighting of each criterion in relation to the others and each alternative in relation to the others based on attributes. Each subject-matter expert is surveyed as part of the data collection process. The author met with them and went through each alternative's résumé before demonstrating how to fill out the survey data.

To analyse the data, author used software Expert Choice Comparion Version 6.11.003.45797 to have better consistency, accuration and also minimze error on calcluation. In software Expert Choice Comparion, the first step need to be done to develop and run AHP model simulation create new model:

Input Username and Password

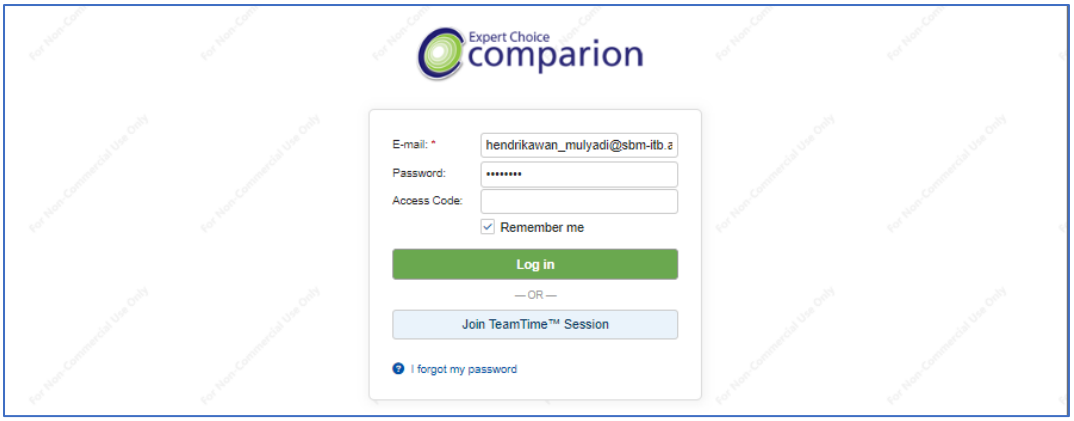


Figure 3. Comparion Login Interface

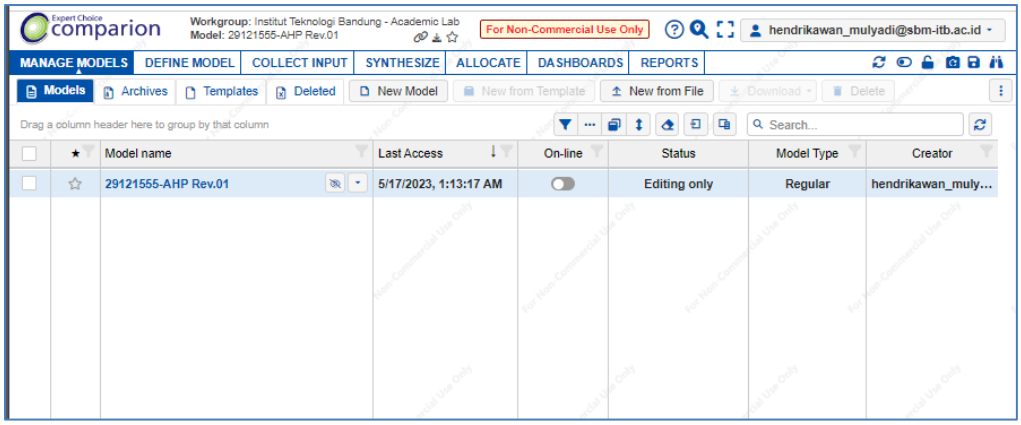


Figure 4. Comparion User Interface

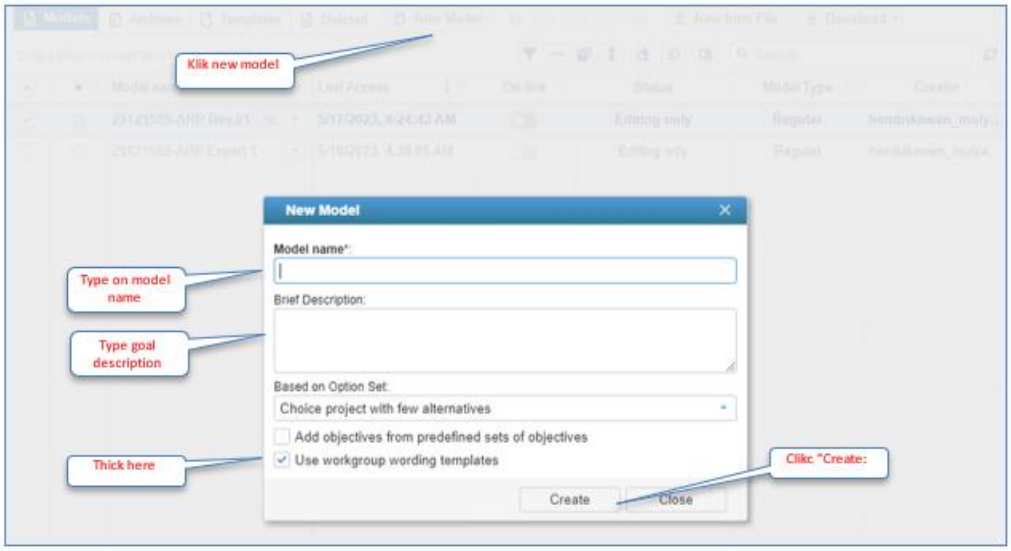


Figure 5. Comparion Create New Model Interface

After that, this interface appear an it can be seen that the new model was created.

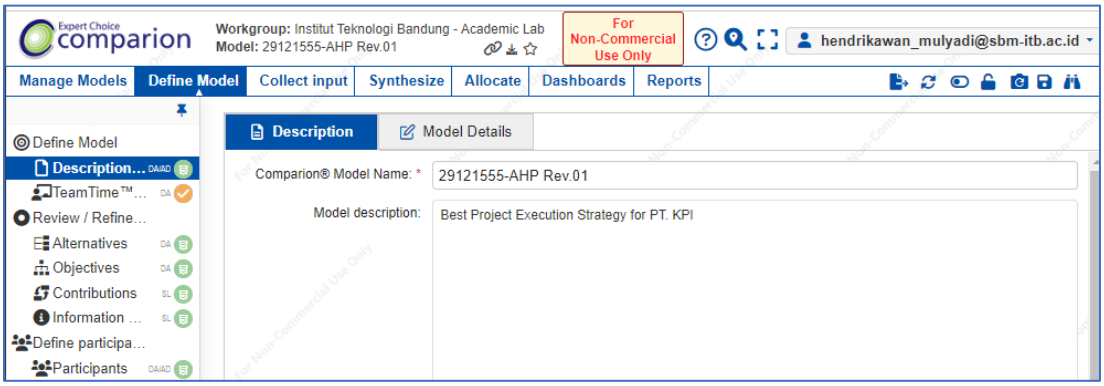


Figure 6. Comparion New Model Interface

The next step is to input decision alternatives (DBB, DFC, DBC, LSTK) based on structure decision hierarchy to the model.

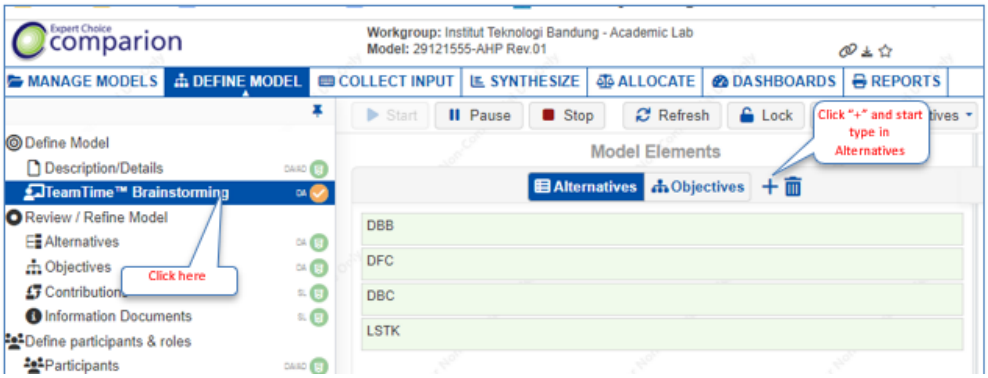


Figure 7. Comparion Decision Alternative Key In

Next is adding criteria in provided Objectives column (Minimize changes on project scope, Minimize change order, Minimize project duration, minimize project risk).

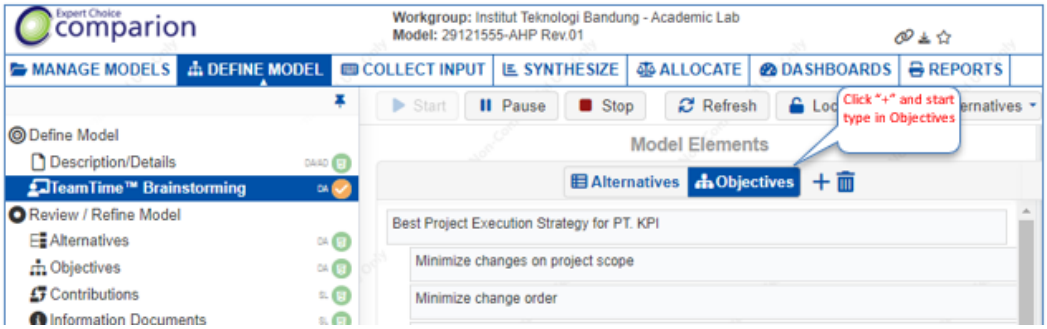


Figure 8. Comparion objective key in

Next step is register the experts so that they can start filling the questionnaire in order for the author to collect tha datas. The epxerts registration can be done in the following step.

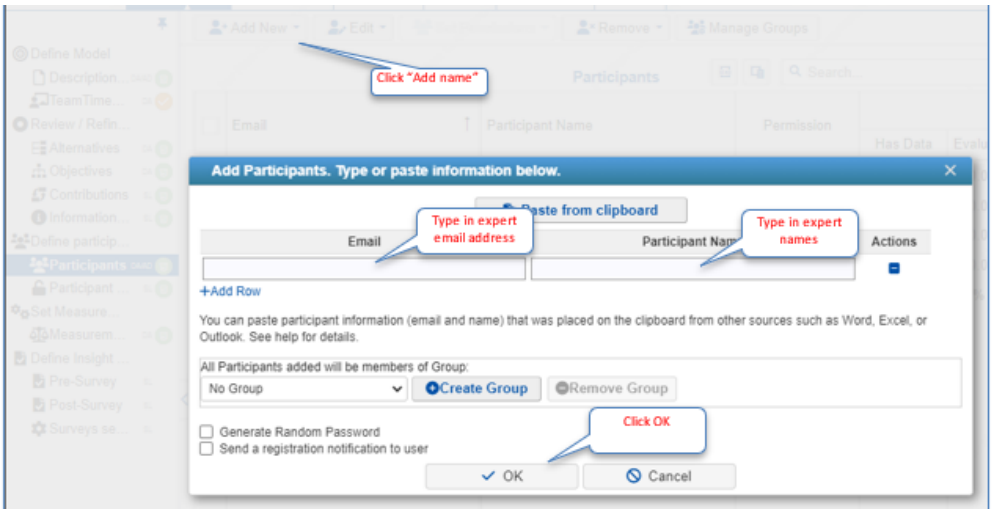


Figure 9. Comparion experts registration

Send emails to experts in order for them to be able to fill ini the questionnaire.

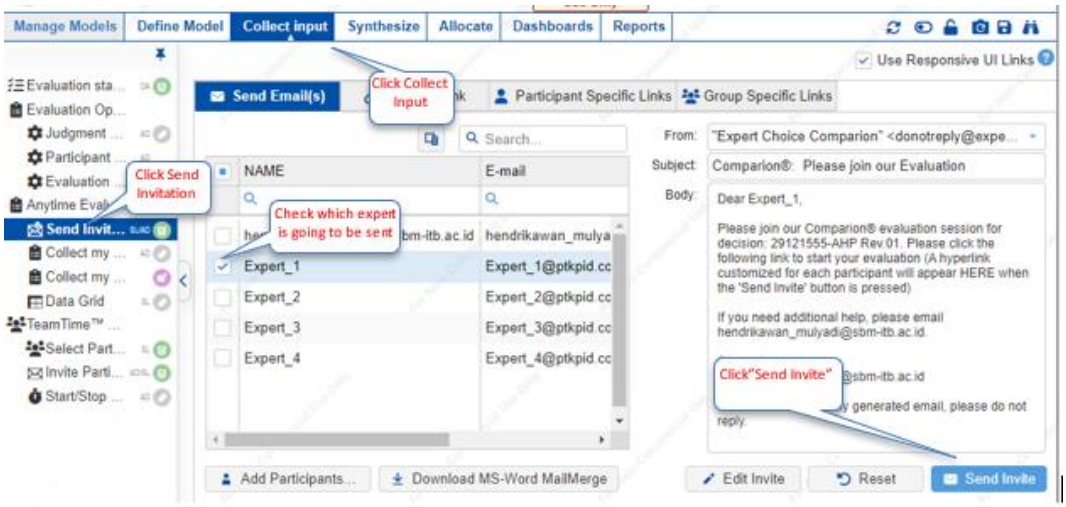


Figure 10. Comparion collective input interface

Next step is comparative judgment which is a strategy used in decision-making to rank or compare several options or criteria according to their relative value or effectiveness. Pairwise comparisons are used by decision-makers to assess the relative merits or preferences of the alternatives or criteria. Scales or numerical values that illustrate the relative differences between the options or criteria are frequently used in these comparisons. In Expert Choice Comparion, comparative judgement was done by experts on survey page provided on sent link.

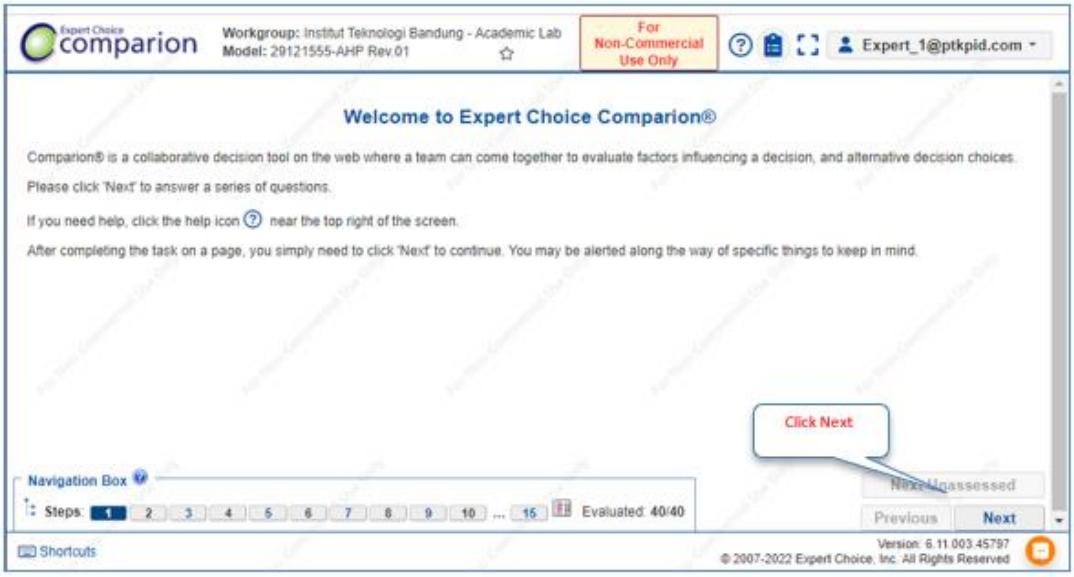


Figure 11. Comparion Questionnaire Welcome Page

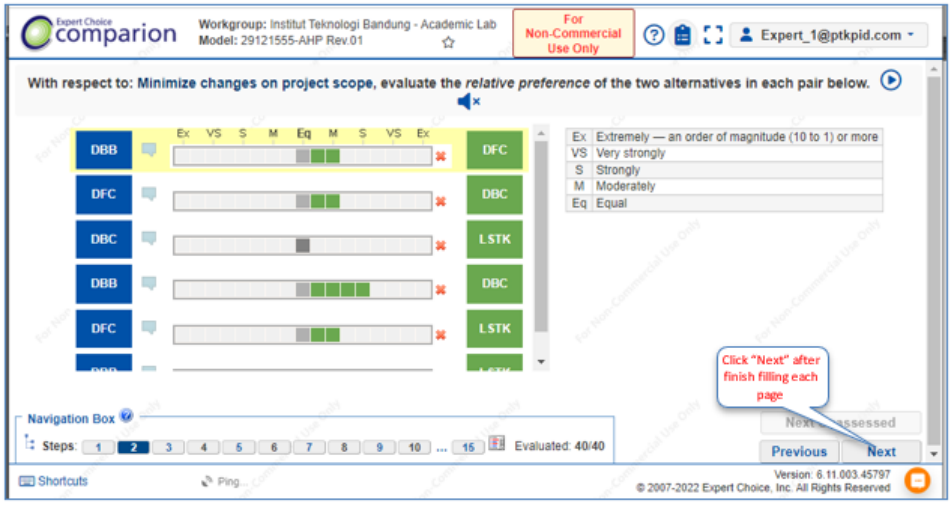


Figure 12. Comparion Questionnaire Key In Interface

Proceed filling the questionnaire until complete all.

RESULT AND DISCUSSION

This part show the results of experts respond to provided questionnaire. Software Expert Choice Comparion calculate the data collected from experts and the results can be seen in menu "Synthesize" below.

Objective Priority

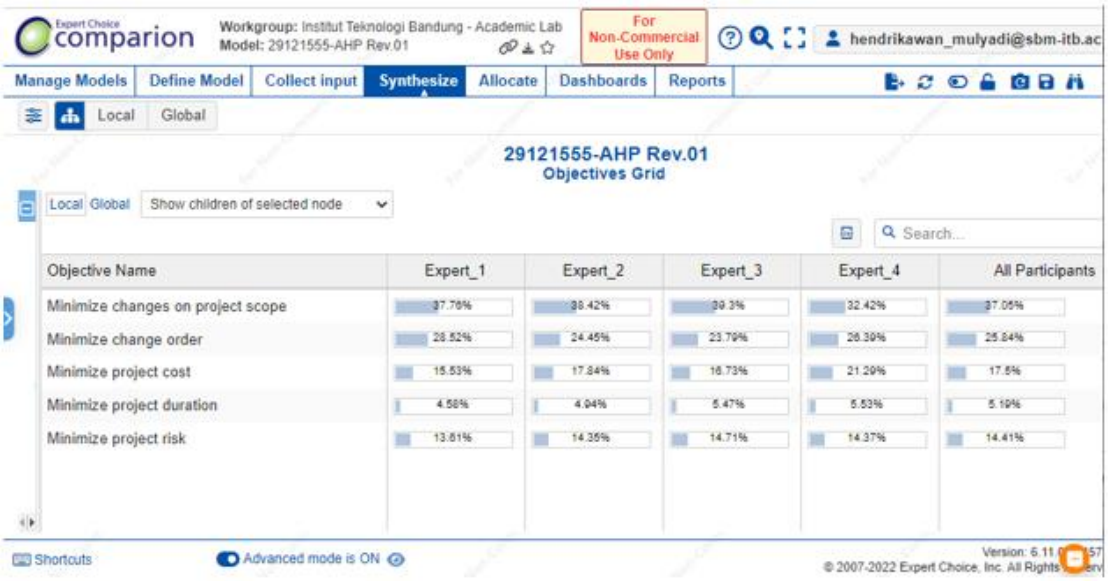


Figure 13. Overall Result of Obejctive Priority (Grid View)

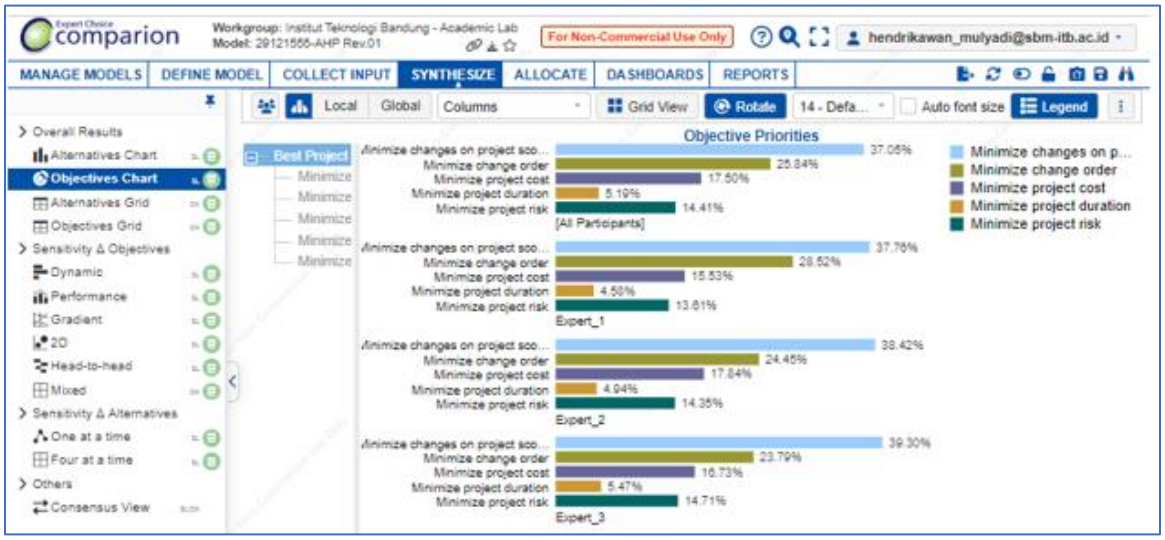
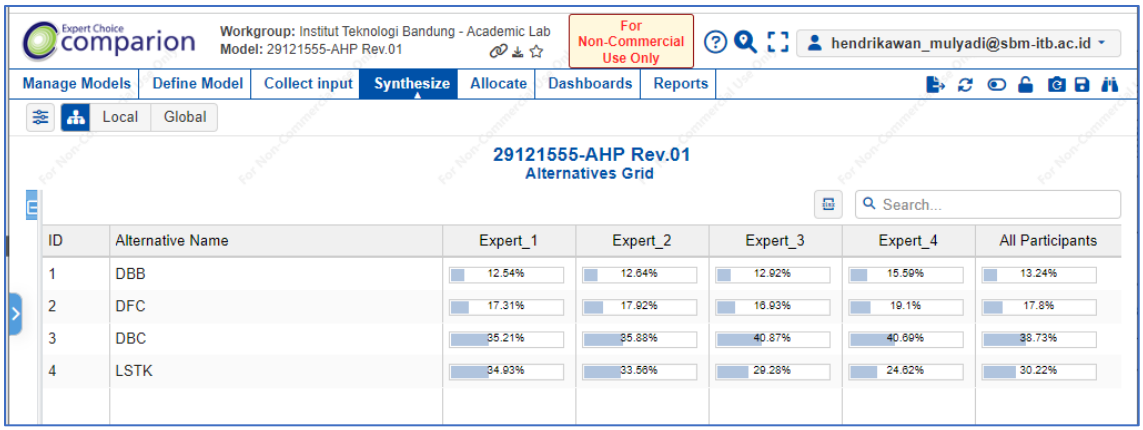


Figure 14. Overall result of obejctive priority (chart view)

From two figure above, majority of experts agree that changes on project scope play important role on selecting the best project execution strategy, followed by change order, project cost, project risk and project duration. Changes in project scope can have a significant impact on selecting the best project execution strategy because the scope defines the objectives, deliverables, and boundaries of the project. When the scope changes, it alters the project's requirements, timeline, resources, and overall goals. By considering the impact of scope changes, project owner can evaluate different execution strategies and select the one that is most suitable for the revised

project requirements, ensuring efficient utilization of resources, timely delivery, risk mitigation, stakeholder satisfaction, and effective cost management.

Decision Alternative Results



ID	Alternative Name	Expert_1	Expert_2	Expert_3	Expert_4	All Participants
1	DBB	12.54%	12.64%	12.92%	15.59%	13.24%
2	DFC	17.31%	17.92%	16.93%	19.1%	17.8%
3	DBC	35.21%	35.88%	40.87%	40.69%	38.73%
4	LSTK	34.93%	33.56%	29.28%	24.62%	30.22%

Figure 15. Overall Result of Alternative Decision (Grid View)

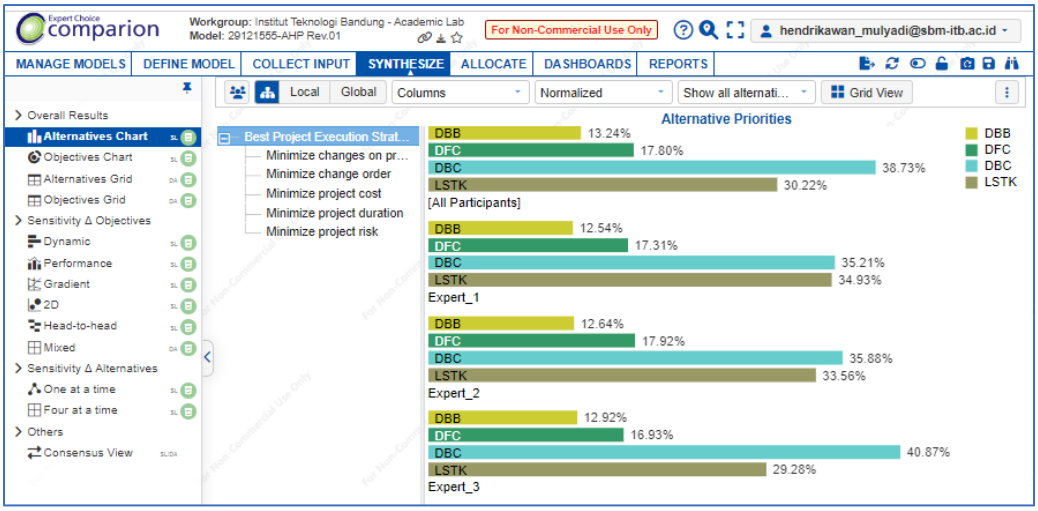


Figure 16. Individual Result of Alternative Decision (Chart View)

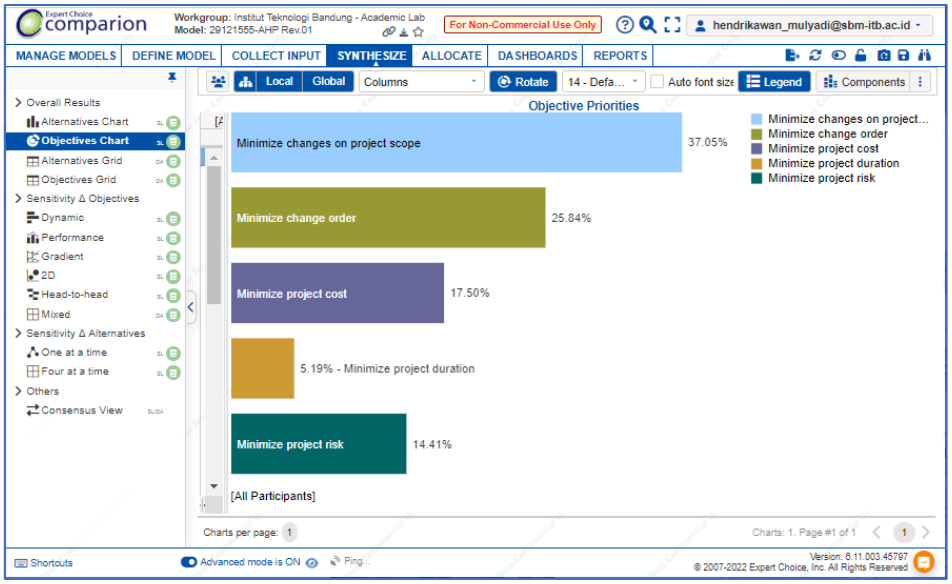


Figure 17. Overall Result of Alternative Decision (Chart View)

From three figures above as result of AHP analysis, it can be seen that the best project execution strategy for PT.KPI is strategy Design Build Competition (DBC). The final decision hierarchy is as follow.

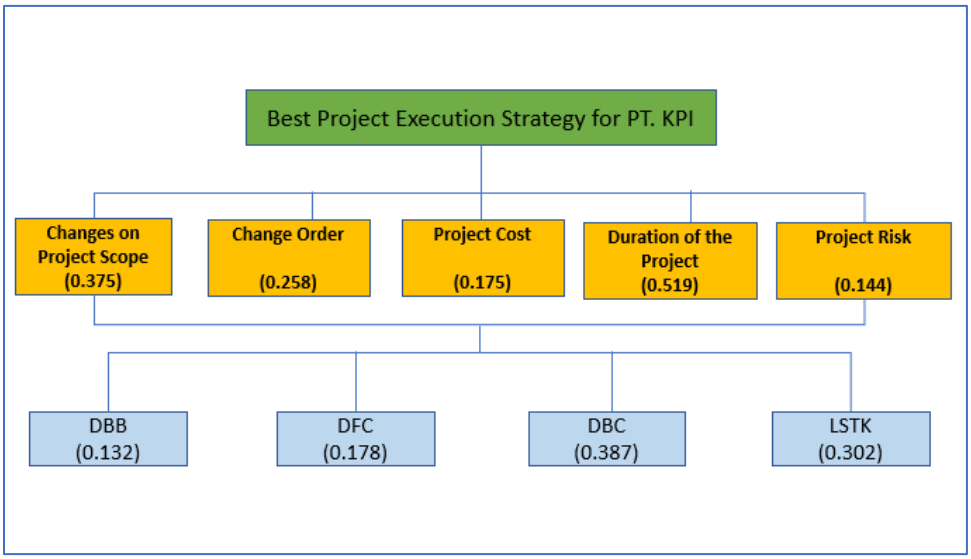


Figure 18. Decision Hierarchy for Best Project Execution Strategy for PT.KPI

CONCLUSION

Based on the data and analysis above, it can be concluded that the main and critical factor that actively contribute to problems on project execution strategy in PT. KPI are (1).Changes to the project's scope, (2).Inadequate planning can result in change order and delays, including poor scope definition, inaccurate cost estimation, and unrealistic project schedules, (3).Inefficient

resource allocation and not clearly defined & control the project cope can lead to significat increase in project cost.

In the upcoming future, PT. KPI still has numbers of projects that need to be executed in order to survive the competition and fullfiling more stringent fuel specification. Being agile and capable to deliver and execute the project is become mandatory for PT. KPI. Strategic decisions require careful analysis, consideration of various alternatives, and an understanding of the potential risks and rewards. They are critical in shaping the future direction of the organization and often require input from key stakeholders and experts within the organization.

In order to do that, in author opinion the strategic decision should be taken are (1) Organizational restructuring which the process may involve changes to reporting relationships, job roles and responsibilities, communication channels, and even the entire organizational culture. (2) Resource allocation, which can include tangible assets like equipment, facilities, and funds, as well as intangible resources such as human capital, time, and expertise. Effective resource allocation is crucial for maximizing productivity, minimizing waste, and achieving organizational goals.

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