

Integration of the Analytic Hierarchy Process (AHP) and Importance-Performance Analysis (IPA) in Optimizing the Accuracy of the Customer Satisfaction Index

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ABSTRACT

Measuring the Customer Satisfaction Index (CSI) is a crucial instrument in formulating strategic planning and developing Balanced Scorecards in the construction industry. However, the current CSI evaluation still assumes that all assessment attributes carry equal importance weights, potentially leading to bias in decision-making. This study aims to enhance CSI accuracy within a private construction company in Indonesia by integrating weighting factors into each primary attribute. Using a quantitative approach, the methodology combines the Analytical Hierarchy Process (AHP) to determine the priority and strategic weight of attributes, and Importance-Performance Analysis (IPA) to map improvement priorities utilizing historical CSI data. The results indicate that implementing AHP-based weights yields a more precise CSI score, objectively reflecting the reality of customer preferences. Through the IPA matrix, the company can precisely identify strategic attributes categorized as top priorities for improvement (Concentrate Here) and those that have met or exceeded customer expectations. This integrated AHP-IPA approach provides a more robust foundation for management in steering corporate strategies effectively to maintain customer retention.

Keywords: Analytical Hierarchy Process (AHP); Balanced Scorecard; Customer Satisfaction Index (CSI); Importance-Performance Analysis (IPA); Strategic Management.

INTRODUCTION

The background of this research is situated in Indonesia's private construction industry, using the case of PT Konstruksi Membangun Negeri Tbk (KMN), a leading national contractor known for high-end projects. The company tracks both CSI and the value of contracts awarded by repeat clients. Between 2018 and 2024, CSI scores showed fluctuations, raising questions about whether satisfaction levels directly impact client decisions to renew contracts. Empirical evidence confirms that in business-to-business (B2B) construction networks, a high Customer Satisfaction Index (CSI) functions as a strategic asset that directly influences client loyalty and drives repeat business (Srivastava, 2023). Maintaining highly satisfied clients significantly reduces customer acquisition costs and secures a stable pipeline of revenue through contract renewals in volatile private markets (Dorri et al., 2025).

Despite the effort and time to collect the data from the client's upper management, CSI analytical procedure is simple. The score from all the questions is averaged to produce the final score. It jumped into conclusion that all the questions in CSI is treated equally. And the customers are considered satisfied once the score exceeds 80% threshold.

The question is raised when target CSI is not achieved, what objective should be improved? Considered they are calculated with equal weight the logic dictates the corporation to improve all of them simultaneously. In practical business, it would consume a lot of resources and far from the

definition of strategic effective action. To address this resource-allocation dilemma, empirical research heavily advocates for combining weighting mechanisms with diagnostic tools. By applying this hybrid approach, firms can avoid the trap of diluting corporate resources across non-essential improvements.

KMN's annual corporate plan perspectives consist of Financial Performance, Customer, Learning & Growth, and Process Excellence. Within Customer perspective, KMN put 5 strategic objectives in the Corporate Balance Score Card (BSC). They are Quality, Cost, Time, Environment-health-safety, Service. Along the common QCT triangle in construction business, KMN put service and EHS objectives as the tools for differentiation strategy. Furthermore, the application of the Balanced Scorecard (BSC) in large-scale contractors has been heavily documented as an effective mechanism to align operational KPIs with long-term strategic objectives, bridging the gap between field performance and corporate goals (Lu et al., 2022).

This research is highly relevant to all stakeholders. It aims to clarify the extent to which the CSI influences repeat customer behaviour. Is the total number is important or only key individual dimensions have big influence. By exploring the presence of direct effects, the study provides meaningful insights for improving the strategic application of satisfaction metrics. For the company, the findings will support more accurate performance evaluation, better resource alignment, and stronger client retention strategies. More broadly, it will contribute to the construction industry's understanding of how customer satisfaction data can be transformed into actionable business intelligence. The paper genuinely introduced Quality, Cost, Time with EHS and Service as strategic objectives in construction. At the end of the research, a replicable method combining AHP result and IPA with actual score CSI data can be a new replicable and practical tool for the construction companies against the commonly equal-weight assumption.

LITERATURE REVIEW

Expectancy Disconfirmation Theory (EDT)

The fundamental baseline for understanding customer evaluations rests upon the Expectancy Disconfirmation Theory (EDT), originally conceptualized by Oliver (1980). EDT posits that satisfaction is a psychological state determined by the comparative cognitive evaluation between pre-purchase expectations and post-purchase perceived performance. When performance exceeds expectations, a positive disconfirmation occurs, leading to high satisfaction. Conversely, when performance falls short of expectations, a negative disconfirmation results in dissatisfaction.

In project-based environments like high-end construction, client expectations are heavily defined by baseline contracts, strict technical drawings, and rigorous schedules. However, because construction projects are long-term and subject to volatile changes, managing this disconfirmation requires more than just meeting the baseline contract; it demands the continuous management of perceived performance throughout the project lifecycle (Dorri et al., 2025).

Transforming Data into Business Intelligence

Teixeira (2023) use AHP to determine the ranking with 7 group of criteria for 40 factors. They also did the survey among 5 participant organization in the common project and served the result for each type of organization's point of view. Also with AHP method, Belay et al. (2022) directly put the 6 types of stakeholders as the criteria in the hierarchy for further analytical process for infrastructures construction project in Ethiopia. AHP is popular due to its ability to check the consistency for the factor / attributes ranking. It also started with a clear formal structuring for the objectives that will be compared each other. The method itself literally put each attribute's score again each other for a one-on-one comparison within the matrix. Its versatility make it popular in various topic of research and not limited to the customer satisfaction world only. Introduced as the multi criteria decision making tools, but previous researches record its application for weight factoring and forecasting.

Some criticism discussed the 1-9 scale interpretation and some authors might argue that 5 times score is too high to express strong preference. And it will be multiplied and failed in consistency logic, when the logic dictates A is 25 times more important than C, if previous judgement stated A is five times B and B is five times C. Another drawback is the number of questionnaires that must

be answered by subject matter experts. Montaser & Montaser (2017) used SMART for 9 criteria on 4 alternatives. Theoretically in AHP method, we need 36 comparisons that need to be judge by the respondents for a matrix 9x9.

The previous literature laid various values and objectives that determined customer satisfaction and critical success factors. Though the focal company tried to narrow it down and focused on five values and 36 objectives, the classic query always comes up. The top management always want to determine which one is the most precious in their customer's eye. This is not just a plain curiosity since the practical business situation is far from ideal, where the firm can always put their resources to cover all objectives even in good times. When business goes down, the information about the customer's most important values will be more useful and the corporate can reroute their capital into a better focused action. Hence, the research will try to answer the first question:

RQ1: What is the importance factor of each objective in CSI?

IPA originated from the customer satisfaction sector since it is introduced by Martilla & James in 1970s. AHP, SMART, or other methods could calculate the weight factor and further be used as the importance score. With the actual performance result, both scores put down in a cartesian chart and divided into 4 quadrants. Cao et al. (2025) successfully deduce the initial 23 indicators across five aspects and offer the urgent five indicators in Concentrate Here Quadrant to the policymakers for creating a better heritage protection strategy. Suhada & Syairuddin (2020) successfully identify 8 from 29 attributes for customer satisfaction in construction that need urgent attention. The number of deduction allows the stakeholders to focus on concentrated area. The ability to pick the top priorities based on two-dimensional axis will support the company to focus on the selected objectives with a strong reason and confident.

To resolve the resource-allocation dilemma inherent in traditional CSI monitoring, contemporary research advocates for robust quantitative methodologies that combine multi-criteria decision-making with diagnostic mapping tools. AHP with IPA provides a statistically sound framework to determine the exact strategic weights of quality attributes and map them against actual performance (Medina-Muñoz et al., 2016). AHP eliminates the bias of equal-weight assumptions by systematically establishing the true mathematical priority of client requirements.

A practical gap showed that the most important factor is not equal to the top priority for the company. The increasing number of values and objectives need more filters to guide the construction company on setting their management strategy. There are also different strategies between concentrated improvement for highlighted underperformed objectives and continuous maintenance to keep up the good work. So, the research didn't stop at the ranking list and the title of best objective. Therefore, the second question should complete the research:

RQ2: Which objectives are the high priorities based on their performance as another consideration?

METHOD

A sequential quantitative design was employed. Stage 1 used VFT (Françozo & Belderrain, 2013) to structure the objective hierarchy. Stage 2 is about collecting data. The third stage applied AHP to derive importance weights from expert judgment. Last stage, combined AHP weights with historical performance scores in IPA to identify priority improvement targets.

Following VFT, five QCTES strategic values were confirmed as fundamental objectives. Thirty-six CSI items were extracted from the company's existing questionnaires across four client-interaction periods: Type A (Owner/Corporate, overall); Type B (Construction Management, construction period); Type C (Building Management, maintenance); and Type D (Building Management, post-contract). Each objective item followed the Verb + Object format required by VFT.

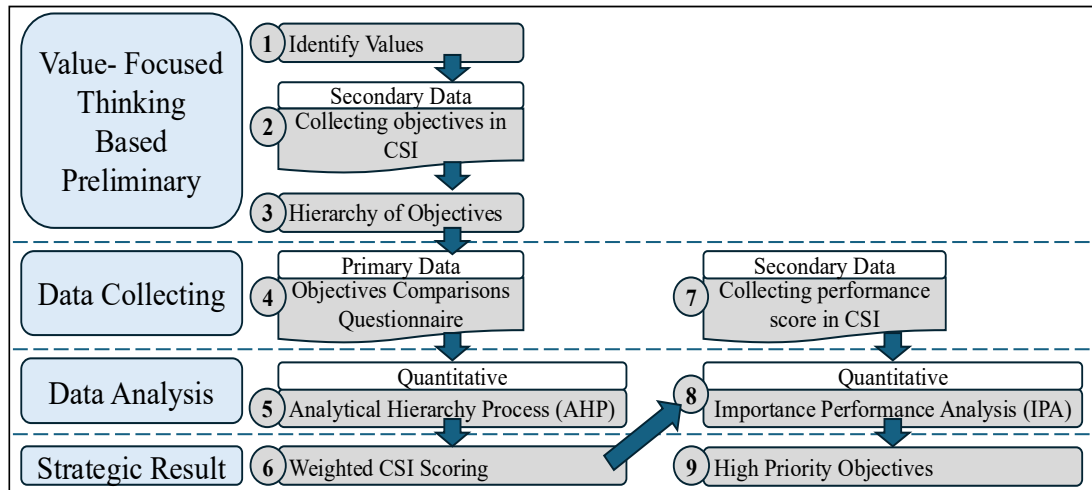


Figure 1. Research Design

Data Collecting and Validation

The secondary data served CSI results from 2018 to 2024, covering 177 respondents across four questionnaire types (Type A: 8 objectives, Type B: 15, Type C: 8, Type D: 5). The 2018 start date aligns with the standardisation of KMN's CSI framework, making pre-2018 records incompatible for aggregation. This seven-year period includes the COVID-19 disruption in 2020–2022, ensuring the dataset captures customer priority judgements across both normal and disrupted operating conditions, producing a more representative performance baseline.

A 5-point Likert scale was retained to maintain longitudinal consistency with KMN's CSI framework in use since 2018, as migrating to an alternative scale would disrupt comparability with six years of historical data. While central tendency bias is an acknowledged limitation of odd-numbered scales (Kusmaryono et al., 2022), this choice is consistent with precedent in construction CSI research (Ansari et al., 2025; Astana et al., 2023) that still use 5-point scale. To mitigate the neutral midpoint risk, scores are converted to a 20–100 scale with a target threshold of 80, effectively repositioning the neutral point (score 3 is 60) below the operational benchmark.

The primary data is the questionnaire for AHP. Three customer groups were targeted: Type A (16 comparisons), Type B (30 comparisons), and combined Type C-D (21 comparisons) using Saaty 1–9 intensity scale. With minimum four respondents in each division, the initial overall target is only 12 SMEs is achieved with the number of actual respondents doubled at the end of data collection.

Table 1. Intensity of Importance Scale

Intensity	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong importance	An activity is favored very strongly over another; its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

Source: Saaty & Vargas (2012)

One of AHP advantages is that there is no strict requirement on the minimum sample size for AHP analysis. The literature on AHP applications in project / construction management used sample sizes ranging from four to nine (Darko et al., 2019). For B2B business model, the annual number of customers is sometimes limited and would not suffice to perform the statistical analysis.

However, it is more important to choose the correct personnel that represents the voice of the company. The selection of respondents will follow the Subject Matter Expert criteria. In AHP respondent targeting, we can apply the quality over quantity principle.

SME eligibility requires at least three years' relevant experience for managers and five years for directors, with direct engagement with the company's projects within three years prior to the survey. The research tried to cover all the top positions but the structural organization mostly dominated by managers. The survey type C-D didn't have director as respondent since the building management director usually don't involve too much in technical issues. The result shows that chosen SMEs mostly have 10 years or more experienced. It is safe to say that everyone understands the customer point of view in client-contractor relationship. Another note on type C-D where the building management's staff is dominated by 3-4 years experienced crew.

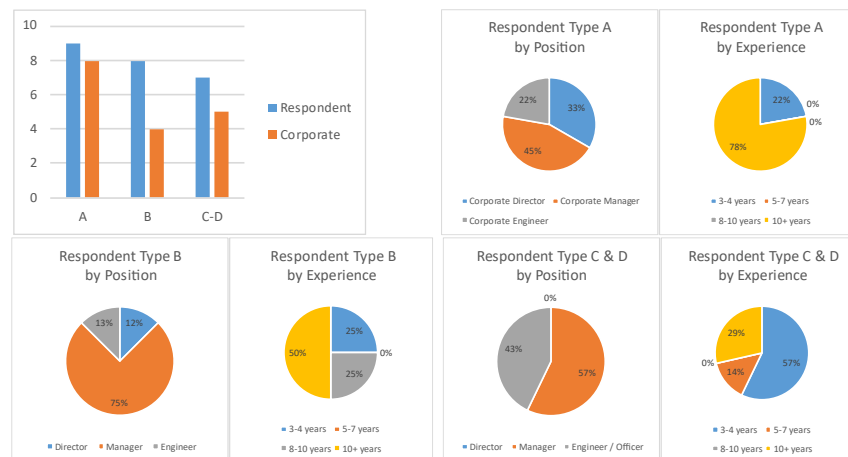


Figure 2. Respondents' Profiles

AHP Procedure

Geometric mean aggregation was applied across respondents within each client type (Ramadhani & Handayati, 2020) instead of arithmetic means due to the reciprocal properties of AHP matrix. Park et al. (2025) also generated group-level comparison matrices from individual responses aggregate using the geometric mean method.

$$GM = (x_1 \times x_2 \times x_3 \times \dots \times x_n)^{1/n}$$

Goodwin & Wright (2004) elaborate the main stages of the method for AHP in their book. Each matrix was column-normalised and local weights obtained by row-averaging the normalised matrix. Global weights were derived by multiplying local weights by parent-node weights. The consistency level must be checked for the result validity on each matrix. For example, we calculate the local weight for Matrix CSI (4x4) that consist of 4 types of client/period. Later, the global weight factor simply achieved by multiplying the local weight factor to its parent's weight

Table 2. Example of Pairwise Comparison and Normalize Local Weight on Matrix CSI

MATRIX CSI									
Judgement	Type A	Type B	Type C	Type D	Normalize	Type A	Type B	Type C	Type D
Type A	1	0.48	0.61	0.86	Type A	0.170	0.116	0.198	0.214
Type B	2.08	1	0.61	0.99	Type B	0.353	0.242	0.198	0.246
Type C	1.64	1.64	1	1.17	Type C	0.279	0.398	0.326	0.292
Type D	1.16	1.01	0.85	1	Type D	0.197	0.244	0.278	0.249
Sum	5.89	4.13	3.07	4.02					
									Local Weight
									0.174
									0.260
									0.324
									0.242
									1.000

One of AHP advantage is the built-in Consistency Ratio (CR), which mathematically identifies judgments that deviate from logical transitivity. All matrices with Consistency Ratio (CR) < 0.10 were accepted as consistent. CR could be acquired through these following steps. (1) Get the weighted sum vector from matrix multiplication between Judgement matrix and Local Weight vector. (2) Calculate each λ by dividing each weighted sum value by its corresponding local weight. (3) Get the λ_{max} value by averaging all λ . (4) Calculate CI value and obtain Random Index (RI)

value from the table according to the n data on the matrix. RI is the given constant that represents the average consistency of a randomly generated reciprocal matrix of the same size. (5) Divide CI with RI for Consistency Ratio. An example on Matrix CSI consistency check are previewed in table 4 with result CR= 0.024 and fit below 0.1 tolerance limit.

$$[Weighted\ Sum] = [Judgement] \times [Local\ Weight] \quad (1) \quad CI = \frac{\lambda_{max} - n}{n - 1} \quad (4)$$

$$\lambda = \frac{Weighted\ Sum}{Local\ Weight} \quad (2) \quad CR = \frac{CI}{RI} \quad (5)$$

$$\lambda_{max} = \frac{\sum \lambda_i}{n} \quad (3)$$

Table 3. RI values

n	3	4	5	6	7
RI	0.58	0.9	1.12	1.24	1.32

n : the numbers of item being compared

Table 4. Example of CR Check on Matrix CSI

MATRIX CSI									
Judgement	Type A	Type B	Type C	Type D	X	Local Weight	Weighted Sum	λ	λ_{max} 4.065
Type A	1	0.48	0.61	0.86		0.174	0.704	4.04	n 4
Type B	2.08	1	0.61	0.99		0.260	1.060	4.08	CI 0.022
Type C	1.64	1.64	1	1.17		0.324	1.322	4.08	RI 0.900
Type D	1.16	1.01	0.85	1		0.242	0.983	4.06	CR 0.024

Importance Performance Analysis

The importance axis used the global AHP weight per objective. The performance axis used historical mean CSI scores for each objectives/question between 2018–2024. Quadrant boundaries were set at the cross-means value of both axes across all 36 objectives. Following Cao et al. (2025) and Lu et al. (2020) who adopted the traditional IPA that typically use fixed mean-based crosshair settings. The Y-axis of importance and X-axis of performance are drawn according to the mean scores of each item. The central tendency bias in CSI 5-point score system is further mitigated by IPA crosshair system, which evaluates relative positioning across objectives rather than absolute score values, reducing the impact of systematic midpoint bias on the final prioritisation outcome.

Using IPA, Wardhana (2024) set clear objectives to ensure the analysis remains aligned with the organizational goals and identifies which aspects of service or product performance need to be measured. Bose et al. (2023) researched the sustainable city dimensions on resident's satisfaction for each quadrant. Keep Up the Good Work quadrant significantly and positively affected satisfaction. The Concentrate Here quadrant presented a negative yet insignificant relationship with satisfaction while both the Low Priority and Potential Overkill quadrants demonstrated no notable influence.

All quantitative analyses in this research, including the AHP pairwise comparison matrices, Consistency Ratio calculations, weighted CSI scoring, and IPA quadrant plotting, were conducted using Microsoft Excel (Microsoft 365 version 2024). Excel was selected for its accessibility and transparency in formula auditing, allowing each step of the AHP computation (matrix normalization, eigenvector approximation, λ_{max} , CI, and CR) to be manually traced and verified by the reader. No proprietary MCDM software (Expert Choice or SuperDecisions) was used, as the mathematical procedures involved are fully executable through standard spreadsheet functions without loss of methodological rigor, consistent with prior AHP applications in construction research that similarly implemented the method in spreadsheet environments.

RESULT

VFT Based Preliminary

Based on the practice in KMN, there are 5 values that become the strategic objectives in their Balance Score Card within Customer section. Quality that ensures all project outputs consistently meet corporate standards and client specification to minimize rework. Cost control to keep the

corporate competitiveness in financial term by managing budgets to meet the customer expense expectation in obtain the excellence KMN service. Time delivery for project milestones and final completion within agreed schedules to support continuity and client trust. EHS to protect people, assets, and the environment through proactive safety management and compliance to reduce risk and maintain operational continuity. Service Excellence would provide responsive, reliable, and value-added customer engagement across all project phases to strengthen client satisfaction and repeat business.

For the objectives extraction, we have the list of 36 questionnaires in previous CSI from all type of client / construction period. Each item contains the objective and the verb to achieve the objective. For example, the objective AS1 – Accommodative is described as the staff's flexible and accommodative attitude in meeting needs/expectations.

All the 36 objectives are divided by the period type as primary criteria and the strategic values (QCTES) as secondary subcriteria. From the hierarchy we got 16 matrixes that required 67 comparison judgements from the respondents and will be distributed to each type of client. The hierarchy become the reference to build the comparison questionnaires, which is the primary data that will be collected for the AHP.

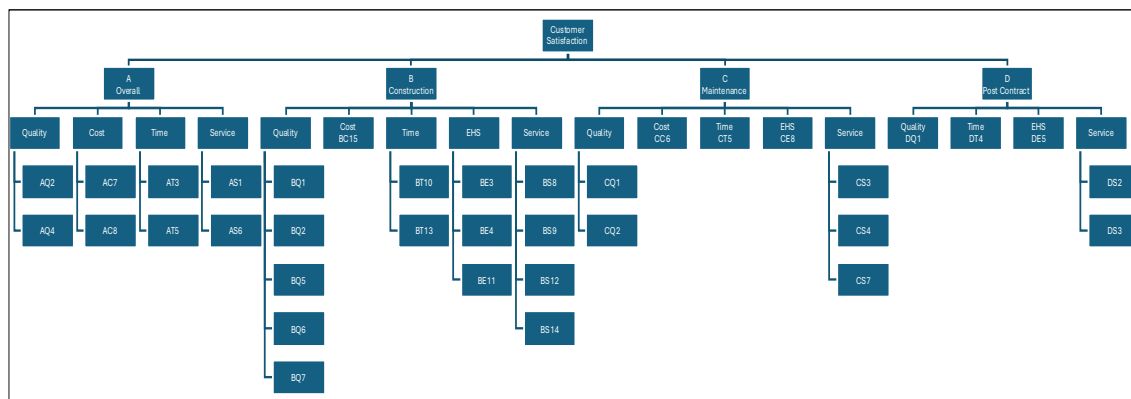


Figure 3. Hierarchy for CSI measurement

AHP Data Validation for Importance Weighting

All 15 AHP matrices produced $CR < 0.10$. The maximum CR was 0.059 (EHS sub-matrix, Type B) while the lowest is found in the Quality cluster ($CR = 0.007$) also in type B client. The test confirmed the consistency of aggregate judgement from the SMEs.

From table 2, we got at the top hierarchical level, Maintenance Period (Type C) received the highest weight (0.324), followed by Construction Period (Type B: 0.260), Post-Contract Period (Type D: 0.242), and Overall Corporate Review (Type A: 0.174). Combined post-handover weight ($C-D = 0.566$) exceeds the combined construction and corporate weights show a direct challenge to the conventional contractor focus on construction phase performance management. Clients assign greater aggregate importance to service performance after project handover than during construction.

The local weight is calculated in each matrix and according to the hierarchy, it further calculate the global importance weight as one whole structure. From the overall result, we have the top weight from CSI type C in the cost value. Customer put the most weight on Variation Order Price (CC6) with 0.096 importance. Fairness of price in submitting variation orders is important as they ideally don't expect any additional or reduced scope. Other objectives with weight above average are EHS Concern (CE8 0.059), Response Time (CT5 0.056), and Detail Perfection (CQ1 0.038). The result in maintenance period that have weight above average cover all values except Service.

Aggregated by QCTES value, the distribution is dominated by Quality 33% and Cost 26%, followed by Time 22%, EHS 11%, Service 8%. The Iron Triangle collectively commands over 80% of total CSI importance, consistent with Pollack et al. (2018) and Ibrahim et al. (2024). The low Service weight (8%) should not be interpreted as a signal to reduce service investment. Rather, it indicates that current service performance already meets client expectations as it will be confirmed

in Quadrant B IPA later.

Table 5. Importance Weight Result

#	Code	Objectives	Weight Rank	Importance Weight	CSI score	Weighted Score
29	Cost CC6	Variation Order Price	1	0.096	77.224	7.405
32	Quality DQ1	Specification / Material	2	0.083	86.559	7.190
36	EHS DE5	EHS Concern	3	0.061	87.443	5.369
31	EHS CE8	EHS Concern	4	0.059	85.429	5.049
35	Time DT4	Response Time	5	0.058	87.533	5.045
28	Time CT5	Response Time	6	0.056	84.367	4.755
23	Cost BC15	Price to Quality & Service	7	0.055	79.440	4.344
21	BT13	Time Schedule	8	0.043	79.020	3.415
24	CQ1	Detail Perfection	9	0.038	79.837	3.002
4	AQ4	Work Quality	10	0.037	83.429	3.055
5	AT5	Time Schedule	11	0.029	81.889	2.391
1	AS1	Accommodative	14	0.026	87.984	2.262
3	AT3	Response Time	12	0.026	81.857	2.157
34	DS3	Communication	13	0.026	93.959	2.444
11	BE3	Methode of Statement	15	0.025	83.474	2.065
27	CS4	Communication	16	0.022	85.551	1.856
25	CQ2	Specification / Material	17	0.021	80.150	1.667
26	CS3	Information	18	0.021	71.388	1.484
6	AS6	Transparency	19	0.020	82.984	1.624
7	AC7	Price to Quality & Service	20	0.019	76.222	1.480
18	BT10	Response Time	21	0.018	84.848	1.557
19	BE11	EHS Capability	22	0.018	83.744	1.495
12	BE4	Work Permit	23	0.015	84.417	1.242
10	BQ2	Specification / Material	26	0.014	81.693	1.127
14	BQ6	Quality Control	24	0.014	78.786	1.140
15	BQ7	Detail Perfection	27	0.014	80.948	1.115
33	DS2	Information	25	0.014	83.538	1.160
9	BQ1	Shop Drawing	28	0.012	85.499	0.987
30	CS7	Transparency	29	0.011	81.224	0.926
22	BS14	Commitment	30	0.010	81.648	0.782
2	AQ2	Staff Capability	31	0.009	85.548	0.765
8	AC8	Price to Brand	32	0.009	80.889	0.700
17	BS9	Solution	33	0.007	83.231	0.571
16	BS8	Accommodative	35	0.006	88.284	0.503
20	BS12	Coordination	34	0.006	80.567	0.522
13	BQ5	Re-work / Defect	36	0.004	80.603	0.336

#	Code	Objectives	Weight Rank	Importance Weight	CSI score	Weighted Score
	Legend:			AVG Importance	Average Performance	Weighted Performance
	Above AVG			0.028	82.811	82.986

The weighted score (82.986) is higher than the average performance (82.811). It indicates that the contractor already performed better in objectives with heavy weight. The firm show the knowledge in the customer's concern. The reason for this phenomenon will be clear in IPA.

IPA Results

The average of the importance score is 0.028 is set as vertical axis on the IPA chart separate the data that range between 0.004 and 0.096. For the performance score that scattered between 71.338 and 93.959, the horizontal axis is set on 82.811, the average of CSI score.

The IPA chart presents the five Quadrant A (Concentrate Here) and six Quadrant B (Keep Up the Good Work) objectives. The remaining 25 objectives occupy Quadrant C (12) or Quadrant D (13). IPA results explain why the weighted score slightly exceeds the unweighted average. The contractor's stronger performance in high-importance quadrants (B+D vs. A+C = 19:17) accounts for the marginal score advantage.

The most critical finding is that the highest-weighted objective (Variation Order Price CC6) scores below average and directly lowers overall weighted performance. Conversely, Information Objective (CS3) records the lowest performance score but carries low customer weight, placing it in Quadrant C where it poses minimal strategic risk. Communication (DS3) shows strong contractor performance but lands in Quadrant D, indicating over-investment relative to customer priority. We can learn that putting the company's effort and budget on an objective that is not important in the client's eye would not bring high impact to customer satisfaction experience. The table below will show that the bottom performer is not equal to Quadrant A. Affirming that comparison based on performance alone is inadequate to capture the customer's priority.

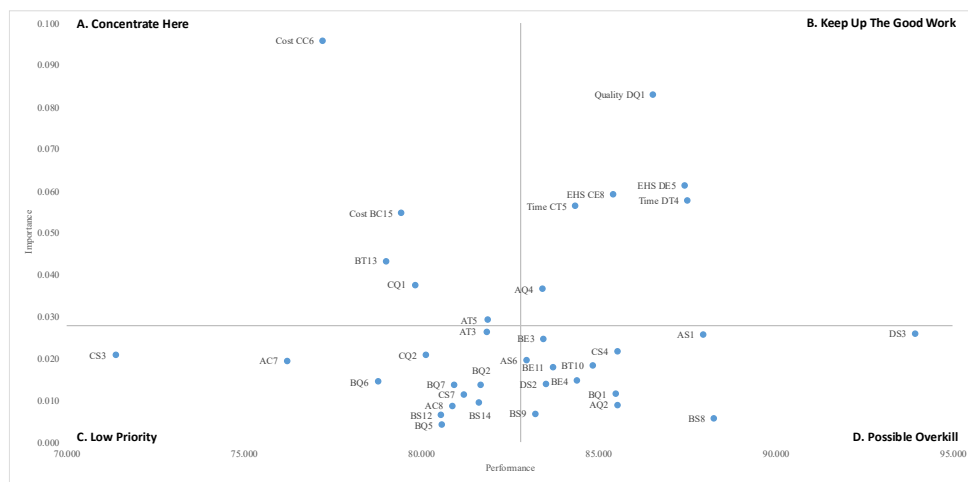


Figure 4. Importance Performance Chart

Table 6. Top and Bottom Rank on CSI Performance Score

Bottom Five Performance

Top Five Performance

Code Objectives	CSI score	Code Objectives	CSI score
BT13 Time Schedule	79.020	DS3 Communication	93.959
BQ6 Quality Control	78.786	BS8 Accommodative	88.284
CC6 Variation Order Price	77.224	AS1 Accommodative	87.984
AC7 Price to Quality & Service	76.222	DT4 Response Time	87.533
CS3 Information	71.388	DE5 EHS Concern	87.443

DISCUSSION

Immediate Result and Action

Those findings carry the most operational significance. The result itself could be directly become a raw discussion material to decide the next corporate action. First, post-handover periods account for over 56% of total CSI importance while the Owner Corporate Office (Type A) contributes the least. This overturns the conventional operations management assumption that construction-phase delivery is the primary satisfaction driver and aligns with service quality theory (Parasuraman et al., 1988). The operational implication might cause the contractors to design post-handover service management systems with the same consistency applied to construction delivery.

Second, Variation Order Price (CC6) is both the highest importance objective and a Quadrant A (Concentrate Here) the single most actionable gap in this study. Building management clients operate with constrained post-handover budgets and any variation in order pricing is disruptive when not aligned with client expectations. A dual operational response is needed as future prevention. First, strengthen value engineering during construction to reduce the incidence of variation orders in the maintenance phase and then establish transparent pricing policies for maintenance-period variation orders. This finding connects to Khadim et al. (2023), who recommended Cost of conducting VE is calculated as a part of Cost of Quality framework.

Third, the weight variation across objectives produces a directly actionable output for operations performance management: the derived weights can be applied as differential BSC weightings in the Customer perspective, translating the empirical voice of clients into corporate KPI targets. Corporate strategy synchronization is the extension follow-up after IPA result so the higher up could focus on selected top priorities as Cao et al. (2025) reported their result to the policymaker. Continued with the related technical function development to keep the action practicable by the staff as suggested by Suhada & Syairuddin (2021).

Another result interpretation also supported by previous literature. Quality value is appreciated the most and the Iron Triangle collectively over 65% of total CSI importance, legitimate its domination as discussed by Pollack et al. (2018).

While current results show the original Three Constraint domination, Ibrahim et al. (2024) still highlighted the corporate adaptation ability to the evolving construction landscape. The result of CSI Analysis might differ each year. Some cross function team might be formed as corporate action team to respond to the voice of customers. The team should be able to deduct any conclusion from the CSI analysis. Immediate action also needs to be suggested to BOD to improve the objectives in quadrant A – Concentrate Here.

CSI Structural & Procedural Impact

In the near sight, this research offers a better and replicable analytical procedure compared to the simple averaging score method. The new analytical procedure operates in three sequential steps. First, Importance Weight Analysis ranks objectives above and below the importance average, enabling resource-constrained contractors to focus on what customers prioritise (Darko et al., 2019). In the same time it also tracking value-group trends, which currently dominated by the Iron Triangle but subject to future shifts toward EHS (Ibrahim et al., 2024). Second, Performance Analysis introduces a weighted CSI score alongside the conventional average score. Comparing both reveals whether the contractor's operational focus is aligned with customer priorities since a misalignment that Othman (2015) identifies as a root cause of client dissatisfaction in construction. Third, Importance-Performance Analysis (IPA) synthesises both axes into a quadrant matrix (Martilla & James, 1977), isolating Quadrant A objectives with high importance and low performance. In current case, it successfully filtered five top priorities from the full set of 36, consistent with Cao et al. (2025) who demonstrated IPA's utility in directing limited resources toward the most critical service gaps. Findings from Quadrant A are escalated to a cross-functional team and presented to the Board of Directors for corrective action, whether through process improvement, BSC target adjustment, or new programme development.

After the new CSI analytical procedure became the new standard, the firm got new data as knowledge resources. The questionnaire structure for CSI has already been used by KMN for over seven years. AHP brought new data on the table as a base for KMN to update their CSI

questionnaire structure. From the importance weight and the customer's input, we could reselect the relevant objectives and put aside or merge the objectives with less importance.

The owner's headquarters (Client type A) have proven to have a helicopter view and carry the corporate's priorities. The same type of client also placed the type A questionnaire (Overall) as the lowest importance. In the future, client type A should be entrusted to give judgement on weight importance but the overall questionnaire type can be eliminated. Questionnaire type C (maintenance period) and D (post contract) also can be merged since they got input from the same type of client (Building Management).

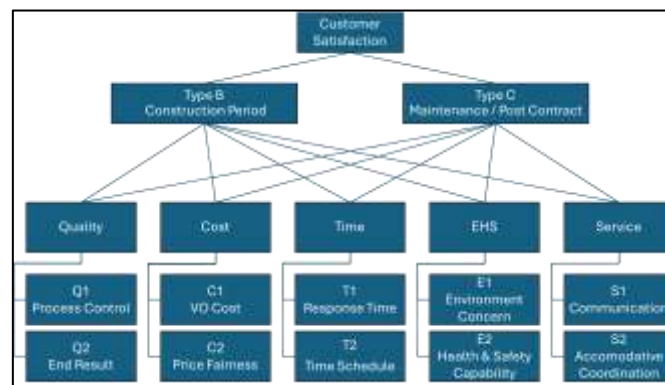


Figure 5. Proposed Hierarchy

On the first level of the hierarchy, previously we faced 3 type of owner (Headquarters, Site, and Building Management) and 4 types of questionnaire. Based on the experience during survey, the proposed structure should have only three types of questionnaire. Type A - Owner/Corporate Headquarters will provide the Weight Importance Judgment, Type B - Project/Construction Management will score the Construction Period Performance and merged Type C - Building Management will submit the CSI scores on Maintenance Period and Post Contract.

On second level, the corporate can eliminate or merge low-importance objectives and create a simpler and balanced hierarchy. The new hierarchy is proposed to have equal objectives on each value to avoid some objective got relatively less importance due to too many objectives in certain value. This case happened in Quality and Service in previous hierarchy. In the new hierarchy, each value should have two objectives to make each value more comparable.

Another improvement for the performance scoring is using the even options for Likert Scale. It could avoid the risk of central tendency bias as Kusmaryono et al. (2022) and would give a better result to capture the client's view on PT KMN performance.

These adjustments are examples of what the analytic result can give as a source of information and open to the continuous CSI structural improvement. The hierarchy will be more fluid from time to time and can be adjusted after committed period. The study on future results will become the source of reason for any hierarchy adjustment.

Alignment Convenience

The new analysis procedure on the CSI result above is needed as the current CSI with equal-weight objectives does not reflect real customer priorities. Our analytical findings with AHP also revealed unequal importance across values. Previously, the customer's concern on these 5 values is delivered down to the employees via Balanced Score Card. Currently the time values and EHS values have more weight among the others. The importance weight analysis may become the reference for the weight factor in the BSC as it represents the voice of consumers.

As the follow up, the system should include the follow-up effect to the corporate balanced score card. Weight factor in AHP results can be easily used as weight factor in BSC. Expected business impact after the implementation is a better resource allocation and improved client retention strategy. More accurate BSC alignment with business outcomes also applied with the data from the CSI analysis. Project manager and Department Heads conveniently capture the BOD priorities

based on the variable of objective's weight factor in BSC. The weight variation across objectives produces a directly actionable output for operations performance management: the derived weights can be applied as differential BSC weightings in the Customer perspective, translating the empirical voice of clients into corporate KPI targets. Corporate strategy synchronization is the extension follow-up after IPA result so the higher up could focus on selected top priorities as Cao et al. (2025) reported their result to the policymaker. Continued with the related technical function development to keep the action practicable by the staff as suggested by Suhada & Syairuddin (2021).

CONCLUSION

The first research question about the importance weight revealed several findings that could be valuable information for the firm. First, the objectives in CSI is far from equal-weighted situation. The average importance score is 0.028 but the weight is varied between 0.004 to 0.096 with only 11 of 36 objectives (30.6%) that can go above the average weight. The top weight is tripled the weight of 11th objective. Even in the top rank objectives, the weight is clearly varied.

The research also showed that after-sales is also critical in this B2B model. Maintenance Period become the biggest concern in CSI and Overall type A CSI from Owner Corporate Office staff is the least important. Combined post-handover weight ($C+D = 0.566$) ruled over construction phase.

For the future strategy, PT KMN should consider to take less profit in this opportunity to increase the excellence customer experience. Pre-emptively, although the objectives category is in the Price Value during Maintenance Period (type C), we can take the root cause from the Price and Quality Value during Construction Period. Early mitigation is the quality improvement and avoid all major repair work during maintenance period. Also, the project team in the construction period should improve their value engineering skill to detect any missed and potential needs during building operations. VO during construction period is more acceptable by the owners.

The answer to the second question about customer's priority suggested KMN focus on 5 objectives to achieve better weighted score CSI with optimal effort. During maintenance period KMN should improve Variation Order Price (Cost). Contractors should avoid additional claim after handover since Building Management team have minimum budget for more construction. Engineers should be active to forecast the potential issues before project finishes. KMN should improve Price to Quality & Service (Cost) during Construction Period. Cost is always a consideration objective even in the high-end market. Time Schedule is a concern for client type B during Construction Period and client type A in overall point of view. On time delivery is important for project team and the real owner. Last, Detail Perfection (Quality) during maintenance period is also important. Contractors might want to improve their repair result. The end result on detailed things is what the user is concerned (alignment, flatness, straightness, precision of dimensions).

Noted all the objectives came from the original three constraint values: Cost, Time, and Quality. EHS as a modern key success factor and Service Value might be worked as corporate differentiation strategy. But statistically, current customers still don't put both values in their Concentrate Here quadrant. These fives also didn't cover the post-contract period, a good sign that PT KMN performed beyond expectation in the after-service game. However, the maintenance period is the highest weighted objective in IPA quadrant A, indicating after the handover steps, the contractor service is still highly concerned by the customer.

With IPA, the lowest performance objectives didn't automatically become the high priorities and the best ones also didn't become the company's advantages. When you compared between IPA and simple CSI score ranking, it could be a misdirection for the company if they decide the priority and the advantage only based on performance alone as single dimension criteria.

For academic contribution, the research introduced the combination of VFT as front-end preliminary for AHP and IPA methodology in B2B construction's CSI context. The research also used empirical CSI score as evidence from Indonesian private construction sector (2018–2024). And it tested QCTES, the practical corporate values, as the extension of Iron Triangle theory.

In practical business world, high-priority objectives are successfully identified for immediate strategic action. Deducting from 36 objective to five concentrated action is clearly a cost-cutter for the company. The CSI analytic procedure to gain more knowledge from customer's voice in this research is also easily replicable for the contractor business.

Limitations include the single-company case study design and the SME respondent pool reflects a specific segment of the Indonesian Grade A private construction market. The values also adopted from the late theory Iron Triangle. Although PT KMN tried to adopt a few more values among the growing demands outside the original three constraints in current business trend. Every contractor always ponders the new values in these modern days while considering the right moment to apply them and not just stick to the Quality-Cost-Time alone.

Future research should test the framework across multiple contractors of varying ownership type, market positioning, and geographic context. Over long period, researchers could apply historical weight tracking to detect shifts in client priority and the potential adoption of new values beyond QCTES. Methodological alternatives such as AHP express (Leal, 2020) or SMART (Montaser & Montaser, 2017) could be tested to reduce respondent burden while maintaining validity.

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