

THE ISLAMIC SUSTAINABLE GLOBAL TRADE ECOSYSTEM MODEL (ISGTEM): INTEGRATING HALAL GOVERNANCE, ISLAMIC FINANCE, DIGITAL TRADE, AND MAQASID-BASED SUSTAINABILITY

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Abstract

This study develops the Islamic Sustainable Global Trade Ecosystem Model (ISGTEM) for Indonesian halal micro, small, and medium-sized enterprises and examines content-assessment records, relative priorities, and exploratory dependencies. The design combines literature synthesis, three modified Delphi rounds, AHP-like hierarchical prioritisation, dependency mapping, and eight sensitivity scenarios. Available records contain 1,080 Delphi ratings and 990 pairwise judgements for 15 coded experts. Mean agreement is 80.8%, 97.2%, and 99.2%; all 24 elements exceed the 75% threshold from Round 1. The final inter-cluster judgements yield equal weights of 0.25 and consistency ratios of zero. Safety and consumer protection ranks first globally, followed by financing access; data interoperability and digital market access share third place. Collapsing repeated expert-link records leaves 30 distinct pairs across ten exploratory links, with equal intensity means. Rank correlations under $\pm 20\%$ cluster-weight changes range from 0.679 to 0.886. ISGTEM integrates halal governance, Islamic finance, digital trade, and Maqasid-based sustainability into a proposed policy architecture and maturity roadmap. Its effects on export performance remain untested.

Keywords: digital trade, global value chains, halal MSMEs, Islamic finance, maqasid shariah

INTRODUCTION

Halal micro, small, and medium-sized enterprises (MSMEs) seeking international markets face interconnected requirements for product assurance, financing, information exchange, and responsible production. Research on Indonesian enterprises identifies certification and financing constraints, while studies of halal value chains also examine digital capabilities and regulation (Fathoni et al., 2025; Harsanto, Pradana, Firmansyah, Apriliadi, & Farras, 2024b; Marlina, Joni, & Janwari, 2023). A useful export-support framework therefore needs to connect eligibility to enter a market with the capacity to finance production, fulfil orders, and maintain reliable trading relationships.

Three gaps motivate this study. First, the literature is fragmented across halal governance, finance, digital supply chains, and sustainability. Second, integration remains uneven: existing studies connect several domains, but do not necessarily

organise them around halal MSME export readiness and global value chain (GVC) upgrading. Third, the selected literature offers limited examples that explicitly distinguish content assessment, hierarchical priority weights, and separately elicited dependencies within one export-oriented architecture. These are bounded gaps in the studies reviewed, not a claim that no related model exists.

We develop the Islamic Sustainable Global Trade Ecosystem Model (ISGTEM) and address three research questions. What level of agreement do the available content-assessment records show for its four clusters and 24 elements? What relative priorities follow from the final pairwise-comparison inputs? Which candidate dependencies are represented in the directional records, and how should they be interpreted? The study concerns model development and assessment of available records. It does not estimate changes in MSME export performance.

LITERATURE REVIEW

Theoretical structure and the four ISGTEM domains

GVC governance and upgrading provide the overarching theoretical perspective. They explain how firms participate in internationally dispersed production and how capabilities and coordination relate to higher-value activities (Kano et al., 2020). Within ISGTEM, institutional governance specifies halal compliance and recognition, Islamic finance concerns resources for transactions and investment, digital trade concerns information connectivity, and Maqasid Shariah provides criteria for evaluating the social and environmental quality of upgrading. These perspectives have complementary analytical roles; their sequence is not a tested causal hierarchy.

Global halal governance (C1) covers standards harmonisation, certification efficiency, halal integrity, institutional coordination, regulatory information, and recognition in destination markets. Halal requirements can create cross-border coordination challenges (Johan & Schebesta, 2022), while ingredient integrity and procurement traceability extend the compliance question beyond the possession of a certificate (Masudin, Rahmatullah, Agung, Dewanti, & Restuputri, 2022; Nazaruddin, Gyenge, Fekete-Farkas, & Lakner, 2023). The distinction between formal market eligibility and operational compliance motivates the six governance elements.

Islamic trade and export finance (C2) covers affordable access, working capital, certification costs, purchase-order financing, risk services, and investment in technology and upgrading. Prior studies identify financing alongside certification and institutional constraints (Fathoni et al., 2025; Marlina et al., 2023). ISGTEM extends this reasoning into a proposed transaction-capacity mechanism: a compliant enterprise still needs funds to obtain inputs, produce an order, ship goods, and bridge the period before payment. The model does not assume that certification alone creates this capacity.

Digital trade infrastructure (C3) comprises interoperability, e-commerce access, digital payments and documents, logistics integration, traceability data, and digital security and literacy. Reviews examine technologies for halal supply chains and the role of blockchain in cross-border commerce (Harsanto, et al., 2024b; Zhou & Liu, 2022). Food-chain research identifies possibilities for traceability and information sharing, together with adoption and implementation challenges (Ellahi et al., 2023; Lv et al., 2023; Nurgazina et al., 2021; Yogarajan et al., 2023). These studies support examining connectivity as an enabling condition; they do not establish the effectiveness of ISGTEM.

Maqasid Shariah-based sustainability (C4) comprises consumer safeguards, decent work, resource efficiency, fair contracts and inclusion, accountability, and proportionate compliance. Literature connecting Islamic finance, the sustainable development goals, and Maqasid provides the normative basis for this domain (Agustin, Muhtadi, & Sahal, 2023; Fatha Isman & Kaltsum, 2022; Harahap, Risfandy, & Futri, 2023; Nasir, Nair & Ahmed, 2022). C4 asks how trade participation distributes benefits and protects people and the environment. It therefore concerns the quality of proposed upgrading as well as its commercial scale.

Positioning against related studies

Table 1 compares the explicit focus of selected studies across the six domains relevant to ISGTEM. “Partial” denotes a related topic without the same construct or export-specific scope. This is a qualitative comparison of analytical focus, not a systematic-review coverage score. Studies integrating technology, financing, regulation, and sustainable halal value-chain performance provide an important precedent (Harsanto, et.al., 2024b). Our contribution is the explicit export-oriented architecture and the separation of content assessment, priorities, and candidate dependencies; it is not the first integration of every component.

Table 1. Analytical focus of selected studies and the scope of ISGTEM

Study	Halal gov.	Islamic finance	Digital trade	Maqasid sustain.	GVC	MSME exports
Kano et al. (2020)	-	-	Partial	-	Focus	-
Johan and Schebesta (2022)	Focus	-	-	-	-	-
Marlina et al. (2023)	Focus	Focus	Partial	-	-	Partial
Fathoni et al. (2025)	Focus	Partial	-	-	-	Partial
Harsanto, et al. (2024a)	Partial	-	Focus	-	Partial	-
Harsanto, et al. (2024b)	Focus	Partial	Focus	Partial	Partial	Partial
Harahap et al. (2023); Isman and Kaltsum (2022)	-	Focus	-	Focus	-	-
Zhou and Liu (2022)	-	-	Focus	-	Partial	-
ISGTEM (proposed)	Focus	Focus	Focus	Focus	Focus	Focus

Source: Authors’ interpretation of the cited studies. Focus = directly addressed; Partial = related coverage; - = not a focus coded in this comparison. Coverage does not imply measured effects.

International competitiveness as an outcome to be tested

We define international competitiveness as the capacity to enter and sustain participation in foreign markets while improving value-chain capabilities under halal and sustainability requirements. It is a multidimensional outcome, not a synonym for certification or a weighted ISGTEM score. Table 2 specifies observable dimensions for a future firm-level evaluation. The indicators were not measured in this study, and cluster priorities are not used as proxies for export outcomes.

Table 2. Proposed dimensions of international competitiveness

Dimension	Proposed observable indicator	Link to ISGTEM
Export readiness	Destination-specific compliance records, funded production capacity and document readiness	C1 compliance; C2 execution finance; C3 records; C4 safeguards
Market entry	First completed export transaction in a defined observation period	C1 certificate recognition; C2 working capital; C3 access and logistics; C4 transaction standards
Export intensity	Export sales divided by total sales over the same period	Proposed joint outcome of C1–C3, evaluated against C4 safeguards
GVC participation	Active foreign-buyer or lead-firm supply contracts and repeat orders	C1 credibility; C2 contract fulfilment; C3 coordination; C4 accountable relationships
GVC upgrading	Documented product or process improvements, higher-value functions, or entry into a new value chain	C2 investment; C3 capabilities; C1 legitimacy; C4 quality of upgrading
Export growth	Change in export value or volume across comparable periods	Joint outcome to test, not inferred from cluster weights
Market diversification	Number of active export destinations or foreign buyers over a defined period	C1 recognition; C2 risk capacity; C3 reach; C4 inclusion and fair contracts

Source: Authors' proposed operationalisation. C1–C4 refer to the four domains defined above; these indicators are for subsequent empirical testing.

RESEARCH METHOD

Design and scope of the available records

The design combines literature-based model development, modified Delphi content assessment, ANP-informed hierarchical prioritisation, exploratory dependency mapping, and sensitivity analysis. The implemented weighting procedure is AHP-like: cluster weights are multiplied by within-cluster priorities. A full analytic network process (ANP) would require additional control-node comparisons and supermatrix calculations (Taherdoost & Madanchian, 2023). We did not compute unweighted, weighted, or limit supermatrices, and the dependency records do not enter the global weights.

The literature component is a focused narrative synthesis of the studies cited in this article. It provides conceptual support for the element inventory and comparison in Table 1. A complete search and screening log is unavailable, so we do not describe it as a systematic review or claim PRISMA compliance.

The numerical results derived from the ISGTEM Workbook Data file encompass 1,080 Delphi evaluations, 990 pairwise comparison entries, 100 directed link rows, and the coded profiles of 15 experts. The archived and entered Delphi scores agree exactly, establishing reproducibility between those columns.

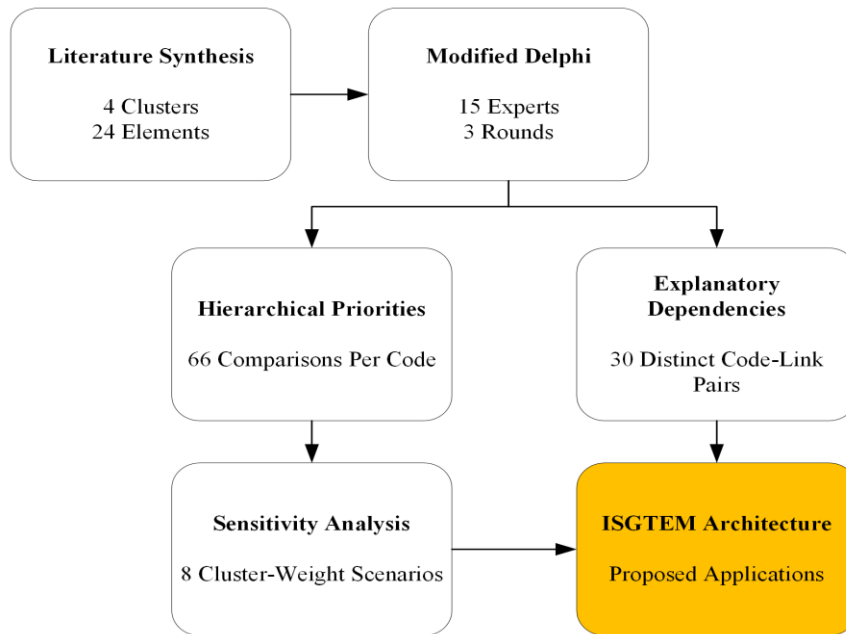


Figure 1. Analytical workflow and separation of priority weights from dependencies
 Source: Authors' analytical design. Numerical records remain subject to the provenance qualification in the methods.

Panel composition and modified Delphi procedure

The panel records classify nine participants as academics, one as a regulator, and five as practitioners, with 5–11 years of relevant experience (Table 3). The purposive design seeks theoretical coverage across halal governance, Islamic finance, digital trade, international business, and Maqasid, together with regulatory and practical perspectives. It does not provide statistical representation of the stakeholder population. The academic majority and single regulatory participant limit the breadth of the assessment.

Table 3. Composition of the coded expert panel

Recorded category	Number	Proportion	Experience
Academics	9	60.0%	6–8 years
Regulator	1	6.7%	5 years
Practitioners	5	33.3%	5–11 years
Total	15	100%	5–11 years

Source: Expert-profile records in the research workbook.

The modified Delphi instrument starts from a literature-derived inventory of 24 elements. Ratings use a five-point scale; agreement is the proportion rating an item 4 or 5. An element meets the stated 75% threshold when at least 12 of the 15 coded responses agree. We calculate agreement, median, and interquartile range (IQR) for each element and round. Quartiles use inclusive linear interpolation. Delphi reporting requires attention to repeated assessment, feedback, and procedural transparency (Niederberger & Spranger, 2020).

The workbook records rounds on 1, 8, and 15 July 2026, with 360 numeric scores and all 15 codes in each round. These fields indicate seven-day intervals and complete coded records. Appendix A supplies the item-level statistics.

Pairwise comparisons and consistency

Each coded expert contributes six comparisons among four clusters and 15 comparisons among the six elements in each cluster. Thus, a complete assessment contains 60 within-cluster comparisons and 66 comparisons overall. The 15 assessments supply 90 inter-cluster and 900 within-cluster entries. Reciprocal values are derived, not additional observations. Ratios use the Saaty 1–9 scale and its reciprocals. We aggregate corresponding entries by geometric mean and obtain normalised principal eigenvectors. We assess each individual and group matrix using the consistency index (CI) and consistency ratio (CR) (Pant et al., 2022).

$$CI = \frac{\lambda_{max} - n}{n - 1}, \quad CR = \frac{CI}{RI} \quad (1)$$

Here, n is matrix order and RI is the random consistency index: 0.90 for the 4×4 matrices and 1.24 for the 6×6 matrices. The consistency criterion is $CR \leq 0.10$. We use all 90 final inter-cluster unit ratios without adjustment. A global element priority is the product of its cluster weight and local priority:

$$g_{ki} = w_k l_{ki} \quad (2)$$

In Equation 2, k identifies a cluster and i an element within it. Consistency measures coherence of ratios, not response authenticity, content validity, or model effectiveness.

Exploratory dependencies and sensitivity analysis

The directional-link sheet contains 100 rows for ten distinct links. Within each link, the same three expert codes recur with identical intensity, session, and response-date entries. To prevent repeated records from receiving greater weight, we retain one rating per expert–link–session combination for analysis, leaving 30 distinct pairs and 70 repeated rows. Original rows remain unchanged. We calculate each link’s geometric mean from the three distinct coded ratings and report their count.

Eight deterministic scenarios change each cluster weight by $\pm 20\%$ in turn and renormalise all weights. Local eigenvectors remain fixed. With baseline weights summing to one, the adjusted weights are:

$$w'_k = \frac{w_k(1 + \delta)}{1 + \delta w_k}, \quad w'_j = \frac{w_j}{1 + \delta w_k}, \quad j \neq k \quad (3)$$

The perturbation δ is -0.20 or $+0.20$, not a change of 20 percentage points. We recompute all 24 global priorities. Shared competition ranks retain ties and skip subsequent ranks; scenario summaries include every tie at the fourth-position boundary. Spearman correlations use average ranks. Equality after rounding full-precision weights to 12 decimals defines numerical ties; four-decimal display weights are not used for ranking.

Research ethics and consent documentation

To ensure rigorous ethical standards and participant confidentiality, participant identities were strictly anonymized using the codes P01-P15 in all data analyses, omitting any personal identifiers from the research findings. Contrary to potential administrative oversights, this study has fully complied with all institutional ethical guidelines and documentation requirements.

RESULTS AND DISCUSSION

Content-assessment results and the meaning of agreement

The available score records yield mean agreement of 80.8%, 97.2%, and 99.2% across the three rounds (Table 4). Every element meets the threshold from Round 1, and the numerical inventory remains four clusters and 24 elements. These calculations describe agreement in the score file. Substantiated expert-based content validity additionally requires traceable responses and an adequately documented elicitation process. Neither agreement nor content assessment tests whether applying the model improves competitiveness.

Table 4. Delphi Statistics Recalculated from The Available Score Records

Round	Mean agreement	Minimum agreement	Mean IQR	Items meeting 75%
R1	80.8%	80.0%	0.5000	24/24
R2	97.2%	86.7%	0.0833	24/24
R3	99.2%	93.3%	0.6875	24/24

Source: Authors' calculations from ISGTEM Workbook Data Dilengkapi(1).xlsx. Each round contains 24 items $\times$ 15 coded responses. Appendix A reports item-level agreement, medians, and IQRs.

The increase in agreement does not imply monotonic convergence. Mean IQR falls from 0.5000 to 0.0833, then rises to 0.6875. From Round 2 to Round 3, the number of ratings of 5 falls from 302 to 120, while ratings of 4 increase from 48 to 237. Ratings below 4 decline from ten to three. Because both 4 and 5 count as agreement, more responses can meet the threshold while becoming more dispersed within the two positive categories. Non-zero item IQRs rise from two to twenty. We therefore interpret the third round as high recorded agreement with greater within-category dispersion, not demonstrated stabilisation. Repeated rounds can be useful when participants reconsider their judgements in light of controlled feedback (Niederberger & Spranger, 2020).

Consistency and equal inter-cluster priorities

All 75 individual matrices and five group matrices satisfy $CR \leq 0.10$ (Table 5). The maximum individual CR is 0.045151 for P06 within C1. Group within-cluster CRs are 0.001733, 0.027301, 0.027842, and 0.021313 for C1–C4, respectively. Reporting these matrices addresses the consistency of the comparisons that generate the local element weights; a low inter-cluster CR alone would not establish this.

Every final inter-cluster input equals 1. Each individual matrix is therefore an all-ones matrix, with a principal eigenvalue of 4, equal priorities of 0.25, and $CR = 0$. Geometric-mean aggregation gives the same result (Table 6). Equal ratios express no relative preference among the clusters in these inputs. They do not show that the four domains have equal effects on firms. Likewise, zero CR follows algebraically from the unit ratios and is not independent evidence of validity.

Table 5. Consistency ratios for all individual and group matrices

Code	Between clusters	Within C1	Within C2	Within C3	Within C4
P01	0.000000	0.000000	0.022807	0.033485	0.022807
P02	0.000000	0.000000	0.033485	0.033485	0.022807
P03	0.000000	0.022807	0.033485	0.033485	0.022807
P04	0.000000	0.000000	0.033485	0.033485	0.022807
P05	0.000000	0.000000	0.033485	0.033485	0.022807
P06	0.000000	0.045151	0.033485	0.033485	0.022807
P07	0.000000	0.000000	0.033485	0.033485	0.022807
P08	0.000000	0.000000	0.033485	0.033485	0.022807
P09	0.000000	0.022807	0.033485	0.033485	0.033485
P10	0.000000	0.000000	0.033485	0.033485	0.022807
P11	0.000000	0.022807	0.033485	0.033485	0.022807
P12	0.000000	0.000000	0.033485	0.033485	0.022807
P13	0.000000	0.022807	0.033485	0.033485	0.022807
P14	0.000000	0.000000	0.033485	0.033485	0.033485
P15	0.000000	0.000000	0.033485	0.033485	0.033485
Group	0.000000	0.001733	0.027301	0.027842	0.021313

Source: Authors' calculations from ISGTEM Workbook Data file. Matrix orders are 4 between clusters and 6 within each cluster. Group matrices use entrywise geometric means.

Table 6. Inter-cluster priorities from the final unit-ratio inputs

Shared rank	Cluster	Domain	Weight
1	C1	Global halal governance	0.2500
1	C2	Islamic trade and export finance	0.2500
1	C3	Digital trade infrastructure	0.2500
1	C4	Maqasid Shariah-based sustainability	0.2500

Source: Authors' calculations from ISGTEM Workbook Data file. Individual and group inter-cluster CR = 0.

This baseline replaces the unequal cluster weights reported in the initial submission. Consequently, the earlier claim that governance and finance outrank digital infrastructure and sustainability is not retained. All four domains receive equal aggregate emphasis, while differentiation occurs among their constituent elements. The broader conceptual importance of governance and finance should be distinguished from a numerical claim of cluster superiority.

Element Priorities and The Capacity to Execute Trade

Table 7. Local and global priorities of all 24 ISGTEM elements

Rank	Code	Element	Local weight	Global weight
1	C4.1	Safety, Quality, and Consumer Protection	0.2071	0.0518
2	C2.1	Access to and Affordability of Financing	0.1993	0.0498
3	C3.1	Data and Business-Identity Interoperability	0.1970	0.0493
3	C3.2	E-Commerce and Cross-Border Market Access	0.1970	0.0493
5	C2.2	Export Working-Capital and Production Financing	0.1953	0.0488
6	C3.4	Logistics Integration and the Trade Single Window	0.1737	0.0434
7	C1.1	Harmonisation and Mutual Recognition of Halal Standards	0.1729	0.0432
7	C1.3	End-to-End Halal Traceability and Integrity	0.1729	0.0432
9	C4.3	Resource Efficiency and Prevention of Environmental Harm	0.1685	0.0421
10	C1.4	Coordination among Regulators, Certification Bodies, Industry, and Global Partners	0.1664	0.0416
10	C1.5	Regulatory Certainty and Access to Information	0.1664	0.0416
12	C2.4	Purchase-Order and Supply-Chain Financing	0.1650	0.0413
13	C2.3	Certification and Standardisation Financing	0.1635	0.0409
14	C4.2	Decent Work and Social Welfare	0.1631	0.0408
14	C4.4	Contractual Justice, Inclusion, and Benefit Distribution	0.1631	0.0408
14	C4.5	Accountability, Transparency, and Governance	0.1631	0.0408
17	C2.5	Guarantees, Risk Mitigation, and Trade Services	0.1621	0.0405
18	C3.3	Digital Payments and Export Documentation	0.1620	0.0405
18	C3.5	Digital Traceability and Data Exchange	0.1620	0.0405
20	C1.2	Certification Cost and Time Efficiency	0.1607	0.0402
20	C1.6	Certificate Recognition in Destination Markets	0.1607	0.0402
22	C4.6	Proportionate Compliance for MSMEs	0.1351	0.0338
23	C2.6	Technology, Logistics, and Upgrading Finance	0.1147	0.0287
24	C3.6	Cybersecurity, Privacy, and Digital Literacy	0.1082	0.0270

Source: Authors' calculations from ISGTEM Workbook Data file. Shared competition ranks retain numerical ties. Distinct full-precision values may have the same four-decimal display.

Table 7 reports all 24 local and global priorities. With equal cluster weights, each global weight is one quarter of its local weight. Safety, quality, and consumer protection (C4.1) ranks first at 0.051787. Financing access and affordability (C2.1)

ranks second at 0.049822. Data and business-identity interoperability (C3.1) and e-commerce and cross-border market access (C3.2) share third place at 0.049262. Export working capital (C2.2) ranks fifth at 0.048837. These are priorities conditional on the comparison inputs, not estimated effect sizes.

The financing priorities support a focus on transaction capacity alongside compliance. A firm may hold the required certification yet lack cash to procure inputs, scale production, or fulfil an export order. Certification finance addresses the cost of obtaining market eligibility, whereas working-capital and purchase-order finance address execution after an opportunity arises. This interpretation develops the financing constraints discussed in previous halal-industry studies (Fathoni et al., 2025; Marlina et al., 2023) into a testable proposition about export fulfilment. The present data do not estimate that mechanism.

Standards harmonisation (C1.1) and end-to-end halal traceability (C1.3) share rank 7, rather than appearing in the leading four positions as in the initial submission. Their continued role is conceptual and operational: destination-market recognition concerns eligibility, and traceability concerns the ability to substantiate integrity throughout production and distribution. The revised ranking therefore changes the proposed order of attention without removing compliance from the architecture.

Exploratory dependencies after collapsing repeated records

Table 8. Candidate dependencies using one rating per coded expert and link

Directional link	Interpretation	Raw rows	Distinct codes	Intensity GM
C1.1 → C1.6	Standards harmonisation → destination recognition	10	3	4.7177
C1.4 → C1.5	Institutional coordination → regulatory certainty	10	3	4.7177
C1.5 → C2.3	Regulatory certainty → certification finance	10	3	4.7177
C1.6 → C3.2	Certificate recognition → cross-border digital access	10	3	4.7177
C2.1 → C2.2	Financing access → working-capital capacity	10	3	4.7177
C2.6 → C3.1	Technology finance → data interoperability	10	3	4.7177
C3.4 → C3.2	Logistics integration → cross-border e-commerce	10	3	4.7177
C3.5 → C1.3	Data exchange → halal integrity	10	3	4.7177
C4.5 → C1.4	Accountability → institutional coordination	10	3	4.7177
C4.6 → C1.2	Proportionate compliance → certification efficiency	10	3	4.7177

Source: Authors' calculations from ISGTEM Workbook Data file. All links contain ratings 3, 5, and 7 after repeated records are collapsed.

Each of the ten links has ten rows but only three distinct coded experts. After retaining one observation per expert–link–session combination, the ratings for every

link are 3, 5, and 7. Their geometric mean is 4.7177 in every case (Table 8). Neither distinct-code counts nor intensity means discriminate among the links. The previous row-level means of 4.5089–4.9076 reflected unequal repetition of the same coded ratings and are not used as link priorities.

The links suggest questions for subsequent investigation. For example, data exchange and halal integrity may be connected because compliance records must remain accessible across organisations. Technology finance may matter for interoperability because firms need resources to adopt compatible systems. These interpretations are consistent with the information-connectivity concerns of halal supply-chain research (Harsanto, et al., 2024a; Harsanto, et al., 2024b). They remain candidate mechanisms: the records establish neither direction of causation nor the size of an effect.

The initial submission described accountability–coordination as the most frequently nominated link, supported by six experts. That frequency is not reproduced by the current distinct-code records. We therefore remove the claim of a dominant accountability pathway and do not combine the historical counts with the recalculated table. Reconciling the original nominations, duplicate entries, and participation record is required before stronger structural conclusions can be drawn.

Sensitivity of the global ordering

Table 9 reports the equal-weight baseline and all eight perturbation scenarios. Raising one cluster weight by 20% gives a normalised selected weight of 0.285714 and other weights of 0.238095. Lowering it gives 0.210526 and 0.263158, respectively. Spearman correlations with the baseline range from 0.679 to 0.886. The lowest correlations occur when C3 or C2 is reduced, indicating that the overall element order changes appreciably under those assumptions.

Table 9. Sensitivity scenarios around the equal-weight baseline

Scenario	Normalised weights C1 / C2 / C3 / C4	Leading positions 1–4 including boundary ties	Spearman ρ
Baseline	0.2500 / 0.2500 / 0.2500 / 0.2500	C4.1; C2.1; C3.1 = C3.2	1.000
C1 -20%	0.2105 / 0.2632 / 0.2632 / 0.2632	C4.1; C2.1; C3.1 = C3.2	0.793
C1 +20%	0.2857 / 0.2381 / 0.2381 / 0.2381	C1.1 = C1.3; C4.1; C1.4 = C1.5	0.784
C2 -20%	0.2632 / 0.2105 / 0.2632 / 0.2632	C4.1; C3.1 = C3.2; C3.4	0.680
C2 +20%	0.2381 / 0.2857 / 0.2381 / 0.2381	C2.1; C2.2; C4.1; C2.4	0.886
C3 -20%	0.2632 / 0.2632 / 0.2105 / 0.2632	C4.1; C2.1; C2.2; C1.1 = C1.3	0.679
C3 +20%	0.2381 / 0.2381 / 0.2857 / 0.2381	C3.1 = C3.2; C3.4; C4.1	0.859
C4 -20%	0.2632 / 0.2632 / 0.2632 / 0.2105	C2.1; C3.1 = C3.2; C2.2	0.852
C4 +20%	0.2381 / 0.2381 / 0.2381 / 0.2857	C4.1; C4.3; C2.1; C3.1 = C3.2	0.837

Source: Authors' calculations from ISGTEM Workbook Data file. “=” indicates a numerical tie. Ties at the fourth-position boundary can produce five listed elements. Correlations use all 24 elements and average ranks; local weights remain fixed.

C4.1 remains first in four scenarios. Other scenarios place C2.1, the tied C3.1–C3.2 pair, or the tied C1.1–C1.3 pair first. The findings support using the weights to organise a set of priorities under explicit assumptions, rather than selecting a universal first intervention. Local ranks remain unchanged because the scenarios hold local vectors fixed; this is a feature of the calculation, not an additional empirical robustness result. The analysis does not vary individual responses or estimate statistical uncertainty.

ISGTEM architecture and theoretical implications

Figure 2 displays all 24 elements using shortened labels; Table 7 provides their full names. Equal cluster weights are shown consistently. The figure describes how four domains are brought into one conceptual architecture. It does not depict estimated causal paths, and the ten exploratory links are reported separately in Table 8.

The theoretical contribution is an explicit division of analytical roles within a shared framework. GVC governance and upgrading concern participation and capability development (Kano et al., 2020). Halal governance specifies eligibility and assurance; Islamic finance specifies the resources needed to act on commercial opportunities; digital trade specifies information and transaction connectivity; and Maqasid specifies the quality of the resulting participation. This organisation supports the proposition that competitiveness depends on both meeting requirements and financing and executing transactions. Testing that proposition requires firm-level outcomes.

ISGTEM with Four Complementary Domains

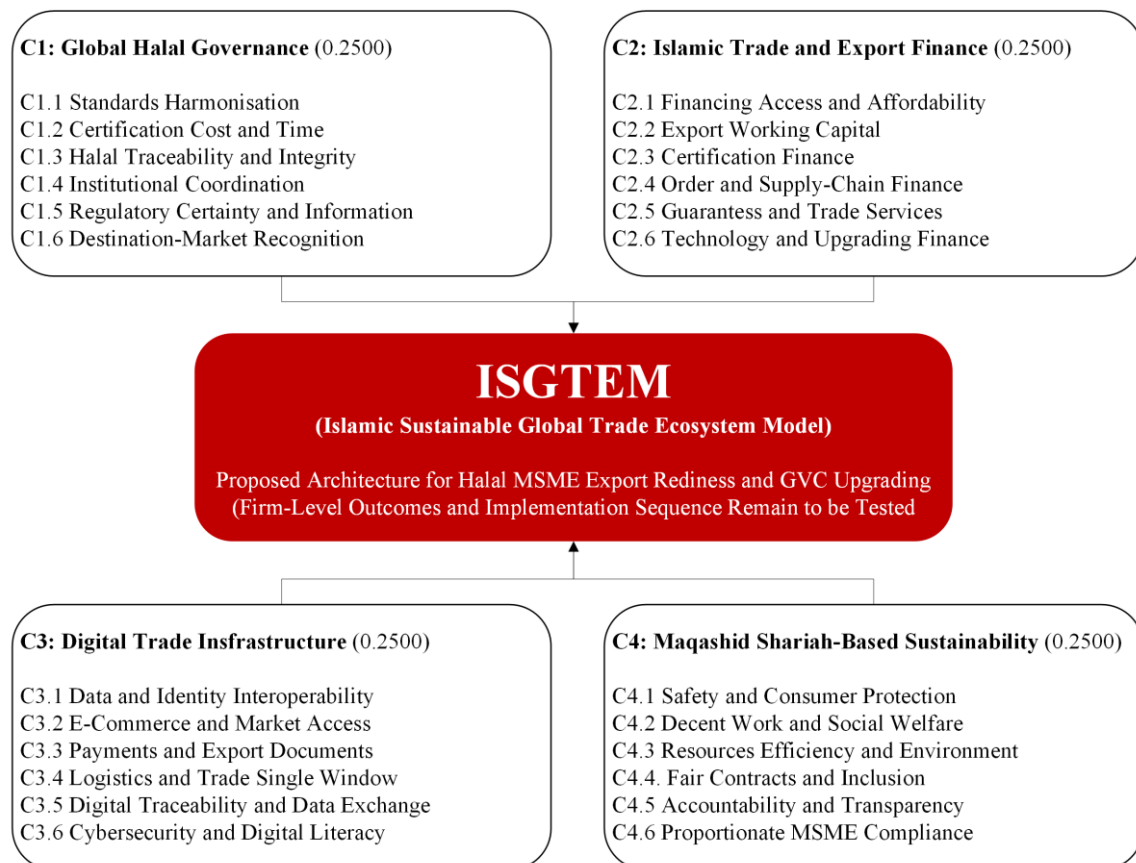


Figure 2. ISGTEM architecture with all 24 elements and equal cluster weights

Source: Authors' model and recalculated priorities. Labels are abbreviated; full element names appear in Table 7. The architecture does not establish effects on export performance.

Maqasid-based sustainability operates both as a domain with six explicit elements and as a normative perspective for interpreting the proposed applications. Its highest-ranked element concerns consumer safeguards, while its aggregate cluster weight remains equal to the other domains. This distinction avoids inferring cluster superiority from one high-ranking element. Related work connects Islamic finance and sustainable development to social and environmental objectives (Agustin et al., 2023; Fatha Isman & Kaltsum, 2022; Harahap et al., 2023; Nasir et al., 2022); within ISGTEM, those objectives remain criteria for evaluation rather than measured impacts.

Policy and managerial implications

The provisional priorities suggest examining consumer protection, affordable finance, interoperable business data, and digital market access together. Policymakers could use the framework to define a pilot that links destination-specific certification assistance with working-capital facilities and compatible documentation systems. Before allocating resources, the pilot should verify the local constraints and specify which outcomes it intends to change. The weights are not a cost–benefit analysis, and an element’s lower rank does not imply that it can be omitted when it is a prerequisite for a particular market.

For MSMEs and support organisations, the proposed maturity roadmap translates the four domains into practical planning questions (Table 10). Compliance readiness concerns lawful and credible participation. Transaction readiness concerns the ability to execute an order. Digital connectivity concerns reliable information and transaction exchange. Sustainable upgrading concerns improvements in capabilities and the distribution of benefits. The stages can overlap; they do not constitute a validated maturity scale or a demonstrated sequence of causation.

Table 10. Proposed maturity roadmap for planning and subsequent evaluation

Planning stage	Capability to examine	Illustrative evidence for a future pilot
Compliance readiness	Destination-specific legal, halal, safety, and quality requirements	Current certificates, input records, audit findings, and buyer requirements
Transaction readiness	Costing, funded capacity, order fulfilment, and risk management	Cost sheets, cash-flow plans, financing agreements, and delivery records
Digital connectivity	Interoperable identity, documents, payments, traceability, and logistics	Usable data links, transaction records, and traceability coverage
Sustainable upgrading	Resource efficiency, decent work, transparent governance, and fair participation	Operational improvements, workforce records, complaints handling, and contract terms

Source: Authors’ proposed roadmap. These are planning and evaluation categories, not observations collected in this study.

Evaluation should separate enabling conditions from outcomes. Certification time, financing availability, data interoperability, and consumer safeguards describe conditions that a pilot can monitor. First export entry, export intensity, repeat orders, growth, diversification, and GVC upgrading describe outcomes at the firm level (Table 2). Baseline and follow-up measurements, with a suitable comparison group where

feasible, would permit a stronger assessment than inferring success from changes in a priority score.

Limitations and further validation

The principal limitations concern both evidence and scope. The small, academically concentrated panel limits stakeholder coverage, and the dependency records contain repeated expert–link entries without a complete response denominator. Hierarchical weighting does not model network feedback. Cluster-level perturbations assess sensitivity to selected assumptions, while leaving local judgements fixed. Finally, no MSME export outcomes were observed. These limitations prevent claims of authenticated consensus, generalisable effect sizes, or empirical validation of the model’s effectiveness at this stage.

CONCLUSION AND SUGGESTION

ISGTEM provides a four-cluster, 24-element architecture linking halal governance, Islamic trade and export finance, digital infrastructure, and Maqasid-based sustainability. The available Delphi records show high agreement from the first round, but the rise in third-round IQR does not establish stabilisation. The final pairwise inputs yield equal cluster weights and consistent matrices. Consumer safeguards rank first globally, financing access second, and interoperability and digital market access jointly third.

The ten candidate dependencies remain exploratory. Collapsing repeated records leaves three distinct coded ratings per link and identical intensity means, so the current data do not identify a dominant pathway. Sensitivity scenarios show that the global order depends on cluster weighting. The model’s contribution is therefore an integrated conceptual architecture, conditional priorities, and a proposed maturity roadmap; improved export performance has not been demonstrated.

A subsequent MSME study should test the measurable export dimensions in Table 2 and the proposed connection between compliance, transaction finance, digital connectivity, and upgrading. These steps are necessary before stronger empirical or implementation claims can be made.

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APPENDIX A

Item-level Delphi statistics are provided for all 24 elements. Each item has 15 coded ratings per round. Agreement counts ratings of 4 or 5; medians and IQRs use the original five-point scale. The recorded dates are 1, 8, and 15 July 2026.

Table A1. Agreement, median, and IQR for each element and round

Code	R1 Agr. %	R1 Med.	R1 IQR	R2 Agr. %	R2 Med.	R2 IQR	R3 Agr. %	R3 Med.	R3 IQR
C1.1	80.0	4.0	0.00	86.7	5.0	0.00	100.0	5.0	1.00
C1.2	80.0	4.0	0.00	100.0	5.0	0.00	100.0	4.0	1.00
C1.3	80.0	4.0	1.00	100.0	5.0	0.00	100.0	4.0	1.00
C1.4	86.7	4.0	1.00	93.3	5.0	0.00	100.0	4.0	0.00
C1.5	80.0	4.0	0.00	93.3	5.0	0.00	100.0	4.0	1.00
C1.6	80.0	4.0	0.00	100.0	5.0	0.00	100.0	4.0	0.00
C2.1	80.0	4.0	1.00	100.0	5.0	0.00	100.0	4.0	0.50
C2.2	80.0	4.0	0.50	93.3	5.0	0.00	100.0	4.0	0.50
C2.3	80.0	4.0	1.00	93.3	5.0	0.00	100.0	5.0	1.00
C2.4	86.7	4.0	0.50	100.0	5.0	0.00	100.0	4.0	0.00
C2.5	80.0	4.0	1.00	100.0	5.0	0.00	93.3	4.0	0.50
C2.6	80.0	4.0	0.50	100.0	5.0	0.00	100.0	4.0	0.50
C3.1	80.0	4.0	0.00	100.0	5.0	0.00	100.0	4.0	0.50
C3.2	80.0	4.0	1.00	100.0	5.0	0.00	100.0	4.0	0.00
C3.3	80.0	4.0	0.00	100.0	5.0	0.00	100.0	4.0	1.00
C3.4	80.0	4.0	0.00	86.7	5.0	0.00	100.0	4.0	0.50
C3.5	80.0	4.0	1.00	100.0	5.0	0.00	93.3	4.0	1.00
C3.6	80.0	4.0	0.00	100.0	5.0	1.00	100.0	5.0	1.00
C4.1	80.0	4.0	1.00	93.3	5.0	0.00	100.0	4.0	1.00
C4.2	86.7	4.0	1.00	100.0	5.0	0.00	100.0	4.0	1.00
C4.3	80.0	4.0	0.50	100.0	5.0	0.00	100.0	4.0	1.00
C4.4	80.0	4.0	0.50	100.0	5.0	0.00	93.3	4.0	1.00
C4.5	80.0	4.0	0.50	93.3	5.0	1.00	100.0	4.0	1.00
C4.6	80.0	4.0	0.00	100.0	5.0	0.00	100.0	4.0	0.50

Source: Authors' calculations from ISGTEM Workbook Data file. Quartiles use inclusive linear interpolation. Agr. = agreement; Med. = median; IQR = interquartile range.