

TIERED APPLICATION OF DECISION QUALITY AND CHOOSING BY ADVANTAGES ACROSS MANAGERIAL PROJECT LEVELS

Jon Lerche¹ & Annett Schöttle²

ABSTRACT

Decision-making in megaprojects is challenging due to uncertainty, time pressure, and the involvement of multiple stakeholders with diverse roles and interests. Decision Quality (DQ) provides a structured framework for assessing the quality of the decision-making process, but it offers limited guidance for systematically identifying and evaluating alternatives. Suhr's Choosing by Advantages (CBA) complements DQ by enabling transparent comparison of alternatives based on the importance of their advantages. This paper investigates how DQ and CBA can be linked to improving decision-making throughout the project life cycle, using a case from the renewables industry. The study proposes a DQ–CBA framework in which DQ serves as an overarching framework to ensure decision readiness, while CBA is applied when clearly defined alternatives require rigorous and bias-resistant evaluation. When no viable alternative is identified, the process loops back to DQ to revisit problem framing and option generation. The paper further distinguishes between strategic and operational decisions, identifying situations where rapid, “quick-and-dirty” decisions are appropriate (often based on a CBA-informed mindset) and where the additional effort of CBA Tabular method is justified. The findings support more effective, transparent, and implementable decisions in megaprojects.

KEYWORDS

Choosing by advantages (CBA), complexity, decision-making, decision quality, value.

INTRODUCTION

The owners and developers of construction and infrastructure projects are inherently dependent on their advisors and organisations to make sound decisions (Lee et al., 2010; Yeo & Ning, 2002). In the high-stakes environment of megaprojects, given their magnitude, a decision is not merely a choice but an irreversible allocation of resources (Howard, 1966). This dependence applies to both strategic portfolio management and the execution of individual projects. With developers overseeing multiple projects across complex life-cycles, it is essential that decisions-making remains consistent and sound, and that resources are understood as dynamic assets whose requirements evolve across different project stages. During the engineering phase, the focus is on reducing uncertainty and mitigating cost overruns during execution through the application of various methods (Do et al., 2014; Miron et al., 2015) or collaboration (Arroyo & Long, 2018; Schöttle et al., 2019). During the procurement stage relies on how the production system and supply chain is engaged through contracts alliancing (Bølviken et al., 2023; Ferstad et al., 2023; Paulsen et al., 2023) and integrated project delivery (IPD) (Simonsen et al., 2019;

¹ Founder & Advisor, Upscale Performance, jonlerche@gmail.com, orcid.org/0000-0001-7076-9630

² Independent Consultant, annett.schoettle@web.de, and Founder and Co-Director, CollabDecisions, orcid.org/0000-0001-6001-7320

Tillmann et al., 2012). This emphasises collective decision-making and risk sharing. During construction, the primary focus is around coordination, planning, and commitment among stakeholders using Last Planner System (Ballard & Tommelein, 2016; Daniel et al., 2015; Lerche et al., 2020), Takt (Lehtovaara et al., 2020; Lerche et al., 2022; Tommelein & Lerche, 2023), or location-based management (Lerche et al., 2019; Olivieri et al., 2018). At the programme and portfolio management level, the focus is on managing external, technological, logistical, and resource-related interfaces across multiple projects, whereas senior project management concentrates on delivering individual assets. While project-level management has been extensively studied, portfolio-level decision-making remains comparatively underexplored. Figure 1 integrates these perspectives by illustrating portfolios across projects on the y-axis and life-cycle phases over time on the x-axis, highlighting how complexity emerges from shared resources, external constraints, and strategic trade-offs, whether these are related to market conditions, investments, or geopolitical environments.

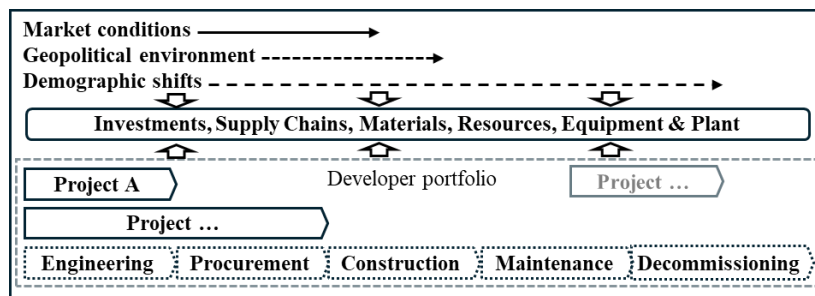


Figure 1: Simplified portfolio Gantt overview of projects moving through life cycles.

To be effective, these decisions must be made in a timely manner and achieve a high level of quality by meeting or exceeding stakeholder and customer requirements. Achieving this quality requires a collaborative effort. With decision-makers relying on supporting organisations and technical teams to prepare alternatives, identify factors, define criteria, and evaluate the relevant data to generate a sound choice (Suhr, 1999). In practice, however, project teams often struggle with fundamental questions: When must this decision be finalised? Which information is relevant? How do we verify its validity? Can we align the decision outcomes? Historically, many have relied on guessing, gut feelings, or subjective opinions. Furthermore, often decisions are driven by one party's perspective alone (Arroyo et al., 2025).

To establish a repeatable and robust process, Spetzler and Meyer (2016) advocate for implementing a Decision Quality (DQ) framework. They argue that the main reason for such a framework lies in the opportunity for continuous improvement in decision-making. Suhr (1999) echoes the necessity for rigour but proposes the Choosing By Advantages (CBA) system as a specific decision-making philosophy. CBA provides structured methods and processes to elevate a team's ability to differentiate between alternatives based on the importance of their advantages.

Despite the maturity of research in lean construction, project management, and the IGLC community, the literature reveals limited understanding of DQ in this context, a lack of direct comparison between DQ and CBA, and little exploration of their synergy in portfolio-level and large-scale infrastructure decision-making. This paper investigates the compatibility of DQ and CBA, assessing whether they should be understood as competing approaches or as a unified management architecture. It further explores the applicability of DQ and CBA across different managerial levels and project phases. The paper is structured as follows. First DQ and CBA are briefly reviewed. Next, the qualitative research design and the focus group with industry practitioners are described. The stages of an examined infrastructure project are then outlined and analysed. Finally, the findings are synthesised, and a DQ-CBA framework for portfolios

and megaprojects is proposed and discussed. Finally, the paper addresses limitations and future research.

BACKGROUND

DECISION QUALITY (DQ)

Decision Quality (DQ) is a framework designed to ensure that the decision-making process is robust, transparent, and logical, regardless of the eventual outcome. As Spetzler and Meyer (2016) argue, a "good" outcome does not necessarily indicate a "good" decision was made, as outcomes can be influenced by external luck; conversely, a high-quality decision can still result in an unfavourable result. DQ shifts the focus toward the controllable process. Table 1 shows the six elements of the DQ framework and the requirements that must be met to achieve 100% decision quality. The scale is fuzzy, not prescriptive, so individual teams have to align on it

Table 1: Describing the Elements of Decision Quality, Spetzler and Meyer (2016)

Elements	Requirements	Scale (0-100%)
1. Appropriate frame	Define the problem clearly: what decision is needed, by when, and at what level (strategic/tactical/ operational). Align on "why": the purpose, strategic drivers, and what success looks like. Set scope and boundaries: what's in/out, constraints, decision rights, and interfaces with other decisions. Identify stakeholders: decision owner, contributors, impacted parties, and approval path.	0%: no clear problem/why, stakeholders not identified. 50%: why is agreed; key stakeholders identified. 100%: problem clearly defined, strategic drivers explicit; stakeholders aligned on purpose, scope, and success.
2. Creative doable alternatives	Generate real choice beyond "yes/no." Design distinct paths (different concepts, not variants). Avoiding the trap of binary choices. This requires generating significantly different paths forward to ensure the best value is not overlooked. Check feasibility: technical, operational, regulatory, and organisational do ability. Ensure comparability: each alternative includes credible baselines (what if we did nothing) and, where relevant, "hybrid" options.	0%: no alternatives (single path/default). 50%: multiple alternatives listed, limited differentiation. 100%: 3–5 distinct, feasible, value-relevant alternatives developed. Defined with a similar level of detail and time horizon.
3. Meaningful, reliable information	Target what matters: focus on the few key uncertainties and value drivers (cost, schedule, safety, quality, performance, risk). Use forward-looking evidence: forecasts, scenarios, ranges, and probabilistic thinking, rather than just historical facts. Validate quality: source credibility, traceability, and appropriate granularity. Make assumptions explicit: document which estimates and assumptions depend on and include sensitivity to key inputs. Evaluate impact-effort: spend time where uncertainty and impact are highest.	0%: information is missing, outdated, or pure with no link to decision needs. 50%: relevant information exists, key uncertainties/ assumptions are only partly addressed. 100%: decision-critical information is credible and forward-looking, with uncertainties, ranges, and key assumptions made explicit.

Table 1: Describing the Elements of Decision Quality, Spetzler and Meyer (2016) (continued)

Elements	Requirements	Scale (0-100%)
4. Clear values and trade-offs (strategic direction)	Define decision factors: what the organisation cares about (e.g., safety, sustainability, schedule). Prioritise factors: relative importance and non-negotiables. Set thresholds and guardrails: minimum requirements, risk limits, compliance constraints. Clarify trade-offs through strategic direction or intent: what can be sacrificed, how much, and under which conditions. Translate values into usable measures: KPIs, scoring definitions, utility/weighting logic or stakeholders' acceptance.	0%: values are unclear, conflicting, or not discussed; trade-offs are avoided. 50%: values are stated, but priorities and trade-offs are not fully defined or shared. 100%: values are explicit, prioritised, and translated into clear trade-offs that stakeholders agree to use in the decision.
5. Logically correct reasoning	Use a transparent method to compare alternatives. Connect inputs to outputs: show how information and assumptions drive outcomes on each value dimension. Handle uncertainty explicitly: ranges, scenarios, sensitivities, and key risks. Avoid logical errors such as double-counting, inconsistent baselines, hidden criteria, or shifting definitions. Make the reasoning auditable: clear calculations, traceable inputs, and documented rationale. This is, according to Spetzler and Meyer (2016), the stage where many organisations struggle due to a lack of formal evaluation methods.	0%: reasoning is ad hoc, narrative-only, or biased; without a transparent link between data, alternatives, and values. 50%: Some structure is used (e.g., a criteria matrix), logic is incomplete or inconsistent. 100%: transparent, logically sound, with consistent links between alternatives, information (incl. uncertainty), and values.
6. Commitment to action	Ensure the decision is not just a choice on paper but is backed by the resources and stakeholder buy-in necessary for implementation. Assign ownership: accountable decision owner and execution lead. Secure resources: budget, people, time, and capabilities. Align stakeholders: explicit buy-in, dissent resolved or documented, and a communication plan in place. Define implementation plan: milestones, dependencies, governance, and decision gates. Set follow-through mechanisms: KPIs, risk management, and review cadence to ensure implementation happens.	0%: no clear owner, no resources, and stakeholders are not aligned; execution is unlikely. 50%: decision is accepted in principle, but ownership/resources/timing still have gaps or unresolved resistance. 100%: clear ownership, resources, governance, and stakeholder commitment are secured.

CHOOSING BY ADVANTAGES (CBA)

While DQ provides a holistic framework for the decision process, Choosing by Advantages (CBA), developed by Suhr (1999) provides a structured decision-making system comprising multiple methods that can be applied depending on the complexity of the decision. CBA is rooted in the fundamental rule that decisions must be based on the importance of advantages, rather than the weight of factors or the magnitude of attributes. In contrast to commonly used methods such as weighted rating calculations, it grounds decisions in the systematic evaluation of relevant facts by explicitly assessing the differences between alternatives (Arroyo et al., 2025). This distinction is vital for creating transparency in how a team perceives value. Furthermore, in CBA, cost is not treated as a decision factor but is considered separately from value; understood as a medium of exchange (Suhr, 1999). Alternatives are first evaluated based on the importance of their advantages, and then cost is introduced to assess whether additional value justifies the additional expenditure. This separation enhances transparency and supports explicit value-for-money discussions. CBA distinguishes itself from traditional Weighting-Rating-Calculating (WRC) methods in several key ways (Arroyo et al., 2016):

One CBA method often used in complex group decisions is the Tabular Method, which applies a step-by-step process to make the decision-making logic transparent to all stakeholders. This transparency directly supports the "Respect for People" pillar of Lean Construction, as it ensures technical experts' contributions are clearly reflected in the final choice.

METHODOLOGY

RESEARCH DESIGN: A CONSTRUCTIVIST APPROACH

The research adopted a constructivist qualitative approach, which assumes that “decision quality” is not a static metric but a socially constructed reality shaped by practitioners' interactions, experiences, and expertise within the construction industry. Accordingly, this approach acknowledges the integration of DQ and CBA evolution emerging from the lived challenges of EPC management. The research was executed in three primary phases: (1) Literature synthesis: Establishing the theoretical foundations of DQ and CBA and identifying the “evaluation gap” in current literature. (2) Case integration: Better understand the process of decision-making in different phases and levels. (3) Empirical validation: Utilising a focused qualitative data collection method to test the theoretical bridge between the two systems.

MINI FOCUS GROUP DESIGN, STRUCTURE, AND DATA ANALYSES

In this case, a mini focus group with four participants was considered appropriate, as smaller groups are particularly suitable for complex or specialised topics and allow for more in-depth discussion and greater opportunity for each participant to contribute (Krueger & Casey, 2015; Morgan, 1997). The session was meticulously structured into three distinct segments to move from the general framework to a specific synthesis: (1) Framework Familiarity: This initial phase assessed the participants' current understanding and application of Spetzler and Meyer (2016) Six DQ requirements. This established a baseline for the discussion, ensuring all participants were aligned on the preparatory elements of decision-making. (2) Constraint Identification: Participants were asked to identify where “Sound Reasoning” (DQ requirement #5) typically fails within their organisations. This targeted the “logic gap” that exists between having reliable information and making a final commitment to action. (3) Synthesis and Feasibility: Presenting CBA as a potential engine to solve the reasoning constraints identified in segment 2. Participants provided feedback on the feasibility of this integration at both the portfolio (Strategic) and project (Tactical/Operational) levels.

The session was recorded with participant consent and transcribed. The data was analysed using thematic coding, where responses were categorised into patterns (Mayring, 2010) related to framing, cost-bias, and managerial hierarchy.

PARTICIPANT PROFILE: THE "PRACADEMIC" PERSPECTIVE

The mini focus group consisted of four participants, including the two authors, a billion-dollar portfolio advisor with 20+ years of experience and a billion-dollar project advisor with +10 years of experience. All participants have extensive experience in large-scale infrastructure projects. The group provided a unique "pracademic" perspective, a hybrid approach (Posner, 2009) that balances academic theory with the “harsh realities” of EPC execution. This ensures that the proposed integration of DQ and CBA is not merely a theoretical exercise but a functional design capable of withstanding the high-pressure, resource-constrained environment of megaprojects (Pousadela et al., 2025). This ensures that the proposed integration of DQ and CBA is not merely a theoretical exercise, but a functional tool designed to survive the high-pressure, resource-constrained environment of large-scale construction (Pousadela et al., 2025).

CASE DESCRIPTION: PROJECT CONTEXT AND THE SUPPLIER NETWORK

The development and execution of offshore wind farm infrastructure represent one of the most complex challenges in modern engineering. Owners and Engineer-Procure-Construct (EPC) organisations must deliver massive infrastructure systems by managing intricate system designs and vast networks of global suppliers (Lerche et al., 2020). These projects are essentially “systems of systems,” where individual components, such as turbines, subsea cables, foundations, and substations, must be integrated into a functional energy network (Barlow et al., 2018). The supplier network provides specialised services or individual pieces of the system, typically governed by various International Federation of Consulting Engineers (FIDIC, 2019). contract forms (Green, Red, or Yellow books). These contracts define the risk profiles and responsibilities of the parties, making every interface between suppliers a potential point of conflict or value loss. Consequently, high-quality decision-making is required to align these disparate packages toward a common project goal.

The life cycle of an offshore wind project is a multi-year journey characterised by distinct phases of maturation. The process begins with Conceptual Development and the Bid phase. After the award, the engineering transitions to the procurement phase, which is critical as it prepares the project for the Final Investment Decision (FID), the point at which the most significant capital is committed. As the procurement phase concludes, fabrication begins, followed by pre-assembly, installation, and commissioning. The construction cycle concludes with the handover to operation and maintenance, where the focus shifts from capital expenditure to operational expenditure and excellence. Between these stages, a series of formal gates is implemented. These gates serve as quality checkpoints, verifying project progress, technical maturation, and value creation compared to expenses. They also account for enabling factors such as sustainability requirements, permitting status, and supplier capacity.

Each gate represents a decision point that demands different types of reasoning and information processing across three managerial levels: Strategic Decisions: Handled by the portfolio or program organisation, these decisions focus on the overall business case. Strategic decision-makers use gates to determine whether a project continues to align with corporate strategy and financial hurdles. At this level, DQ Framing is essential to ensure the "right problem" is being solved before the project moves to the next phase. Strategic decisions often require a structured evaluation process to ensure alignment and transparent communication of decision outcomes across the organisation. CBA offers a strong framework to support this process. Tactical Decisions: These focus on cross-package and inter-project concerns. Tactical decision-makers manage the interfaces between technical packages, for example, resolving design interface characters between foundation suppliers and turbine manufacturers. This is where cross-functional teams would compare logical and technical alternatives based on their specific advantages across package boundaries. Operational Decisions: Made on a day-to-day basis, these involve functional scope queries, resource, capacity, or design-nature questions.

DATA ANALYSIS: PRACADEMIC INSIGHTS

The data analysis phase synthesised the "Pracademic" perspectives of the mini focus group participants, identified critical points of failure in current infrastructure decision-making, and validated the potential for integrating DQ-CBA.

The group agreed that while organisations often excel at gathering reliable information (Requirement #3), they consistently struggle with sound reasoning. In the absence of a structured system such as CBA, decision-making frequently shifts toward advocacy rather than analysis, with decision-makers entering meetings with preferred alternatives and using time- or cost-related data to justify their choices instead of allowing evidence to guide them. Especially

in megaprojects, the sheer volume of technical, environmental, social, and financial information further contributes to cognitive overload and analysis paralysis, making comparative reasoning difficult and obscuring logical evaluation. Moreover, decisions made by senior leadership without a transparent audit trail can create a “black box” effect, weakening teams’ commitment to action during execution.

The focus group identified "Framing" as the most critical, yet most frequently neglected, element of the DQ framework. Practitioners emphasised that for a decision to be "sound," the frame must be anchored in top-down "Strategy Drivers." For example, if a portfolio strategy is "Decarbonization at any cost," the frame for a specific procurement decision must reflect that value. Participants further noted that skipping a formal framing session is a major source of waste. One practitioner observed, "We spend millions fixing the wrong problem because we didn't spend ten thousand dollars framing the right one."

A primary insight from the "Pracademic" perspective was the distorting power of cost. In traditional construction procurement, the "lowest bid" often becomes a default choice because it is the most easily quantifiable factor. Conforming to a price bias. Participants noted that when cost is mixed with other factors (as in traditional weighting-rating systems), the qualitative advantages of a superior alternative are often buried. Furthermore, instead of analysing the relevant facts, possibilities are ignored or not analysed when considering the alternatives and their advantages, as cost sets the tone of the conversation. The group validated that, by using CBA to evaluate the "Importance of Advantages", first, the team can have an honest conversation about value. This ensures that the FID is based on the best overall value-for-money, rather than just the lowest initial price.

The analysis revealed that the applicability of these tools depends heavily on the managerial level: About strategic (Portfolio): At this level, DQ is essential for initial "testing the decision" at life-cycle stages or stage gates. The focus is on framing and aligning with long-term portfolio values. When alternatives are narrowed, the integration of DQ and CBA manages the wider range of interfaces (people/resources, technology, supply chain, contracts, and project management framework), which is also relevant at the project's strategic level. Tactical level (Project): Here, integrating DQ and CBA helps manage the complexity of technical interfaces during the engineering and procurement cycles. CBA provides the transparency needed for cross-functional teams to agree. Operational level (Trade): At the execution level, DQ is often seen as too "heavy", as some decisions about one resource capacity or on specific tooling made the practitioners feel that it was “to shoot at sparrows with a cannon.” Hence, a simplified DQ model which ensures that alternatives are available and that a decision can be based on availability at pre-selected suppliers. However, CBA methods are viewed as a highly scalable “whiteboard tool” that engineers and tradespeople can use to resolve day-to-day queries in minutes. While smaller in scope, these decisions are vital for maintaining construction flow. CBA is particularly valuable here as a rapid, transparent method for resolving queries without stalling the schedule. By applying the integrated DQ-CBA model to this lifecycle, the project organisation can move from reactive “firefighting” to a proactive, “Sound Reasoning” approach that minimises rework and maximises stakeholder value at every gate.

The focus group concluded with a critical distinction: DQ is for setting the appropriate frame and testing the decision, while CBA is for evaluating alternatives. This reinforces the research hypothesis that DQ provides the framework (the container), and CBA provides the engine (the content).

DISCUSSION

THE SYNTHESIS: FRAMEWORK AND ENGINE

Integrating DQ and CBA requires examining both their structural components and philosophical approaches. Broadly, DQ provides a process architecture for high-quality decisions, while CBA provides analytical rigour for systematically evaluating alternatives.

Table 2 highlights the complementary strengths of DQ and CBA. While DQ provides a high-level, principle-driven framework, CBA offers a stepwise, method-specific process that ensures transparency and shared understanding. Notably, DQ embeds uncertainty as a core element of decision quality, whereas CBA relies on explicit comparisons of advantages to clarify trade-offs, including separating value from cost. Together, the table emphasises how DQ establishes the overarching standards for robust decision-making, while CBA operationalises these standards to rigorously evaluate alternatives in collaborative, multi-criteria environments.

Table 2: Comparison of Decision Quality (DQ) and Choosing by Advantages (CBA)

Feature / Concept	DQ Framework	CBA System
Purpose	Assess decision quality independent of outcomes	Structured method for selecting among alternatives
Scope	Broad decision design framework	Specific decision-making methods
Structure	Quality derived from six principles, not fixed steps	Well-defined stepwise process based on four principles
Level of Prescription	High-level principles	Step-by-step procedure with defined terminology and documentation with mid-level principles
Transparency	Depends on how the framework is implemented	High transparency through explicit comparison of advantages
Handling Uncertainty	Embedded as a core requirement	Relies on complementary methods to address uncertainty
Group Decision-Making	Applicable, requires facilitation design	Strongly suited for collaborative, multi-stakeholder settings
Role of Cost	Cost is an input factor, not prescribe how to quantify cost	Separates value and cost to clarify trade-offs and prevent price bias
Limitation	Abstract, not a selection method	Deterministic by design

A key differentiation between DQ and CBA lies in the understanding of the decision “trade-off.” A trade-off is the balancing of competing options, in which improving one aspect entails a reduction or compromise in another (Keeney & Raiffa, 1993). DQ addresses the trade-off conceptually, focusing on whether a decision was well-designed rather than quantifying differences between alternatives. For example, while safety may be a strategic goal, it only influences the decision if the differences between alternatives are meaningful. CBA, by contrast, evaluates which alternative is preferable based on the importance of its comparative advantages (Suhr, 1999). This approach clarifies trade-offs, including the relationship between cost and value, and fosters transparency and shared understanding among stakeholders. While DQ evaluates whether a decision was well made under uncertainty (Spetzler, Meyer, & Winter, 2016), CBA operationalises the evaluation of alternatives in a deterministic, structured manner.

In essence, DQ functions as a normative framework, defining what constitutes a good decision using six quality requirements; it is broad and adaptable across contexts, emphasising

the design of processes and the cognitive rigour of decisions. In comparison, CBA is a multi-criteria decision system that contains different methods that structure decisions around the importance of advantages and encourage shared understanding and transparency. It is method-specific and particularly useful in group decision environments with complex criteria.

THE DQ–CBA FRAMEWORK–ENGINE MODEL

Together, DQ and CBA form a powerful framework–engine combination in which DQ ensures robust decision design and CBA enables rigorous and transparent evaluation of alternatives. As illustrated in Figure 2, this synthesis bridges conceptual rigour and practical implementation by embedding the CBA process within a value-based decision architecture grounded in appropriate framing, clear objectives, and stakeholder values. This integrated approach provides a coherent foundation for complex, multi-stakeholder decision environments.

Within this framework, the central circular process represents the operationalisation of decision-making through CBA. It begins with identifying alternatives and defining factors, followed by developing must/want criteria and attribute descriptions based on reliable information. This structured progression reflects CBA's emphasis on transparency, explicit reasoning, and shared understanding. The later stages focus on evaluating advantages, determining their relative importance, and integrating cost data. By separating value and cost, the model supports systematic trade-off analysis and reduces price-driven bias. The explicit weighting of advantages makes preferences transparent and facilitates collective reasoning in multi-stakeholder settings. Reconsideration points highlight the iterative nature of high-quality decision-making, allowing earlier steps to be revisited when new information emerges. The process culminates in a commitment to action, indicating that decisions are both analytically sound and supported by stakeholder alignment.

Overall, Figure 2 demonstrates how DQ and CBA function as complementary components within a unified system. DQ ensures robust decision design, while CBA provides a rigorous and transparent evaluation mechanism, together bridging conceptual rigour and practical implementation in complex decision environments.

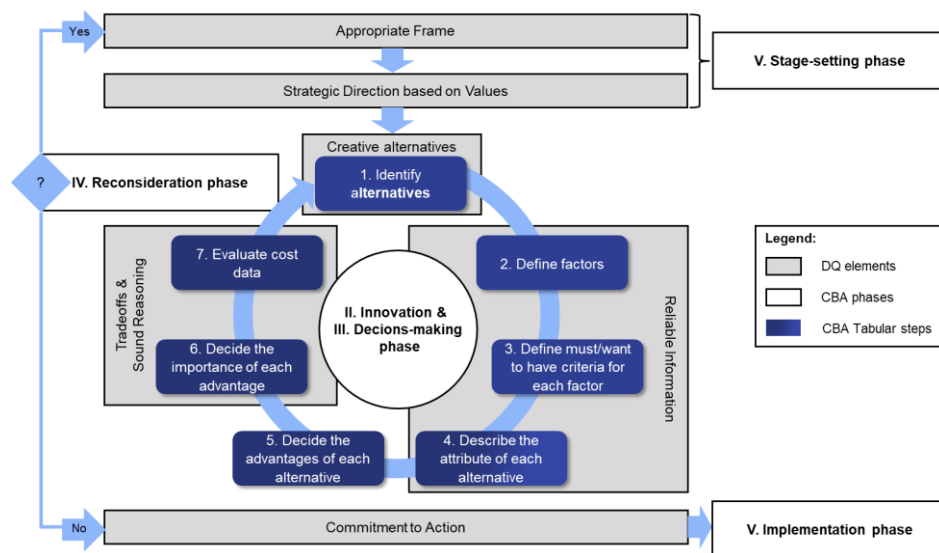


Figure 2: DQ-CBA framework, exemplified with tabular method

LINKING STAGE GATES TO COMMITMENT TO ACTION

In the megaprojects stage gates or phases, serve as formal filters that require the organisation to demonstrate project maturation. However, the focus group results suggest that these gates often prioritise "checklist compliance" over true decision quality. By integrating the DQ-CBA

model, the gate transforms from a bureaucratic hurdle into a verification of Commitment to Action (DQ Requirement #6). A "Commitment to Action" is only possible when the preceding requirements of the DQ-CBA framework in Figure 2 are met. In megaprojects, this commitment is often fragile because the technical specialists' and financial stakeholders' conditions may not be aligned (Schöttle et al., 2023). Using CBA to reach a final choice at a gate makes the reasoning transparent. When stakeholders see the importance of advantages that led to a selection, their commitment is based on understanding rather than coercion.

The "Appropriate Frame" established at the conceptual stage gates (e.g., during the Bid or Maturation phases) serves as the project's north star. If the frame is misaligned with the portfolio's strategy drivers, such as carbon-reduction targets or local content requirements, any subsequent commitment is built on a flawed foundation. The research highlights that the "Framing" element of DQ ensures that the commitment made at the board level aligns with the project's long-term value. Implications at Strategic Level (Portfolio/Steering committee): At this level, decisions occur at major Stage Gates (e.g., FID). DQ requirements provide an essential audit trail. By enforcing the "Appropriate Frame", "Strategic Direction", and "Clear Values," project steering committee-level decision-makers ensure that the project remains aligned with long-term strategy. The "Commitment to Action" here is financial and political, providing the mandate for the project to proceed.

As the project moves from strategic gates (FID) to execution, the nature of "commitment" shifts toward the delivery teams. This is where the integration with CBA becomes critical. CBA provides the "Sound Reasoning" (DQ Requirement #5) necessary to maintain commitment through the turbulent execution phase. For example, during the procurement phase, a decision to switch suppliers at a technical gate requires a rapid but rigorous evaluation. If the decision is made using a "black box" method, the fabrication team may lack the commitment to implement the change effectively. If, however, the decision is made via a CBA tabular method, the Importance of Advantages is clear to all, reinforcing the "Commitment to Action" across package boundaries. Implications at Tactical Level (Program/Project): The combined DQ-CBA framework is most robust here, managing cross-package technical interfaces. When multiple suppliers (governed by different FIDIC contracts) must agree on a design interface, the transparency of the CBA tabular method mitigates "advocacy-based" decision-making. It ensures that the "Sound Reasoning" requirement is met across organisational boundaries. Implications at Operational Level (Site/Trade): At the daily execution level, the full DQ framework may be perceived as too administrative. However, CBA serves as a "Lean tool" for rapid resolution. In the "Heat of the Moment" on a construction site, a 15-minute CBA session on a whiteboard can resolve a functional-scope query, ensuring the "Commitment to Action" is immediate and grounded in the specific advantages of the technical solution.

From a Lean perspective, "Commitment to Action" is the strategic equivalent of reliable promising in LPS (Ballard, 2016). A stage gate is essentially a high-level "promise" by the organisation to allocate resources toward a specific path. By using the DQ-CBA hybrid, organisations reduce decision waste and the rework caused by reversing decisions because they were not "sound" or lacked genuine stakeholder commitment.

CONCLUSION

This paper demonstrates that DQ and CBA are mutually reinforcing systems that address the "logic gap" in infrastructure megaprojects. Our synthesis reveals a clear hierarchy: DQ provides the Container, the process architecture that ensures the right people, information, and values are assembled at the Stage Gates. CBA provides the Content, the analytical engine that enables a transparent, value-based evaluation of alternatives. In the high-stakes EPC sector, where decisions are often irreversible, this integrated model provides a repeatable architecture for value creation. By explicitly linking CBA to the "Sound Reasoning" requirement of DQ,

organisations can mitigate "price bias" and drive towards increased value creation. This allows developers to move beyond the "lowest bid" mentality and focus on delivering the best overall outcome for the project life cycle, ultimately fostering a more substantial "Commitment to Action" from all stakeholders. This study is limited by the small size of the "mini focus group." While the "Pracademic" insights provided are rich in professional depth, they represent a specific snapshot of the offshore wind and infrastructure industry. Future research should focus on longitudinal studies that measure the impact of the DQ-CBA model on reducing decision rework over the full 5–10-year lifecycle of an infrastructure project, and digital integration to explore how BIM and digital twins can provide "Relevant and Reliable Information" directly into the DQ-CBA framework or CBA tabular method.

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