

Sustainability by the Ethics of Unity of Knowledge Between Economy, Science, and Society by the Qur'anic Methodological Worldview of Complementarities

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ABSTRACT

Background: Sustainability increasingly requires a framework capable of integrating economic development, scientific advancement, social wellbeing, and ethical responsibility, yet prevailing approaches often treat these dimensions as separate or only loosely connected domains.

Aims: This study aims to develop a Qur'anic epistemological model of sustainability grounded in the Unity of Knowledge (Tawhid) and to explain how moral consciousness, endogenous ethics, complementarity, circular causation, evolutionary learning, and wellbeing can be integrated into a coherent analytical structure.

Method: A conceptual-theoretical design was employed, combining interdisciplinary synthesis, comparative interpretation, mathematical formalization, and a limited analytical illustration using Islamic participatory financing data for 2011–2018 drawn from the Islamic Development Bank Annual Report 2019.

Results: The resulting framework represents sustainability as a recursive process in which economy, science, and society interact through knowledge-induced complementarities, while the wellbeing function serves as the principal evaluative criterion. The analytical illustration shows that Murabaha, leasing and loan-based financing with Istisna'a, and Awqaf financing did not move uniformly over the observed period; most estimated relationships were positive, although one negative cross-financing coefficient indicated incomplete complementarity. The knowledge or consciousness model produced positive coefficients for all three financing variables, with a combined elasticity of approximately 0.9752.

Conclusion: The study concludes that normative compatibility alone does not ensure systemic sustainability, because sustainable wellbeing depends on reciprocal and ethically embedded relationships among interconnected socio-scientific domains. The proposed framework contributes a unified epistemological perspective that positions ethical consciousness as an endogenous organizing principle linking knowledge formation, institutional interaction, and long-term sustainability.

INTRODUCTION

The pursuit of sustainability has become one of the defining intellectual and policy challenges of the twenty-first century as societies seek to balance economic development, scientific advancement, environmental stewardship, and social wellbeing. Although the concept of sustainability has evolved substantially since the publication of the Brundtland Report, contemporary discourse increasingly recognizes that technological innovation and economic growth alone are insufficient to address persistent global crises such as climate change, ecological degradation, widening socioeconomic inequality, and declining public trust in institutions (Reduction, 2023; Sachs, 2022). Recent debates have therefore shifted from viewing sustainability as merely the efficient management of natural resources toward understanding it as a multidimensional process involving ethical responsibility, institutional transformation, and long-term societal resilience (Purvis et al., 2022; Rockström et al., 2023). Nevertheless, much of the existing sustainability literature continues to emphasize material indicators and policy performance while paying comparatively limited attention to the epistemological and moral foundations that shape human decision-making. Consequently, the search for a more comprehensive sustainability paradigm has stimulated renewed interest in ethical frameworks capable of integrating economic, scientific, and social dimensions into a coherent vision of planetary wellbeing.

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Despite remarkable progress in sustainability science, significant empirical challenges continue to demonstrate the limitations of prevailing development models. International assessments indicate that many countries have struggled to achieve the Sustainable Development Goals (SDGs), not merely because of technological or financial constraints but also because of fragmented governance, conflicting institutional priorities, and weak ethical integration across economic, scientific, and social systems (Leal Filho et al., [2025](#); Sachs et al., [2024](#)). In many policy contexts, economic growth remains pursued independently of scientific responsibility and social justice, while environmental protection is often treated as a corrective mechanism rather than an intrinsic component of development. Such compartmentalized approaches reinforce institutional fragmentation, reduce policy coherence, and weaken collective responses to increasingly interconnected global challenges, including biodiversity loss, financial instability, and technological disruption (OECD, [2023](#)). These developments suggest that sustainability cannot be adequately understood through isolated disciplinary perspectives but instead requires an integrated framework capable of explaining how ethical commitments shape interactions among economy, science, and society. Strengthening the ethical architecture of sustainability has therefore become an increasingly important scholarly and practical concern.

One of the principal reasons for this fragmentation lies in the enduring influence of methodological individualism and utilitarian reasoning within conventional economic and social theories. Dominant analytical frameworks generally assume that rational individuals maximize personal utility and that broader social outcomes emerge from the aggregation of individual preferences, an assumption that has profoundly influenced modern economics, public policy, and organizational decision-making (Drakopoulos, [2025](#); Zhao & Wang, [2026](#)). Although these approaches have generated valuable analytical tools, they often treat ethical values as external constraints rather than endogenous elements embedded within social interaction and institutional evolution. Consequently, relationships among economic actors are frequently interpreted through competition, optimization, and efficiency rather than through reciprocal learning, moral responsibility, and cooperative complementarities. Recent scholarship in sustainability ethics and Islamic economics has increasingly questioned this reductionist perspective, arguing that enduring sustainability requires ethical values to emerge from continuous interaction, mutual trust, and shared responsibility rather than being imposed as external normative principles (Rahma et al., [2025](#); Yilmaz, [2024](#)). These considerations provide a strong rationale for exploring an alternative epistemological framework in which endogenous ethics, rather than methodological individualism, becomes the organizing principle of sustainability across economy, science, and society.

Within this context, the Qur'anic methodological worldview offers an alternative epistemological foundation by conceptualizing sustainability as a process of continuous ethical learning rooted in the unity of knowledge (tawhid). Rather than treating economy, science, and society as autonomous domains connected only through policy coordination, the Qur'anic perspective understands these dimensions as organically interrelated through moral consciousness, reciprocal learning, and complementary relationships that continuously shape human wellbeing. This worldview extends beyond conventional normative ethics by emphasizing that knowledge itself is inherently relational, integrating material, social, and spiritual dimensions into a unified epistemic system. Consequently, ethical values are not external regulatory instruments but endogenous principles that evolve through interaction, integration, and continuous learning across individuals, institutions, and society. Such an approach has become increasingly relevant in an era characterized by technological acceleration, artificial intelligence, environmental uncertainty, and fragmented governance, where sustainability requires not only institutional innovation but also a coherent moral and epistemological foundation capable of guiding long-term collective wellbeing.

Over the past five years, sustainability scholarship has increasingly emphasized that achieving long-term development requires the integration of ethical values with environmental, economic, and social governance rather than relying solely on technological advancement or policy intervention. Contemporary studies have demonstrated that sustainability ethics provide an essential normative

foundation for responsible governance, intergenerational justice, and institutional resilience, thereby extending sustainability beyond environmental management toward value-oriented societal transformation (Mhlanga, [2026](#); Susana et al., [2025](#)). Parallel developments in circular economy research have highlighted regenerative production systems, resource efficiency, and industrial symbiosis as mechanisms for minimizing waste and enhancing economic resilience, yet these frameworks predominantly conceptualize sustainability through material circulation and production processes rather than through the epistemological foundations of ethical knowledge (Arnould, [2022](#); Kativu, [2025](#)). Within Islamic economics, recent studies have reinforced the importance of justice (adl), stewardship (khalifah), and social welfare (maslahah) as normative principles supporting inclusive and sustainable development, particularly through Islamic finance, waqf, and socially responsible investment (Bulut & Dembele, [2026](#)). At the same time, expanding research on artificial intelligence and digital governance has introduced new debates concerning algorithmic accountability, human dignity, transparency, and ethical decision-making, suggesting that technological progress cannot be separated from broader moral considerations (Floridi, [2024](#); Ganbaatar, [2025](#)). Likewise, evaluations of the Sustainable Development Goals have increasingly acknowledged that effective implementation depends not only on measurable indicators but also on institutional coherence, public participation, and ethical governance capable of supporting transformative sustainability pathways (Leal Filho et al., [2025](#); Sachs et al., [2024](#)). Collectively, these developments indicate an emerging consensus that ethics is indispensable to sustainability, although ethical principles are generally incorporated as normative complements rather than as the epistemological foundation governing the interaction among economy, science, and society.

Despite these significant advances, important conceptual and methodological gaps remain unresolved. Systems Theory successfully explains the complexity and interdependence of socio-ecological systems but primarily focuses on systemic interactions without explicitly establishing an epistemological principle that governs the ethical formation of those interactions. Circular Economy frameworks provide practical strategies for regenerative production and resource efficiency; however, they remain largely concerned with material flows and industrial processes, offering limited explanation of how ethical consciousness emerges as an endogenous driver of sustainability. Similarly, Maqasid al-Shariah and Islamic Moral Economy contribute valuable normative principles concerning justice, human welfare, and socio-economic responsibility, yet they generally emphasize legal, institutional, and distributive objectives rather than developing an integrated methodology that explains the continuous interaction among knowledge, ethics, economy, science, and society. Meanwhile, the Sustainable Development Goals have become the dominant global framework for sustainability governance, but their operational emphasis on measurable development indicators provides relatively limited attention to the epistemological processes through which ethical consciousness shapes sustainable decision-making and institutional evolution. Consequently, existing literature has yet to develop a comprehensive sustainability framework that systematically conceptualizes ethical values as endogenous epistemological forces operating through continuous interaction, integration, and evolutionary learning across interconnected systems. This study addresses that gap by proposing the Qur'anic worldview of Unity of Knowledge as a comprehensive epistemological framework in which sustainability is understood not merely as balanced development, but as a continuously evolving process of moral inclusiveness, endogenous complementarities, and wellbeing formation. Rather than replacing existing sustainability paradigms, the proposed framework complements Systems Theory, Circular Economy, Islamic Moral Economy, Maqasid al-Shariah, and the SDGs by providing a unifying epistemological foundation capable of integrating their respective strengths within a coherent model of ethical sustainability.

Against this background, the present study aims to develop a Qur'anic epistemological model of sustainability grounded in the principle of Unity of Knowledge and to demonstrate its conceptual application through the formulation of the wellbeing function as the governing criterion of morally inclusive sustainability. Specifically, the study seeks to explain how continuous interaction, integration, and evolutionary learning generate endogenous complementarities linking economy, science, and society

within a unified ethical system. Theoretically, this paper contributes to sustainability scholarship by repositioning ethical consciousness from a supplementary normative consideration to the central epistemological mechanism through which sustainable development is understood and evaluated. Methodologically, it advances a formal conceptual framework that integrates the wellbeing function, circular causation, and complementary system dynamics into a coherent analytical model capable of supporting future empirical operationalization. From a practical perspective, the framework offers policymakers, sustainability researchers, and practitioners a broader evaluative perspective for designing development policies that integrate ethical responsibility, scientific innovation, economic resilience, and social wellbeing within a unified sustainability paradigm. By bridging contemporary sustainability discourse with the Qur'anic methodological worldview, this study extends existing literature through an interdisciplinary framework that strengthens the theoretical foundations of sustainability while providing a systematic basis for future conceptual refinement and empirical investigation.

METHOD

Research Design

This study adopted a conceptual-theoretical research design to develop an integrated methodological framework for sustainability grounded in the Qur'anic worldview of the unity of knowledge. Rather than examining behavioural phenomena through primary empirical observations, the study focused on reconstructing the epistemological, ethical, and analytical foundations of sustainability by integrating concepts originating from Islamic epistemology, sustainability science, systems thinking, and Islamic economics into a coherent explanatory framework. Contemporary conceptual research emphasizes that theoretical contributions emerge through the systematic integration of previously fragmented concepts into an internally consistent structure capable of generating new explanations rather than merely summarizing existing literature (Luft et al., [2022](#); Rivard, [2024](#)). Accordingly, the methodological framework was developed by combining conceptual synthesis, cross-disciplinary comparison, mathematical formalization, and a limited secondary-data illustration to demonstrate how the proposed relationships could be represented analytically. The framework therefore explains sustainability as a dynamic process of interaction, integration, complementarity, and evolutionary learning among economy, science, society, and moral consciousness instead of viewing these dimensions as independent or static components. This methodological orientation preserves the conceptual nature of the research while providing a structured analytical basis for the subsequent formalization of the wellbeing function and circular causation model.

Research Materials

The methodological framework was developed from four complementary categories of research materials that collectively established the epistemological, theoretical, analytical, and illustrative foundations of the proposed sustainability model. The primary material consisted of the Qur'an, which was treated as the principal epistemological source for explaining the concept of Tawhid and the unity of knowledge as the origin of moral consciousness and the philosophical basis of sustainability. Supporting materials included interdisciplinary scholarly publications addressing sustainability, Islamic economics, endogenous ethics, systems thinking, social causation, wellbeing, circular economy, and evolutionary learning because these disciplines collectively explain the reciprocal relationships among economy, science, and society. Contemporary sustainability frameworks, particularly the Brundtland Report and the Sustainable Development Goals, were incorporated as comparative references to evaluate the extent to which existing sustainability paradigms accommodate ethical integration and epistemological unity, an approach that is consistent with framework-based conceptual synthesis (Siuta-Tokarska & Adamczyk, [2026](#)). Finally, the analytical applicability of the proposed framework was illustrated using aggregate secondary data reported in the Islamic Development Bank Annual Report 2019, specifically Murabaha financing, leasing and loan-based financing combined with Istisna'a, and the Awqaf Properties

Investment Fund for the period 2011–2018, thereby demonstrating how the conceptual model could be translated into a formal representation without altering its fundamentally theoretical orientation. The integration of these research materials enabled the framework to connect normative principles, conceptual reasoning, and analytical representation within a single methodological structure while remaining consistent with the original objective of developing a comprehensive sustainability model.

Table 1. Research Materials and Their Analytical Functions

Research Materials	Main Sources	Primary Function	Contribution to Framework
Epistemological Materials	The Qur'an (<i>Tawhid</i> and Unity of Knowledge)	Establishes the philosophical foundation	Defines the origin of knowledge, ethics, and sustainability
Theoretical Materials	Sustainability science, Islamic economics, systems thinking, endogenous ethics, wellbeing, social causation	Develops conceptual relationships	Explains interaction among economy, science, and society
Comparative Sustainability Materials	Brundtland Report, Sustainable Development Goals, contemporary sustainability literature	Provides conceptual comparison	Identifies similarities, limitations, and theoretical gaps
Analytical Materials	Islamic Development Bank Annual Report (2011–2018)	Illustrates model applicability	Demonstrates formal estimation of the wellbeing framework

Table 1 presents the research materials employed throughout the study together with their respective analytical functions during framework development. Rather than treating all documentary sources as homogeneous references, the materials were organized according to the distinct roles they performed within the methodological process. The epistemological materials established the philosophical origin of the framework, whereas the theoretical materials explained the conceptual relationships among ethics, economy, science, and society. Comparative sustainability materials enabled critical evaluation of contemporary sustainability paradigms, while the analytical materials demonstrated how the conceptual framework could be represented mathematically through the wellbeing function and reciprocal financing relationships. This organization improves methodological transparency by showing that each category contributed a specific component to the construction of the integrated sustainability framework rather than serving merely as supporting literature.

Framework Development Procedure

The framework was developed through an iterative conceptual process that integrated epistemological reasoning, interdisciplinary theoretical synthesis, and analytical formalization into a unified methodological structure. Initially, the Qur'anic worldview of the unity of knowledge was established as the epistemological foundation from which the concepts of moral consciousness, endogenous ethics, and complementarity were derived. Subsequently, relevant concepts from sustainability science, Islamic economics, systems theory, and wellbeing studies were critically interpreted and compared to identify convergent principles capable of explaining reciprocal interactions among economy, science, and society, a process consistent with contemporary theory-building practice (Al-Jayyousi et al., 2022; Bonang et al., 2026). The extracted concepts were then synthesized into an integrated conceptual model in which interaction, integration, complementarity, and evolutionary learning functioned as the principal mechanisms connecting the structural dimensions of sustainability. Following conceptual integration, the framework was translated into a formal analytical representation through the wellbeing function and circular-causation equations, thereby linking philosophical assumptions with mathematically interpretable relationships. This iterative development procedure ensured that every analytical component originated from the same epistemological foundation and contributed consistently to the proposed sustainability framework.

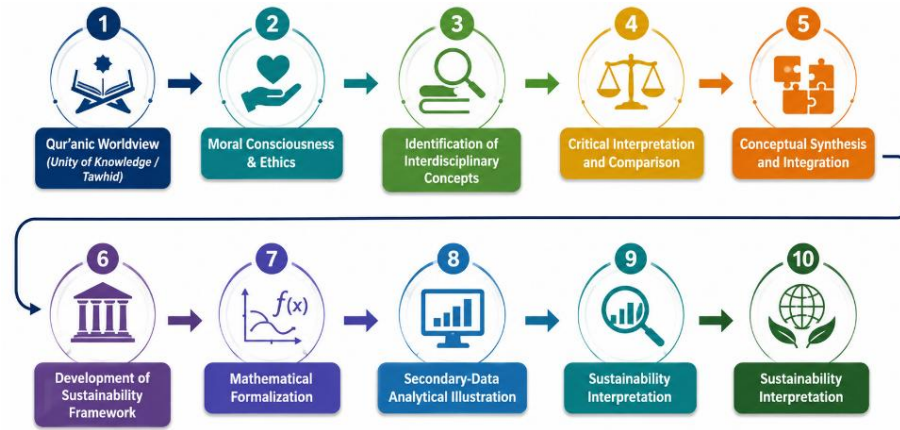


Figure 1. Framework Development Procedure

Figure 1 illustrates the methodological pathway through which the proposed sustainability framework was developed. The process begins with the Qur'anic worldview because the unity of knowledge provides the epistemological basis from which the remaining concepts are interpreted. Moral consciousness and endogenous ethics subsequently establish the normative orientation before interdisciplinary concepts are critically interpreted, compared, and synthesized into an integrated conceptual framework. The synthesized framework is then translated into mathematical expressions through the wellbeing function and circular-causation model, allowing reciprocal relationships among economy, science, and society to be represented analytically. Finally, secondary data from Islamic participatory financing are employed solely to illustrate the operational applicability of the framework rather than to provide definitive empirical validation. Consequently, the figure demonstrates that theoretical reasoning, analytical representation, and illustrative application constitute a continuous methodological process rather than independent stages.

Conceptual Model Formalization

The integrated sustainability framework was formalized to represent the reciprocal relationships among unity of knowledge, moral consciousness, economy, science, society, and wellbeing within a coherent analytical structure. A theoretically meaningful framework should identify its principal constructs, clarify their analytical functions, and explain the logic connecting its epistemological assumptions with its formal propositions before mathematical expressions are introduced (Godino et al., 2022). Accordingly, unity of knowledge was positioned as the epistemological foundation, whereas moral consciousness, endogenous ethics, and moral inclusiveness constituted the normative basis guiding the selection of desirable socio-scientific choices. Economy, science, and society were treated as mutually dependent structural domains whose relationships evolve through continuous interaction, integration, complementarity, circular causation, and evolutionary learning. The wellbeing function was then established as the evaluative criterion through which the direction and degree of complementarity among these domains could be interpreted. This formal organization translates the article's conceptual arguments into an analytically interpretable model without reducing sustainability to a static aggregation of independent economic, social, or scientific indicators.

Table 2. Conceptual Domains of the Proposed Sustainability Framework

Conceptual layer	Principal construct	Analytical function
Epistemological foundation	Unity of knowledge and Tawhid	Establishes the origin, direction, and unifying principle of the framework
Normative foundation	Moral consciousness, endogenous ethics, and moral inclusiveness	Guides value formation and the identification of ethically desirable choices
Structural domains	Economy, science, and society	Represents the principal interdependent components of the socio-scientific system

Functional mechanisms	Interaction, integration, complementarity, and evolutionary learning	Explains how relationships develop, reinforce one another, and change across processes
Relational representation	Circular causation	Formalizes the reciprocal interdependence among the structural domains
Evaluation criterion	Wellbeing function	Assesses the direction and degree of system-wide complementarity
Temporal dimension	Knowledge, space, time, and event-historicism	Represents continuity and transformation across evolutionary learning processes

Table 2 organizes the principal components of the proposed sustainability framework according to their distinct methodological roles. The epistemological layer establishes the origin of the framework, while the normative layer explains how moral consciousness and endogenous ethics guide the formation of desirable choices. Economy, science, and society are positioned as interdependent structural domains rather than separate dimensions that can be evaluated independently. Interaction, integration, complementarity, and evolutionary learning explain how relationships among these domains emerge and change, whereas circular causation provides their formal relational representation. The wellbeing function evaluates whether the resulting interactions move the integrated system toward complementarity or toward substitution and fragmentation. This organization improves theoretical transparency because framework-based research should make explicit how each construct contributes to the explanatory logic of the model (Mahmoud et al., 2026; Waqar et al., 2026).

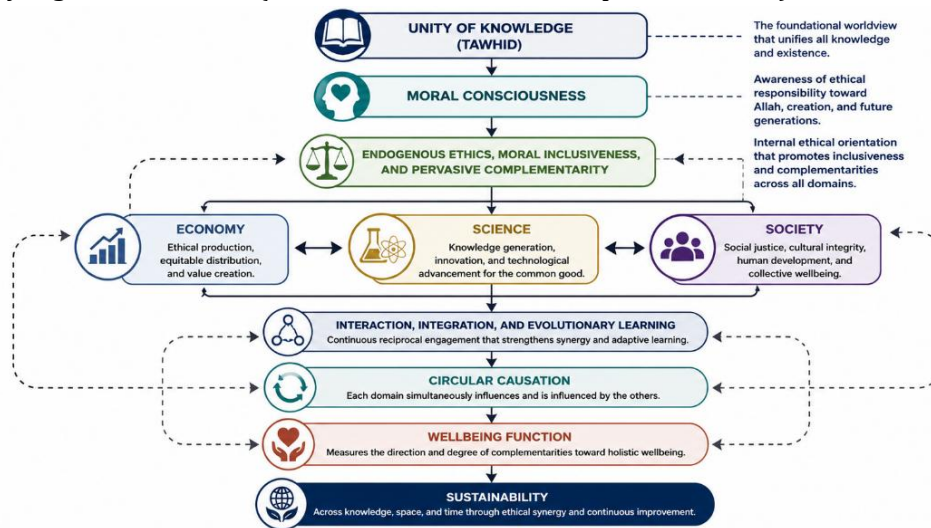


Figure 2. Conceptual Structure of the Proposed Sustainability Framework

Source: Authors' conceptual synthesis based on the methodological structure of the study.

Figure 2 illustrates the internal logic of the proposed sustainability framework from its epistemological origin to its evaluative outcome. Unity of knowledge provides the foundational worldview from which moral consciousness, endogenous ethics, moral inclusiveness, and pervasive complementarity are derived. These principles govern the reciprocal relationships among economy, science, and society, which are represented as interconnected subsystems rather than independent analytical categories. Their continuous interaction and integration generate evolutionary learning, while circular causation formalizes how each subsystem simultaneously influences and is influenced by the others. The wellbeing function evaluates the degree to which these recursive relationships produce complementary rather than substitutive outcomes. Sustainability is therefore interpreted as the continuity of knowledge-induced wellbeing across knowledge, space, time, and successive processes of event-historicism.

Mathematical Representation of the Framework

The conceptual relationships shown in Table 2 and Figure 2 were translated into mathematical expressions to make the internal logic of the proposed framework analytically explicit. Formal

representation supports theory development when it clarifies constructs and relationships without replacing the conceptual reasoning from which the model originates (Kallia & Cutts, 2023; Liu et al., 2024). The formalization begins with the event-historicism coordinate, followed by the generalized wellbeing function and a circular-causation system connecting the economic, social, and scientific domains. These relationships are recursive because none of the three domains is treated as entirely independent, strictly exogenous, or exclusively causal. The generalized framework is subsequently illustrated using secondary data on Islamic participatory financing instruments reported for 2011–2018. Because the dataset contains only eight annual observations, the estimated equations are interpreted as an analytical illustration of model application rather than as confirmatory evidence of universally generalizable causal relationships.

The following expressions may be inserted into Microsoft Word by pressing Alt + =, pasting each equation, and pressing Space to convert it into professional equation format.

Equation (1). Event-Historicism Coordinate

$$Z(\theta) = \{\theta, X(\theta), t(\theta)\}$$

Equation (2). Generalized Wellbeing Function

$$W(Z(\theta)) = W(xE(\theta), xsoc(\theta), xsc(\theta), t(\theta))$$

Equation (3). Economic Subsystem

$$xE(\theta) = f1\{xsoc(\theta), xsc(\theta), t(\theta)\}$$

Equation (4). Social Subsystem

$$xsoc(\theta) = f2\{xE(\theta), xsc(\theta), t(\theta)\}$$

Equation (5). Scientific Subsystem

$$xsc(\theta) = f3\{xE(\theta), xsoc(\theta), t(\theta)\}$$

Equations (1)–(5) represent the generalized sustainability framework. Equation (1) defines the event-historicism coordinate through knowledge or consciousness, knowledge-induced choices, and time, whereas Equation (2) specifies the wellbeing function as an integration of economic, social, scientific, and temporal dimensions. Equations (3)–(5) describe the circular-causation system in which each structural domain is endogenously related to the other two domains. In this formulation, $(Z(\theta))$ denotes the event-historicism coordinate, (θ) represents knowledge or consciousness, $(X(\theta))$ indicates the vector of knowledge-induced choices, and $(t(\theta))$ denotes time. The symbols $(xE(\theta))$, $(xsoc(\theta))$, and $(xsc(\theta))$ represent the economic, social, and scientific variable vectors, respectively. Collectively, these equations formalize sustainability as a reciprocal and continuously evolving process rather than as a set of independent dimensions.

Equation (6). Multiplicative Wellbeing Function

$$W(M, L, A) = CMaLbAc$$

Equation (7). Log-Linear Transformation

$$\ln W = \ln C + a \ln M + b \ln L + c \ln A$$

Equation (8). Estimated Murabaha Equation

$$\begin{aligned} \ln M &= 5.17890636 + 0.30791198 \ln L + 0.14450551 \ln A \\ R^2 &= 0.2835854 \end{aligned}$$

Equation (9). Estimated Leasing, Loan, and Istisna'a Equation

$$\ln L = 6.83650438 - 0.4045457 \ln A + 0.06434436 \ln M$$

$$R^2 = 0.81033341$$

Equation (10). Estimated Awqaf Financing Equation

$$\ln A = -13.680785 + 0.1366307 \ln M + 1.83040683 \ln L$$

$$R^2 = 0.81032015$$

Equation (11). Estimated Knowledge or Consciousness Equation

$$\ln \theta = -5.1830667 + 0.39390583 \ln M + 0.29159052 \ln L + 0.28967714 \ln A$$

$$R^2 = 0.99840769$$

Explanation of the Mathematical Representation

Equation (1) defines the event-historicism coordinate by integrating knowledge or consciousness (θ), the vector of knowledge-induced choices ($X(\theta)$), and time ($t(\theta)$) within a unified analytical domain. Equation (2) specifies wellbeing as a function of economic, social, and scientific variables, whereas Equations (3)–(5) represent their endogenous relationships through a system of circular causation. Equation (6) expresses the joint wellbeing contribution of Murabaha financing (M), leasing and loan-based financing combined with Istisna'a (L), and the Awqaf Properties Investment Fund (A), while Equation (7) provides its log-linear transformation. Equations (8)–(10) reproduce the reciprocal financing relationships reported in the Statistical Appendix, and Equation (11) estimates the relationship between the three financing instruments and the knowledge or consciousness parameter. Positive coefficients indicate complementarity, whereas negative coefficients identify substitution or insufficient integration among variables that are theoretically expected to reinforce collective wellbeing. Taken together, the equations provide an analytically interpretable representation of sustainability as a recursive and continuously evolving process rather than a deterministic or unidirectional causal system.

RESULTS AND DISCUSSION

Results

Emergent Structure of the Integrated Sustainability Framework

The conceptual synthesis produced an integrated sustainability framework comprising an epistemological foundation, a normative orientation, interconnected socio-scientific domains, reciprocal interaction mechanisms, and an evaluative wellbeing criterion. Unity of knowledge emerged as the foundational principle linking moral consciousness with the organization of desirable economic, scientific, and societal choices. Moral consciousness and endogenous ethics subsequently functioned as normative mechanisms through which these choices were directed toward moral inclusiveness rather than isolated individual or sectoral interests. Economy, science, and society emerged as mutually dependent structural domains connected through interaction, integration, complementarity, circular causation, and evolutionary learning. The wellbeing function provided the evaluative mechanism through which the direction and degree of these relationships could be interpreted. Sustainability therefore emerged as the continuity of ethically embedded complementarities capable of generating wellbeing across knowledge, space, and time.

Table 3. Emergent Components of the Integrated Sustainability Framework

Framework component	Resulting conceptual role	Sustainability implication
Unity of Knowledge	Provides the unifying epistemological orientation	Prevents fragmentation between knowledge, values, and action
Moral Consciousness	Internalizes ethical orientation	Directs socio-scientific choices toward responsible outcomes
Endogenous Ethics and Moral Inclusiveness	Embeds ethics within relationships	Positions ethics as an internal property of the system
Economy, Science, and Society	Forms interconnected structural domains	Prevents isolated sectoral treatment of sustainability

Complementarity	Connects desirable choices	Promotes mutually reinforcing relationships
Circular Causation	Establishes reciprocal interdependence	Allows each domain to influence and be influenced by the others
Evolutionary Learning	Sustains continuous adaptation	Enables relationships to develop across successive processes

Table 3 shows that sustainability was not produced as a single independent construct but as the outcome of several hierarchically connected conceptual components. Unity of knowledge and moral consciousness occupy the foundational level, whereas economy, science, and society constitute the operational domains in which ethically oriented choices are expressed. Complementarity, circular causation, and evolutionary learning connect these domains and allow their relationships to change recursively rather than remain fixed. The wellbeing function subsequently provides a common evaluative criterion for examining the direction of the resulting relationships within the integrated system. The table therefore demonstrates that the principal conceptual result of the study is an interconnected sustainability architecture rather than a collection of separate economic, social, and scientific indicators.

Complementarity and Circular-Causation Structure

The formalized framework showed that economic, societal, and scientific variables cannot be interpreted independently when sustainability is examined through the unity-of-knowledge perspective. Each domain operates endogenously because $(x_E(\theta))$, $(x_{soc}(\theta))$, and $(x_{sc}(\theta))$ are recursively related to one another within the same knowledge-induced system. The parameter (θ) represents knowledge or consciousness within these relationships, while the wellbeing function $(W[Z(\theta)])$ provides a common criterion for evaluating their combined direction. Positive reciprocal relationships correspond to complementary configurations, whereas negative relationships identify movements in an opposing direction within the modeled system. Evolutionary learning extends these relationships beyond a single analytical point by allowing interaction and integration to develop continuously across successive events. The resulting systemic structure is summarized in Figure 3.

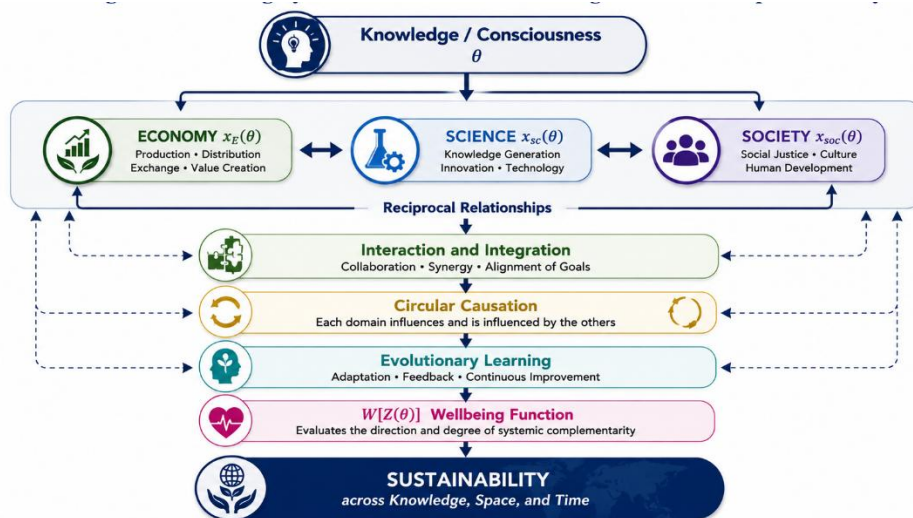


Figure 3. Resulting Systemic Structure of Knowledge-Induced Complementarity

Source: Authors' conceptual synthesis based on the resulting formal structure of the model.

Figure 3 visualizes the principal relational result generated by the formalized framework. Knowledge or consciousness is positioned above the socio-scientific system because (θ) induces the configuration of economic, scientific, and societal choices rather than functioning as another isolated sectoral variable. The bidirectional relationships among the three domains indicate that each component simultaneously operates as an influencing and influenced element within the circular-causation structure. Interaction and integration generate evolutionary learning, while the wellbeing function consolidates the resulting relationships into an evaluative representation of system performance.

Sustainability consequently appears as the continuation of complementary wellbeing across knowledge, space, and time rather than as the endpoint of a one-directional causal sequence.

Empirical Illustration of Islamic Participatory Financing

The empirical illustration applied the generalized framework to three Islamic participatory financing instruments using annual data for 2011–2018 reported in the Islamic Development Bank Annual Report 2019. Murabaha financing ((M)) increased from 2,923.4 in 2011 to its highest observed value of 6,829.5 in 2015 before fluctuating during the remaining years. Leasing and loan-based financing combined with Istisna'a ((L)) similarly reached its maximum value of 10,673.6 in 2015, whereas the Awqaf Properties Investment Fund ((A)) reached 89.1 in the same year. The normalized knowledge-related values associated with all three financing components were also set at 10.00 in 2015, producing an average (θ) value of 10.00 for that year. After 2015, the financing variables did not move uniformly, with Murabaha recovering to 5,499.4 by 2018 while (L) declined to 5,664.6 and (A) remained substantially below its 2015 peak at 32.2. These patterns provided the observed basis for examining the reciprocal relationships among the three financing instruments within the circular-causation system.

Table 4. Islamic Participatory Financing Data Used in the Analytical Illustration, 2011–2018

Year	(M)	(θ_1)	(L)	(θ_2)	(A)	(θ_3)	Average (θ)
2011	2,923.4	4.28	6,387.4	5.98	33.5	3.76	4.67
2012	4,377.5	6.40	7,290.6	6.56	42.8	4.80	5.92
2013	5,125.0	7.69	8,469.5	7.62	83.7	9.39	8.23
2014	5,314.3	7.97	9,846.6	8.86	63.8	7.16	8.00
2015	6,829.5	10.00	10,673.6	10.00	89.1	10.00	10.00
2016	4,097.2	6.15	6,710.0	6.04	29.4	3.30	5.16
2017	5,323.5	7.99	6,461.4	5.81	27.5	3.08	5.62
2018	5,499.4	8.25	5,664.6	5.10	32.2	3.61	5.65

Source: Islamic Development Bank Annual Report 2019, as reported in the Statistical Appendix.

Table 4 shows considerable year-to-year variation across the three participatory financing instruments and their corresponding normalized knowledge-related measures. All financing measures reached their highest observed values in 2015, which also served as the benchmark year in which (θ_1), (θ_2), and (θ_3) each reached 10.00. The post-2015 pattern was heterogeneous because Murabaha recovered after its 2016 decline, while leasing and loan-based financing continued to decrease and Awqaf financing remained comparatively low. Average (θ) consequently declined from 10.00 in 2015 to 5.16 in 2016 and remained between 5.62 and 5.65 during 2017–2018. The observed divergence among the variables shows that the financing components did not follow an identical temporal pattern over the eight-year period.

Estimated Circular-Causation and Wellbeing Relationships

The estimated circular-causation equations produced differentiated relational patterns across the three Islamic participatory financing instruments. In the Murabaha equation, both ($\ln L$) and ($\ln A$) had positive coefficients, whereas the leasing and loan-based financing equation contained a negative coefficient for ($\ln A$). The Awqaf equation produced positive coefficients for both ($\ln M$) and ($\ln L$), with the coefficient of ($\ln L$) being the largest among the reciprocal financing estimates. The knowledge or consciousness equation produced positive coefficients for all three financing variables and the highest reported (R^2) value among the estimated models. The combined elasticity coefficients of Murabaha, leasing and loan-based financing with Istisna'a, and Awqaf financing were approximately 0.9752. The estimated relationships are presented in Equations (8)–(11).

Equation (8). Estimated Murabaha Financing Model

$$\ln M = 5.17890636 + 0.30791198 \ln L + 0.14450551 \ln A$$

$$R^2 = 0.28358540$$

$$t = (0.72672864, 0.31790614, 0.31734493)$$

Equation (9). Estimated Leasing, Loan, and Istisna'a Financing Model

$$\ln L = 6.83650438 - 0.40454570 \ln A + 0.06434436 \ln M$$

$$R^2 = 0.81033341$$

$$t = (4.42601542, 3.77711224, 0.31790614)$$

Equation (10). Estimated Awqaf Financing Model

$$\ln A = -13.68078500 + 0.13663070 \ln M + 1.83040683 \ln L$$

$$R^2 = 0.81032015$$

$$t = (-3.45754840, 0.31734493, 3.77711224)$$

Equation (11). Estimated Knowledge or Consciousness Model

$$\ln \theta = -5.18306670 + 0.39390583 \ln M + 0.29159052 \ln L + 0.28967714 \ln A$$

$$R^2 = 0.99840769$$

$$t = (-12.46687300, 15.87516440, 5.37206366, 11.35198990)$$

Combined Elasticity

$$\Sigma \varepsilon = 0.39390583 + 0.29159052 + 0.28967714 = 0.97517349 \approx 0.9752$$

Equations (8)–(11) show that most estimated cross-financing coefficients were positive, although the pattern was not uniform across the circular-causation system. Equation (8) contains positive coefficients for both (L) and (A), while Equation (9) contains the only negative cross-financing coefficient, with ($\ln A$) negatively associated with ($\ln L$). Equation (10) shows positive coefficients for both Murabaha and (L), including a comparatively large coefficient of 1.83040683 for ($\ln L$). Equation (11) contains positive coefficients for all three financing components and produces a combined elasticity of approximately 0.9752. The estimated (R^2) values vary substantially across the four equations, ranging from 0.28358540 for the Murabaha equation to 0.99840769 for the knowledge or consciousness equation. These estimates describe the fitted relationships within the eight annual observations and are not interpreted here as evidence of universal causal effects.

Table 5. Estimated Circular-Causation and Knowledge Relationships

Dependent variable	Term	Estimated coefficient	Reported t-statistic	(R^2)
($\ln M$)	Constant	5.17890636	0.72672864	0.28358540
	($\ln L$)	0.30791198	0.31790614	
	($\ln A$)	0.14450551	0.31734493	
($\ln L$)	Constant	6.83650438	4.42601542	0.81033341
	($\ln A$)	-0.40454570	3.77711224	
	($\ln M$)	0.06434436	0.31790614	
($\ln A$)	Constant	-13.68078500	-3.45754840	0.81032015
	($\ln M$)	0.13663070	0.31734493	
	($\ln L$)	1.83040683	3.77711224	
($\ln \theta$)	Constant	-5.18306670	-12.46687300	0.99840769
	($\ln M$)	0.39390583	15.87516440	
	($\ln L$)	0.29159052	5.37206366	
	($\ln A$)	0.28967714	11.35198990	

Note: Coefficients, reported t-statistics, and (R^2) values reproduce the results presented in the Statistical Appendix. No additional significance thresholds are imposed because p-values and confidence intervals were not reported in the source results.

Table 5 consolidates the estimated coefficients, reported t-statistics, and coefficients of determination from the four fitted equations. The Murabaha equation exhibits the lowest (R^2), while the equations for (L) and (A) show substantially higher fitted variation and the $(\ln \theta)$ model produces the highest value at 0.99840769. The negative coefficient of $(\ln A)$ in the $(\ln L)$ equation is the only estimated cross-financing relationship with a direction opposite to the remaining coefficients. The $(\ln \theta)$ equation contains positive coefficients for Murabaha, (L), and Awqaf financing within the observed dataset. Because the analysis is based on eight annual observations and the Statistical Appendix does not report p-values, confidence intervals, or additional regression diagnostics, the table is interpreted descriptively as an illustration of the modeled relationships.

Discussion

The first major finding is that sustainability emerges from the proposed framework as an integrated epistemological and ethical architecture rather than as an aggregation of economic, environmental, scientific, and social outcomes. This interpretation extends contemporary sustainability thinking because unity of knowledge (tawhid) places moral consciousness upstream of institutional and sectoral choices, thereby making ethics constitutive of the system rather than an external constraint. Such a position is consistent with Al-Jayyousi et al. (2022), who demonstrate the relevance of Islamic worldviews to sustainable development, while Yilmaz (2024) similarly argues that Islamic moral economy requires a return to substantive morality rather than reliance on instrumental economic rationality. The result also responds to the fragmentation identified in contemporary sustainability scholarship, where interconnected global challenges cannot be adequately addressed through isolated disciplinary or policy domains (Purvis et al., 2022; Rockström et al., 2023). However, the present framework goes beyond these perspectives by proposing that integration originates at the epistemological level: economic, scientific, and societal activities become sustainable when their relationships are organized through a common moral orientation and directed toward collective wellbeing. This distinction addresses the theoretical gap identified in the manuscript, namely that prevailing sustainability paradigms recognize ethics but rarely conceptualize ethical consciousness as the epistemological mechanism governing interactions among economy, science, and society.

A second finding concerns the endogenous and reciprocal character of the relationships among economy, science, and society, which challenges the assumption that sustainability can be produced by optimizing each domain separately. Circular causation implies that changes within one domain alter the conditions under which the other domains operate, while evolutionary learning allows these reciprocal effects to be continually reconstructed through knowledge and experience; consequently, sustainability becomes a dynamic relational process rather than a fixed equilibrium. This interpretation complements recent systems-oriented sustainability research, including Mahmoud et al. (2026), while the emphasis on regenerative interdependence shares important ground with circular-economy thinking described by Arnould (2022). Yet circular economy approaches predominantly organize integration around material circulation and resource efficiency, whereas Rahma et al. (2025) demonstrate the possibility of connecting circularity with Islamic economic principles to establish a broader ethically informed model. The present findings advance this trajectory by locating complementarity not simply in resource flows but in knowledge-induced relationships whose ethical orientation develops endogenously through interaction, integration, and learning. This is particularly important given Kativu's (2025) identification of epistemological tensions between market rationalities and eco-cultural sustainability values, because it suggests that technical coordination alone cannot resolve conflicts generated by incompatible knowledge and value structures. Circular causation therefore represents more than a mathematical feature of the framework: it modifies conventional systems reasoning by specifying moral consciousness as an active condition shaping the direction in which interdependent subsystems evolve.

The empirical illustration adds an important qualification to this theoretical proposition because the three Islamic participatory financing instruments did not evolve uniformly across 2011–2018, despite belonging to an economic system normatively oriented toward Islamic principles. Their common peak in

2015 followed by divergent trajectories indicates that a shared normative identity does not automatically generate operational complementarity, an interpretation reinforced by the negative Awqaf coefficient in the leasing, loan, and Istisna'a relationship. This result is theoretically important because Islamic economic institutions are expected to connect economic activity with justice, welfare, and social responsibility; Bulut and Dembele (2026), for example, emphasize the contribution of Islamic social-finance institutions to sustainable human and economic development. Likewise, Bonang et al. (2026) connect the Islamic worldview with sustainability and equity, while Susana et al. (2025) demonstrate the importance of maqasid-oriented ethical reasoning for environmental governance. The divergence found here nevertheless suggests a distinction between possessing compatible normative objectives and achieving actual systemic complementarity: institutional design, allocation priorities, financing structures, and changing economic conditions can still cause instruments to move in different directions. This provides a critical extension of Islamic moral-economy scholarship because the relevant evaluative question becomes not merely whether an instrument is Shariah-compatible, but whether its interaction with other instruments generates reinforcing contributions to collective wellbeing. At the same time, because the empirical illustration contains only eight annual observations, this interpretation should be understood as evidence of the framework's analytical capacity to identify relational tension rather than as proof of a stable causal mechanism.

The fourth finding is the predominantly positive structure of the estimated relationships, particularly in the knowledge or consciousness equation, alongside one negative cross-financing relationship and substantial variation in model fit. Conceptually, the positive coefficients associated with Murabaha, leasing and loan-based financing with Istisna'a, and Awqaf financing in the $\ln\theta$ equation are compatible with the proposition that materially different economic instruments can participate in a common knowledge-induced wellbeing system, while the combined elasticity of approximately 0.9752 indicates a strongly positive joint configuration within this illustrative specification. This interpretation resonates with contemporary arguments that sustainable development requires institutional coherence and integrated governance rather than disconnected interventions, as demonstrated in assessments of SDG implementation by Leal Filho et al. (2025). It also extends the ethical-governance literature represented by Mhlanga (2026), because human-centred sustainability in technologically complex systems requires normative orientation alongside innovation, while Floridi (2024) and Ganbaatar (2025) similarly show why technological or analytical capability cannot be separated from questions of ethical responsibility. Nevertheless, the negative coefficient linking Awqaf financing with L is theoretically valuable precisely because it prevents the framework from becoming tautological: unity of knowledge predicts the desirability of complementarity but does not assume that every observed relationship is necessarily complementary. Alternative explanations, including differences in financing purposes, institutional allocation, temporal adjustment, or the exceptionally high 2015 benchmark, therefore remain plausible and should be tested with longer time series and institution-level data. Moreover, the very high R^2 of the knowledge equation must be interpreted cautiously because the underlying illustration comprises only eight annual observations and does not report confidence intervals, p-values, or additional regression diagnostics.

Taken together, the findings position the study within global sustainability scholarship by shifting the analytical question from how separate dimensions of sustainability can be balanced to how a common epistemological orientation can generate complementary relationships among them. Existing frameworks have made substantial advances in measuring sustainable development, identifying planetary constraints, and designing integrated interventions, but current SDG assessments continue to reveal difficulties associated with fragmented governance and institutional priorities (Leal Filho et al., 2025), while Rockström et al. (2023) demonstrate the inseparability of biophysical safety and human justice. The proposed unity-of-knowledge framework contributes a different explanatory layer by treating moral consciousness as endogenous to knowledge formation and by connecting that consciousness to interaction, circular causation, evolutionary learning, and the wellbeing function; this

responds directly to the manuscript's stated theoretical objective of moving ethics from a supplementary consideration to a central epistemological mechanism. Methodologically, this formulation also complements recent conceptual scholarship emphasizing internally coherent theory construction and formal representation rather than disconnected conceptual accumulation (Luft et al., [2022](#); Rivard, [2024](#)). Its practical significance lies in suggesting that sustainability policy should be evaluated not only by the performance of individual economic, technological, or social programs, but also by whether interactions among those programs reinforce ethically desirable collective wellbeing over time. The novelty of the study therefore resides in integrating tawhid, endogenous ethics, moral inclusiveness, circular causation, evolutionary learning, and a formal wellbeing criterion within one sustainability architecture, rather than proposing another sector-specific sustainability indicator. In this sense, the framework does not seek to displace Systems Theory, Circular Economy, Islamic Moral Economy, Maqasid al-Shariah, or the SDGs, but supplies an epistemological bridge through which their systemic, regenerative, normative, welfare-oriented, and policy contributions can be interpreted within a unified process of knowledge-induced sustainability.

Implications

The findings imply that sustainability policy and institutional design should be evaluated not only through the performance of individual economic, scientific, or social interventions, but also through the quality of the relationships that connect them within a shared ethical framework. The unity-of-knowledge perspective suggests that moral consciousness can function as an organizing principle for aligning otherwise fragmented domains, thereby strengthening the coherence of decisions that affect collective wellbeing. In the context of Islamic participatory finance, the results further indicate that normative compatibility alone does not guarantee systemic complementarity, because instruments operating under similar ethical principles may still produce divergent relational patterns when their institutional functions and allocation structures differ. This implication extends the practical relevance of the wellbeing framework by shifting attention from compliance-based evaluation toward the assessment of reciprocal contribution, coordination, and long-term interaction among financing mechanisms. Accordingly, policymakers and Islamic financial institutions may use the proposed framework as a diagnostic lens for identifying where complementarities are reinforced and where structural adjustments are required to improve the collective contribution of financing instruments to sustainable wellbeing.

Limitations

The findings should be interpreted within several limitations arising from the conceptual design and the restricted empirical illustration used in the study. The documentary foundation was theoretically purposive rather than based on an exhaustive systematic review, which means that the framework reflects selected bodies of scholarship considered relevant to unity of knowledge, sustainability, ethics, circular causation, and Islamic economics. The quantitative illustration relied on only eight annual observations from 2011 to 2018, substantially limiting the strength of statistical inference and preventing the estimated relationships from being generalized beyond the illustrative dataset. In addition, the available regression outputs did not report p-values, confidence intervals, multicollinearity diagnostics, residual tests, or other inferential checks, so the estimated coefficients and R2 values should be read descriptively rather than as definitive causal evidence. These limitations do not invalidate the conceptual contribution of the framework, but they indicate that its empirical applicability requires broader datasets and more rigorous testing before strong claims can be made about the stability of the proposed complementary relationships.

Suggestions

Future research should extend the proposed framework through empirical studies using longer time series, larger cross-institutional datasets, and more diverse Islamic and conventional financing contexts in order to test the stability of the circular-causation relationships. Particular attention should be given to the negative relationship between Awqaf financing and leasing, loan-based financing, and

Istisna'a, because examining the institutional, regulatory, and allocation mechanisms behind this pattern may clarify why normative compatibility does not automatically produce operational complementarity. Subsequent studies should also incorporate full regression diagnostics, significance testing, confidence intervals, robustness checks, and alternative model specifications to determine whether the observed relationships remain consistent under stronger analytical conditions. Beyond finance, the framework could be operationalized in environmental governance, technological innovation, education, social policy, and other domains where economic, scientific, and societal objectives interact under competing ethical priorities. Such extensions would allow future scholarship to assess whether unity of knowledge, endogenous ethics, and wellbeing-based circular causation can function as a generalizable analytical architecture for sustainability across different institutional and socio-economic settings.

CONCLUSION

This study developed an integrated sustainability framework grounded in the Qur'anic methodological worldview of the unity of knowledge, positioning moral consciousness, endogenous ethics, and complementarity as central elements linking economy, science, and society. The conceptual results show that sustainability is better understood as a recursive process of interaction, integration, circular causation, and evolutionary learning than as a collection of isolated sectoral indicators. Within this framework, the wellbeing function provides the principal evaluative criterion for assessing whether relationships among socio-scientific domains move toward complementary or substitutive configurations. The empirical illustration using Islamic participatory financing data from 2011–2018 further demonstrated that Murabaha, leasing and loan-based financing with Istisna'a, and Awqaf financing did not follow identical temporal patterns, even though they operate within a shared Islamic economic context. The estimated circular-causation relationships were predominantly positive, although the negative coefficient of Awqaf financing in the leasing, loan-based financing, and Istisna'a equation indicated that complementarity was not uniformly realized across the financing structure. Taken together, these findings support the view that normative compatibility alone is insufficient to produce systemic sustainability unless it is accompanied by reciprocal relationships that reinforce collective wellbeing.

The study also demonstrates that the proposed unity-of-knowledge framework contributes a distinct epistemological layer to contemporary sustainability discourse by treating ethics as an endogenous organizing principle rather than an external normative addition. The knowledge or consciousness equation produced positive coefficients for all three financing variables and the highest reported R² value, while the combined elasticity of approximately 0.9752 indicated a predominantly positive joint configuration within the illustrative model. At the same time, the variation across the estimated equations confirms that sustainability outcomes depend on the quality and direction of inter-variable relationships rather than on the independent performance of each financing instrument. This finding strengthens the conceptual role of circular causation and evolutionary learning by showing how complementary and non-complementary relationships can coexist within the same socio-economic system. The principal theoretical contribution therefore lies in integrating Tawhid, moral consciousness, endogenous ethics, economy, science, society, circular causation, and wellbeing into a single analytical architecture for understanding sustainability across knowledge, space, and time. In this sense, the study extends existing sustainability frameworks by offering a coherent model in which ethical knowledge, reciprocal interaction, and wellbeing formation are treated as mutually connected foundations of sustainable socio-scientific development.

AUTHOR CONTRIBUTIONS STATEMENT

Masudul Alam Choudhury conceived and conceptualized the study, developed the unity-of-knowledge and Tawhid-based theoretical framework, and formulated the sustainability model integrating moral consciousness, endogenous ethics, circular causation, and wellbeing. He designed the

conceptual methodology, established the mathematical formalization of the proposed framework, and conducted the analytical illustration using secondary data on Islamic participatory financing. He interpreted the conceptual and quantitative findings, critically examined their implications for sustainability and Islamic moral economy, and developed the theoretical contributions of the study. He prepared the original manuscript and undertook its critical revision to ensure conceptual coherence, methodological consistency, and intellectual integrity. As the sole author, Masudul Alam Choudhury approved the final version of the manuscript and accepts full responsibility for the accuracy, integrity, and accountability of the work.

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