



Zakat, Technological Innovation, and Social Entrepreneurship: A PLS-SEM Analysis of Perceived Sustainable Development Impact

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Abstract

This study investigates whether stakeholders' awareness of and commitment to zakat are associated with perceived sustainable development impact, and whether technological innovation and social entrepreneurship mediate this relationship. Grounded in *maqasid al-shariah* as a normative lens and resource orchestration as the explanatory logic, the study develops a four-construct model linking zakat awareness and commitment (ZAC), technological innovation (TIN), social entrepreneurship (SEO), and perceived sustainable development impact (ZSD). Data from 218 purposively sampled stakeholders were analysed using partial least squares structural equation modelling (PLS-SEM) with 5,000 bootstrap resamples and percentile confidence intervals. The findings indicate that technological innovation is the strongest correlate of social entrepreneurship ($\beta = 0.381$, $p < 0.001$), while social entrepreneurship is the strongest correlate of perceived sustainable development impact ($\beta = 0.338$, $p < 0.001$). Although ZAC exhibits a direct association with the final outcome ($\beta = 0.155$, $p = 0.028$), it is not significantly associated with social entrepreneurship. Social entrepreneurship mediates the association between technological innovation and perceived sustainable development impact (indirect effect = 0.129, $p < 0.001$). However, evidence regarding the indirect paths originating from ZAC remains inconclusive across the inferential criteria. The model accounts for 24.0 per cent of the variance in the target outcome (adjusted $R^2 = 0.229$). This paper offers a preliminary, perception-based evaluation of the zakat–innovation–entrepreneurship–development continuum as an integrated system and identifies the conditions under which broader claims may be warranted.

Keywords: Zakat, Islamic social finance, social entrepreneurship, technological innovation, sustainable development

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1. Introduction

Zakat is an obligatory annual levy on qualifying wealth and one of the five pillars of Islam. The sums involved are substantial and, unlike most development aid, recur annually; conservative estimates place the annual global zakat potential between US\$200 billion and US\$1 trillion, well above the aid reaching many Muslim-majority economies (Obaidullah & Shirazi, 2017). To date, most scholarship on zakat has concentrated on the amounts collected and the efficiency of disbursement. Considerably less is known about the intermediate mechanisms through which zakat might contribute to durable development rather than short-term relief (Widiastuti et al., 2021). Two contemporary developments have reshaped the context in which this issue is considered. First, social entrepreneurship has emerged as a means of creating social value through enterprise-based approaches, sharing with zakat a fundamental concern for improving the position of disadvantaged groups rather than merely providing temporary aid (Santos, 2012). Second, technological innovation—particularly financial technology—has transformed how zakat is collected, verified, allocated, and monitored (Ninglasari & Muhammad, 2021; El Amri et al., 2025). Together, these developments suggest a testable proposition that has not yet been examined as an integrated system: that zakat, technological innovation, and social enterprise may form a sequential pathway leading to sustainable development.

The supporting evidence for this pathway remains fragmented. Research on zakat compliance and

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governance often stops at collection; research on "productive zakat" typically treats enterprise as an end outcome rather than an intermediate mechanism and rarely incorporates technology; and research on digitalisation remains largely administrative in focus. Table 1 summarises this literature positioning in detail. Consequently, three questions remain open: (1) Is stakeholders' awareness of and commitment to zakat associated with their perceptions of innovation and enterprise capacity? (2) Is perceived technological innovation an antecedent of perceived social entrepreneurship capacity in the zakat setting, or merely a separate correlate of development? (3) Through which routes, direct or mediated, is zakat awareness associated with perceived sustainable development impact? Answering these questions is highly consequential for developing and Muslim-majority economies, where fiscal space is constrained, formal financial inclusion is uneven, and many populations remain outside conventional welfare systems. Zakat offers a decentralised, faith-anchored resource whose legitimacy rests on community trust (Obaidullah & Shirazi, 2017), while mobile connectivity provides a modern technological infrastructure that did not previously exist. Whether belief, innovation, and enterprise actually align in the way this proposition assumes remains an empirical matter.

To address this, we test an integrated structural model in which zakat awareness and commitment (ZAC) serves as the exogenous construct, technological innovation (TIN) and social entrepreneurship (SEO) act as sequential intermediary constructs, and perceived sustainable development impact (ZSD) is the target outcome. The model is estimated using partial least squares structural equation modelling (PLS-SEM) based on 218 usable stakeholder responses. Three crucial qualifications frame what follows and are central to interpreting the findings. First, every construct is measured as a stakeholder perception; nothing in this study directly observes actual zakat allocation, technology adoption rates, venture formation, or realised developmental outcomes. Second, the design is cross-sectional; thus, the estimates represent associations consistent with the hypothesised ordering rather than evidence of causation. Third, the constructs are based on a small number of ordinal items from a newly developed instrument, which constrains the interpretive weight that can be placed on the structural paths. Consequently, this study's contribution is a preliminary, perception-based test of an integrated theoretical mechanism, alongside a clear specification of what stronger future empirical tests would require.

The paper proceeds as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 sets out the methodology. Section 4 reports the results. Section 5 discusses the findings, draws out their implications, and outlines the study's limitations. Section 6 concludes.

2. Literature Review

2.1 Zakat, *Maqasid al-Shariah*, and Sustainable Development

Zakat is conventionally levied at 2.5 per cent of qualifying wealth held above the nisab threshold, and it may be disbursed only to the eight categories of beneficiaries (*asnaf*) identified in the Qur'an (al-Tawbah, 9:60). Classical *fiqh* views it simultaneously as an act of worship and an instrument of socio-economic policy (Qardawi, 1999). Its developmental significance derives from the *maqasid al-shari'ah*—the higher objectives of Islamic law—which orient economic activity towards protecting and enriching faith, life, intellect, progeny, and wealth (Chapra, 2008). As these objectives extend beyond mere subsistence to encompass the development of human capabilities, a substantial body of literature argues that zakat should be deployed in ways that enhance recipients' productive capacity.

This capability-oriented interpretation aligns with the global sustainable development agenda, and several studies have mapped Islamic social finance onto the Sustainable Development Goals (SDGs) (Abdullah, 2018; Ahmed et al., 2015). For instance, Widiastuti et al. (2021) find that productive zakat programmes outperform consumptive distribution when business growth is modelled as an intervening variable. This conversion is not automatic, however. Transparency, institutional professionalism, and accountability constrain the developmental impact of the funds collected (Bin-Nashwan et al., 2021; Saad & Haniffa, 2014). Because these governance conditions shape how stakeholders assess the effectiveness of zakat-funded initiatives, we treat perceived sustainable development impact as a perception-based construct throughout this study and name it accordingly. One critical boundary condition must be stated at the outset, as it limits what may subsequently be recommended. Zakat is not generic patient capital. Eligibility is strictly restricted to the *asnaf*; most schools of jurisprudence require *tamlik* (the direct transfer of ownership to the eligible recipient); and national zakat laws and Shariah governance frameworks further constrain permissible deployment (Qardawi, 1999). Proposals to redirect zakat towards enterprise must therefore be framed as questions concerning permissible programme design within these constraints, rather than as a general licence to reallocate funds at will. This issue is revisited in Section 5.

2.2 Social Entrepreneurship as a Shariah-Constrained Mechanism

Social entrepreneurship involves identifying and pursuing opportunities to create social value through innovative, enterprise-based approaches, placing value creation ahead of value capture and directing surplus towards a social mission (Santos, 2012). Its affinity with zakat lies in a shared orientation towards addressing the structural dimensions of disadvantage, rather than merely treating its symptoms, and a mutual commitment to preserving the dignity of productive participation. Where asset-poor entrepreneurs cannot access conventional finance, non-repayable capital can reduce the risks faced by early-stage ventures serving disadvantaged populations (Obaidullah, 2008). If so, part of zakat's developmental contribution may be realised through the enterprise activity it enables, positioning social entrepreneurship as an intermediary mechanism rather than an end in itself. This rationale underpins the proposed structural model. It should, however, be interpreted as a hypothesis concerning perceived capacity, as the indicators capture stakeholders' familiarity with and willingness to support social entrepreneurship, rather than actual venture formation.

2.3 Technological Innovation and Digital Zakat Administration

Innovation lowers the cost of reaching beneficiaries, extends the scale at which solutions operate, and enables new combinations of resources (Phillips et al., 2015). Within Islamic social finance, its most visible expression is the digitalisation of zakat administration: digital platforms now facilitate collection, eligibility verification, allocation, and impact tracking. This digitalisation addresses the trust and accountability deficits that have long constrained confidence in traditional zakat institutions (Ninglasari & Muhammad, 2021; El Amri et al., 2025). Technology also reshapes the opportunity structure for ventures supported by zakat. Mobile connectivity, digital marketplaces, and low-cost productivity tools significantly reduce the barriers to starting and operating small enterprises. Consequently, innovation serves not only as an administrative tool but also as a plausible enabling condition for social entrepreneurship, placing it upstream of enterprise activity in our hypothesised ordering.

2.4 Prior Empirical Evidence and the Research Gap

Table 1: Positioning of the present study against prior empirical work

Research stream	Representative study	Constructs / links tested	Not addressed
Zakat compliance and institutional governance	Bin-Nashwan et al. (2021); Saad and Haniffa (2014)	Religiosity, trust, perceived transparency → intention to pay zakat	Stops at collection; no enterprise, innovation, or development outcome
Productive zakat and poverty alleviation	Widiastuti et al. (2021)	Zakat empowerment programme → business growth → <i>mustahiq</i> welfare	Technology absent; enterprise modelled as outcome, not mechanism
Islamic social finance and the SDGs	Abdullah (2018); Ahmed et al. (2015)	Conceptual mapping of <i>maqasid al-shariah</i> onto SDG targets	Normative and conceptual; no estimated model
Digitalisation of zakat administration	Ninglasari and Muhammad (2021); El Amri et al. (2025)	Fintech adoption → collection efficiency, transparency, targeting	Administrative focus; no link to enterprise formation or perceived impact
Social-enterprise finance	Santos (2012); Phillips et al. (2015)	Catalytic capital and social innovation → social value creation	Developed outside Islamic finance; zakat's Shariah constraints not considered
This study	—	ZAC → TIN → SEO → ZSD estimated as one mediated system	Perception-based and cross-sectional; see Section 5

Table 1 synthesises the positioning of the present model against the foundational literature streams from which it draws. Three key observations emerge. First, the compliance literature effectively explains the supply of funds but stops at collection. Second, the productive-zakat literature establishes that capability-building disbursement can outperform consumptive relief; yet, it models enterprise as an end outcome and generally omits the role of technology. Third, the digitalisation literature documents administrative efficiency gains without linking them to enterprise formation or broader perceived impact. To date, no study identified in this review estimates awareness, innovation, social entrepreneurship, and perceived development impact as a single mediated system,

and mediation-based designs capable of distinguishing direct from indirect associations remain scarce in this field.

Competing explanations should be acknowledged rather than assumed away. Variables such as digital literacy, prior direct experience with zakat, institutional trust, infrastructure quality, and the regulatory environment could each contribute to the observed patterns without any of the hypothesised mechanisms operating. Because our cross-sectional design cannot adjudicate between these alternative explanations, this is treated as a foundational limitation (detailed in Section 5) rather than a residual oversight.

Note. The comparison is illustrative rather than exhaustive and is limited to the streams that inform the hypothesised model.

3. Conceptual Framework

3.1 Theoretical integration

The two theoretical frameworks employed in this study serve distinct but complementary roles, and conflating them would weaken their respective contributions. *Maqasid al-shari'ah* functions as a normative lens: it specifies what constitutes a defensible developmental outcome in Islamic terms, namely the enhancement of human capabilities rather than the mere relief of immediate need. However, it does not, by itself, predict empirical associations among the constructs examined in this study. Resource orchestration, conversely, provides the explanatory logic for how resources can be transformed into value through their effective structuring, bundling, and leveraging (Sirmon et al., 2011). Combined, these perspectives generate a testable proposition: that developmental outcomes consistent with the *maqasid* may be more strongly associated with the effective mobilisation of enabling mechanisms than with resource transfer alone, with technology and enterprise representing two such mechanisms.

One fundamental caveat regarding the level of analysis must be acknowledged. Resource orchestration is inherently a firm-level theory, whereas the unit of analysis in this study is the individual stakeholder. Therefore, the study does not claim to observe resource orchestration directly. Rather, it examines whether stakeholders' perceptions are patterned in a manner consistent with an orchestration account. This represents a more conservative yet empirically tractable application of the theoretical perspective. Accordingly, the constructs are measured as individual-level perceptions rather than as direct measures of organisational capabilities or resource-orchestration processes. Table 2 presents the conceptual and operational definitions, level of analysis, and dimensionality of each construct.

Table 2: Construct definitions, operationalisation, and level of analysis

Construct	Conceptual definition	Operational definition	Level of analysis	Dimensionality
Zakat awareness and commitment (ZAC)	A respondent's understanding of zakat and endorsement of its developmental role and broader educational importance	Two ordinal items addressing belief in zakat's developmental role and support for zakat education (ZAC2, ZAC3)	Individual	Reflective, unidimensional
Perceived technological innovation (TIN)	The importance a respondent attaches to innovation and technology as enabling mechanisms for social ventures	Two ordinal items addressing the importance of innovation and technology for social-venture success (TIN1, TIN2)	Individual perception	Reflective, unidimensional
Social entrepreneurship support (SEO)	A respondent's familiarity with, and willingness to support, enterprise-based approaches to social value creation	Two ordinal items addressing familiarity with social entrepreneurship and likelihood of providing support (SEO1, SEO3)	Individual	Reflective, unidimensional
Perceived sustainable development impact (ZSD)	A respondent's appraisal of the effectiveness, sustainability, and participatory character of zakat-funded initiatives	Three ordinal items addressing effectiveness, sustainability, and stakeholder engagement (ZSD1–ZSD3)	Individual perception	Reflective, unidimensional

Note. All four constructs are specified reflectively. The reflective specification and its limitations are discussed further in Section 4.

3.2 Hypotheses

Awareness of and commitment to zakat may shape stakeholders' perceptions of how zakat resources can be mobilised for broader social purposes. Stakeholders who understand zakat and endorse its developmental role may be more receptive to enterprise-based approaches to social value creation and may attach greater importance to technological innovation that facilitates such approaches (Bin-Nashwan et al., 2021).

H1: Zakat awareness and commitment is positively associated with social entrepreneurship support.

H2: Zakat awareness and commitment is positively associated with perceived technological innovation.

Technological innovation can expand the range of feasible social ventures by reducing entry barriers, improving operational efficiency, and extending market and stakeholder reach (Phillips et al., 2015). Where innovation and technology are perceived as important, enterprise-based approaches to social value creation may consequently be viewed as more feasible and supportable. Technological innovation may also be associated directly with perceived development outcomes through greater administrative transparency, accessibility, and institutional reach (Ninglasari & Muhammad, 2021).

H3: Perceived technological innovation is positively associated with social entrepreneurship support.

H4: Perceived technological innovation is positively associated with perceived sustainable development impact.

Social entrepreneurship provides an enterprise-oriented mechanism through which resources can be mobilised and transformed into sustained social value rather than temporary relief (Santos, 2012). It may therefore represent a proximate mechanism associated with perceived sustainable development impact. In addition, zakat awareness and commitment may be directly associated with perceived impact through the trust, legitimacy, and developmental orientation that may arise from greater understanding of zakat as a social institution.

H5: Social entrepreneurship support is positively associated with perceived sustainable development impact.

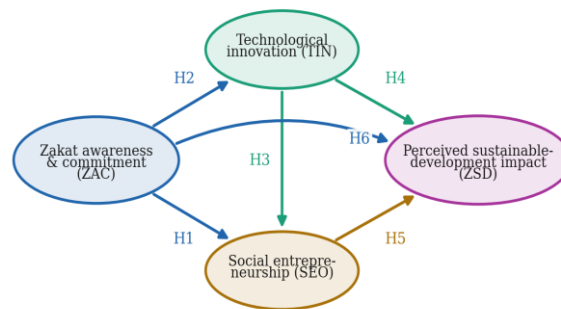
H6: Zakat awareness and commitment is positively associated with perceived sustainable development impact.

The proposed sequential ordering implies three mediation hypotheses. These hypotheses are formulated *a priori* to ensure that the proposed pathways are grounded in the conceptual framework rather than identified *post hoc* during estimation. The mediation relationships are interpreted as statistical associations consistent with the proposed theoretical pathways and are not taken as evidence of causal effects.

H7: Perceived technological innovation mediates the association between zakat awareness and commitment and social entrepreneurship support.

H8: Social entrepreneurship support mediates the association between perceived technological innovation and perceived sustainable development impact.

H9: Perceived technological innovation and social entrepreneurship support serially mediate the association between zakat awareness and commitment and perceived sustainable development impact.



Mediation hypotheses: H7 (ZAC → TIN → SEO) · H8 (TIN → SEO → ZSD) · H9 (ZAC → TIN → SEO → ZSD)

Figure 1: Hypothesised Relationships among the Constructs.

ZAC = zakat awareness and commitment; TIN = perceived technological innovation; SEO = social entrepreneurship support; ZSD = perceived sustainable development impact. Arrows denote hypothesised associations rather than causal effects.

4. Research Methodology

This study employs a quantitative, cross-sectional survey design within a post-positivist paradigm to examine hypothesised associations among four latent constructs. The unit of analysis is the individual stakeholder, and data were collected through a structured questionnaire. Given the cross-sectional and non-experimental design, the findings are interpreted as statistical associations rather than causal effects.

Data were collected in Bangladesh, specifically in the Dhaka and Chittagong divisions, between July and December 2025. Non-probability purposive sampling was used through online and face-to-face recruitment, including Google Forms, door-to-door distribution, professional mailing lists, institutional networks, and the BIM Alumni Group. Respondents were eligible if they had prior exposure to, or a stated interest in, zakat, social entrepreneurship, or innovation. The term stakeholder encompasses zakat payers and recipients, Islamic social finance professionals, and educated members of the general public who may reasonably hold informed views of zakat-funded activities. As recruitment was open rather than based on a defined invitation list, a conventional response rate could not be calculated. Total of 385 questionnaires distributed, 223 responses were received. Five cases were removed through listwise deletion because of missing values, leaving 218 complete observations for structural analysis. Accordingly, demographic results in Table 3 are based on $N = 223$, whereas analyses from Section 5.2 onwards use $n = 218$. The sample comprised 76.7 per cent male respondents and 78.0 per cent with a master's degree, indicating a relatively specialised and highly educated stakeholder group. The findings are therefore not intended to represent the wider population statistically.

The questionnaire comprised demographic and substantive sections covering zakat awareness and commitment (ZAC), perceived technological innovation (TIN), social entrepreneurship support (SEO), and perceived sustainable development impact (ZSD). The instrument was developed specifically for this study and employed three- or four-category ordinal response scales, with higher codes indicating stronger agreement or perceived importance. The questionnaire and available expert-review and pilot-testing documentation are provided as supplementary materials. Three indicators (ZAC1, SEO2, and ZSD4) were removed before structural estimation using an outer-loading threshold of 0.60, provided that conceptual coverage was not substantially affected. Because item retention was based on the same sample used for estimation, the resulting measurement properties should be regarded as sample-specific rather than definitive scale validation. All four constructs were specified reflectively. This specification is strongest for TIN, while the rationale is more qualified for ZAC and SEO. In particular, the retained SEO indicators capture familiarity with and willingness to support social entrepreneurship; therefore, SEO is interpreted as a provisional measure of enterprise-related disposition and support rather than organisational capacity.

The ordinal and coarse-grained nature of the indicators represents a further limitation because the PLS algorithm uses Pearson correlations, making the treatment of three- and four-category responses as approximately continuous a measurement approximation. This issue is particularly relevant to ZAC, whose retained indicators have means of 2.92 and 2.94 on a three-point scale, indicating strong upper-end concentration and restricted variance. Such restriction may attenuate observed associations and reduce the ability to detect smaller effects. The realised sample of 218 observations was evaluated using the inverse square-root method rather than the conventional ten-times rule (Hair et al., 2022). Approximately 155 observations are required to detect a minimum path coefficient of 0.20 at $\alpha = 0.05$ with 80 per cent power, compared with approximately 274 for a coefficient of 0.15. Thus, the sample provides reasonable power for effects of approximately 0.20 or larger but limited power for smaller effects. This limitation is relevant to the non-significant ZAC $\rightarrow$ SEO association ($\beta = 0.097$), which should not be interpreted as evidence that no association exists.

The model was estimated using the path-weighting inner weighting scheme and Mode A outer estimation with correlation weighting. Listwise deletion ensured a consistent analytical sample of 218 observations, and all reported path coefficients are standardised. Inference was based on 5,000 bootstrap resamples with two-tailed testing at $\alpha = 0.05$. The primary inferential criterion was the two-sided 95 per cent bootstrap confidence interval, with an effect considered supported when the interval excluded zero (Hair et al., 2022). Bootstrap t-statistics and p-values were reported as secondary evidence. Where the two criteria disagreed, the relationship was classified as inconclusive. Two effects fell into this category and are discussed accordingly in Section 5.4. Estimation settings, software information, random seed, and complete output are provided in the submitted estimation materials. Measurement assessment covered indicator reliability, internal consistency (Cronbach's alpha, ρ , and composite reliability), convergent validity (AVE), and discriminant validity using the Fornell–Larcker criterion (Fornell & Larcker, 1981) and HTMT (Henseler et al., 2015). Structural assessment included lateral collinearity, path coefficients, R^2 and adjusted R^2 , effect sizes (f^2), and predictive relevance (Q^2), assessed through blindfolding with an omission distance of seven.

Since predictor and criterion measures were obtained from the same respondents using a single questionnaire, common method variance was considered a potential source of bias. Procedural safeguards included respondent anonymity and the use of clearly differentiated response formats to reduce evaluation apprehension and response-pattern effects. Harman's single-factor test indicated that the first unrotated factor accounted for 30.6 per cent of the total variance, below the commonly cited 50 per cent threshold (Podsakoff et al., 2003). This result does not, however, establish the absence of common method bias, given the limited diagnostic sensitivity of Harman's test. A marker-variable or full-collinearity assessment was not conducted; therefore, same-source bias cannot be completely ruled out and should be considered when interpreting the reported associations.

5. Results and Discussion

5.1 Demographic profile

Table 3 presents the profile of the 223 respondents. The sample was predominantly male (76.7 per cent) and highly educated, with 78.0 per cent holding a master's degree and 16.6 per cent holding a bachelor's degree. Most respondents were aged 26–35 (52.5 per cent) or 36–45 (28.7 per cent). Familiarity with zakat was high (93.7 per cent), while 56.1 per cent reported having contributed to or received zakat funds, and 52.5 per cent were aware of zakat-funded enterprise or innovation initiatives.

Table 3: Demographic profile of respondents (N = 223)

Characteristic	Category	n	%
Gender	Male	171	76.7
	Female	51	22.9
	Prefer not to say / other	1	0.4
Age (years)	Under 18	2	0.9
	18–25	9	4.0
	26–35	117	52.5
	36–45	64	28.7
	46–55	24	10.8
	56 and above	5	2.2
	Not reported	2	0.9
Education	Master's degree	174	78.0
	Bachelor's degree	37	16.6
	Doctoral degree	4	1.8
	Other / postgraduate diploma	5	2.2
	High school	3	1.3
Familiar with zakat	Yes	209	93.7
	No	12	5.4
	Maybe	2	0.9
Contributed to / received zakat	Yes	125	56.1
	No	83	37.2
	Maybe	15	6.7
Aware of zakat-funded initiatives	Yes	117	52.5
	No	81	36.3
	Maybe	25	11.2

Note. Percentages are of the total sample. Two respondents recorded an age under 18; see Section 5.9.

Table 4 reports the descriptive statistics for the retained indicators (n = 218). All indicator means exceed their respective scale midpoints. The two ZAC indicators exhibit substantial departures from normality (skewness = –4.36 and –4.73; excess kurtosis = 19.69 and 23.65), reflecting a pronounced ceiling effect, with almost all respondents strongly endorsing zakat's developmental role. This has two important implications for the analysis. First, the restricted variance limits the extent to which differences in the ZAC construct can be explained. Second, it may produce a highly asymmetric bootstrap distribution for product terms involving ZAC, potentially contributing to the criterion disagreement reported in Section 5.4.

Table 4: Descriptive statistics for the retained indicators (n = 218)

Construct	Indicator	M	SD	Skew.	Kurt.
Zakat awareness & commitment (ZAC)	ZAC2: Belief in zakat's developmental role	2.92	0.32	–4.36	19.69
	ZAC3: Support for zakat education/outreach	2.94	0.28	–4.73	23.65

Technological innovation (TIN)	TIN1: Importance of innovation & technology for SE	2.75	0.48	-1.76	2.26
	TIN2: Importance of innovation for SE success	2.80	0.46	-2.19	4.11
Social entrepreneurship (SEO)	SEO1: Familiarity with social entrepreneurship	2.27	0.67	-0.38	-0.80
	SEO3: Likelihood to support SE initiatives	3.32	0.70	-0.61	-0.45
Perceived sustainable-development impact (ZSD)	ZSD1: Effectiveness of zakat initiatives (SE & innovation)	2.66	0.49	-0.91	-0.62
	ZSD2: Sustainability of zakat initiatives	3.34	0.72	-0.83	0.16
	ZSD3: Stakeholder engagement & collaboration	3.40	0.69	-0.97	0.63

Note. M = mean; SD = standard deviation; Skew. = skewness; Kurt. = excess kurtosis. Higher values denote stronger agreement or greater perceived importance. Scales have three or four categories; see Appendix A.

5.2 Measurement Model

loadings are all positive and, following purification, meet or approach the 0.70 benchmark. The two lowest loadings (0.615 for SEO1 and 0.673 for ZSD3) were retained on content grounds, as removing either indicator would not raise its parent construct's AVE above the level already achieved. Composite reliability (CR) ranges from 0.748 to 0.823, and AVE ranges from 0.579 to 0.699, exceeding the conventional thresholds of 0.70 and 0.50, respectively. These figures should not, however, be interpreted as definitively establishing construct validity. Cronbach's alpha (α) and ρ_A are low for three of the four constructs, and particularly low for ZAC ($\alpha = 0.337$; $\rho_A = 0.352$). Although this partly reflects the known sensitivity of Cronbach's alpha to a small number of indicators, it does not fully explain the result. With two indicators, alpha is a monotonic function of the single inter-item correlation; thus, an α of 0.337 implies a weak inter-item correlation of approximately 0.20 between ZAC2 and ZAC3. Composite reliability can nevertheless remain relatively high because it incorporates the indicators estimated outer loadings. Consequently, a high CR based on two weakly correlated indicators does not, by itself, demonstrate adequate measurement quality. Accordingly, while ZAC is reported, its internal consistency is regarded as inadequate rather than merely modest. Any conclusions involving structural relationships with ZAC must therefore be interpreted with considerable caution.

Table 5: Measurement model: indicator loadings, reliability and convergent validity

Construct	Indicator (loading)	α	ρ_A	CR	AVE
Zakat awareness & commitment (ZAC)	ZAC2 (0.839)	0.337	0.352	0.748	0.599
	ZAC3 (0.703)				
Technological innovation (TIN)	TIN1 (0.861)	0.571	0.579	0.823	0.699
	TIN2 (0.810)				
Social entrepreneurship (SEO)	SEO1 (0.615)	0.405	0.527	0.752	0.611
	SEO3 (0.919)				
Perceived sustainable-development impact (ZSD)	ZSD1 (0.811)	0.632	0.632	0.804	0.579
	ZSD2 (0.792)				
	ZSD3 (0.673)				

Note. All outer loadings are significant at $p < 0.001$ (5,000 bootstrap resamples). α = Cronbach's alpha; ρ_A = reliability coefficient rho_A; CR = composite reliability; AVE = average variance extracted.

Discriminant validity is supported by both evaluated criteria. As shown in Table 6, the square root of each construct's AVE exceeds its correlations with all other constructs, satisfying the Fornell–Larcker criterion. Additionally, the HTMT ratios reported in Table 7 all fall below the conservative 0.85 threshold, with the maximum value being 0.812 between TIN and SEO. Although this value remains below the threshold, its proximity to the cut-off warrants caution. Because bootstrap confidence intervals for the HTMT ratios were not obtained, the evidence for discriminant validity relies solely on point estimates. The assessment would be strengthened by reporting these inferential intervals to determine whether they include 1.00.

Table 6: Discriminant validity: Fornell–Larcker criterion

Construct	ZAC	TIN	SEO	ZSD
Zakat awareness & commitment (ZAC)	0.774			
Technological innovation (TIN)	0.225	0.836		
Social entrepreneurship (SEO)	0.183	0.403	0.782	
Perceived sustainable-development impact (ZSD)	0.254	0.334	0.432	0.761

Note. Diagonal elements (in bold) are the square roots of AVE; off-diagonal elements are latent-variable correlations.

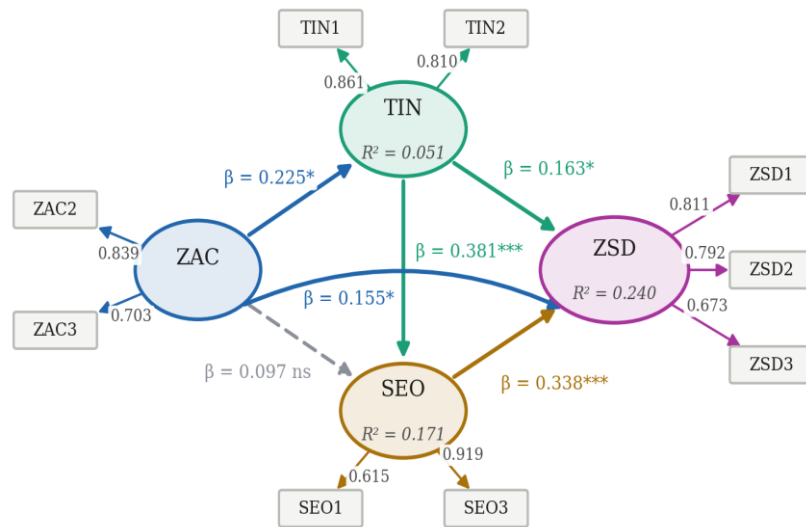
Table 7: Discriminant validity: heterotrait–monotrait ratio (HTMT)

Construct	ZAC	TIN	SEO	ZSD
Zakat awareness & commitment (ZAC)	—			
Technological innovation (TIN)	0.526	—		
Social entrepreneurship (SEO)	0.472	0.812	—	
Perceived sustainable-development impact (ZSD)	0.540	0.546	0.753	—

Note. All ratios fall below the conservative threshold of 0.85. Confidence intervals for HTMT were not obtained; see Section 5.9.

5.3 Structural model

Lateral collinearity is not a concern in this estimation, as the inner variance inflation factor (VIF) values range from 1.00 to 1.23, falling well below the conservative threshold of 3.3. Figure 2 visualises the estimated model, including its measurement component. Figure 3 plots the standardised path coefficients alongside their confidence intervals, and Table 8 details the full structural model results.



*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$ ns = not significant | Solid arrows: 95% percentile bootstrap CI excludes zero. Dashed arrow: CI includes zero.

Figure 2: Estimated PLS-SEM model, showing both the measurement and the structural components. Rectangles are the retained indicators and ellipses the latent constructs; outer loadings appear beside the indicator arrows, standardised path coefficients beside the inner arrows, and R^2 inside each endogenous construct. Arrows denote hypothesised associations, not causal effects.

Five of the six direct hypotheses are supported. Zakat awareness and commitment is positively associated with perceived technological innovation ($\beta = 0.225$, $SE = 0.109$, $p = 0.039$), supporting **H2**, and with perceived sustainable development impact ($\beta = 0.155$, $SE = 0.070$, $p = 0.028$), supporting **H6**. Its association with social entrepreneurship support is positive but not statistically significant ($\beta = 0.097$, $SE = 0.065$, $p = 0.133$; 95% CI $[-0.026, 0.230]$); therefore, **H1** is not supported. As noted in Section 4, however, an effect of this magnitude may be difficult for the current sample to detect reliably. The two strongest associations involve the constructs proposed in the intermediary pathways: TIN is positively associated with SEO ($\beta = 0.381$, $SE = 0.069$, $p < 0.001$), supporting **H3**, while SEO is positively associated with ZSD ($\beta = 0.338$, $SE = 0.063$, $p < 0.001$), supporting **H5**. Additionally, TIN is directly and positively associated with ZSD ($\beta = 0.163$, $SE = 0.070$, $p = 0.019$), supporting **H4**.

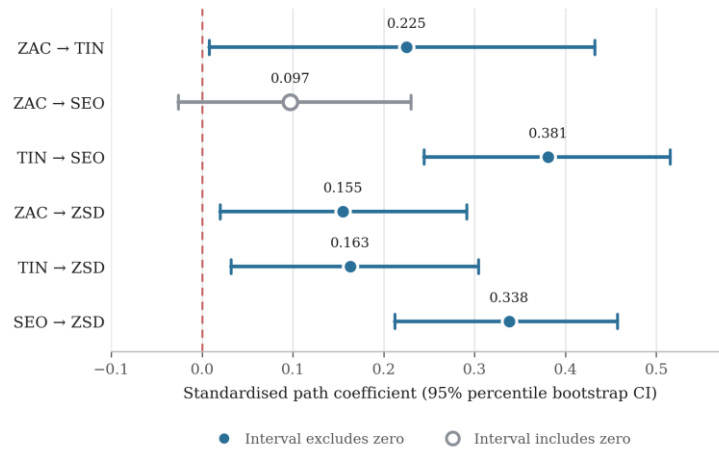


Figure 3: Standardised path estimates with 95 per cent percentile bootstrap confidence intervals (5,000 resamples). Filled markers denote intervals excluding zero and open markers intervals including zero, so significance is encoded by both fill and colour rather than by asterisks. Exact coefficients, standard errors and p -values appear in Table 8.

Table 8: Structural model results: direct effects

H	Path	β	SE	t	p	95% CI (percentile)	f^2	Decision
H1	ZAC → SEO	0.097	0.065	1.50	0.133	[-0.026, 0.230]	0.011	Not supported
H2	ZAC → TIN	0.225	0.109	2.06	0.039	[0.008, 0.432]	0.053	Supported
H3	TIN → SEO	0.381	0.069	5.50	<0.001	[0.244, 0.515]	0.166	Supported
H4	TIN → ZSD	0.163	0.070	2.34	0.019	[0.032, 0.304]	0.029	Supported
H5	SEO → ZSD	0.338	0.063	5.38	<0.001	[0.212, 0.457]	0.124	Supported
H6	ZAC → ZSD	0.155	0.070	2.20	0.028	[0.020, 0.291]	0.030	Supported

Note. β = standardised path coefficient; SE = bootstrap standard error, obtained as β divided by the bootstrap t -statistic; CI = two-sided percentile bootstrap confidence interval (5,000 resamples); f^2 = effect size. The percentile CI is the primary inferential criterion (Section 4.4). Inner VIF values range from 1.00 to 1.23.

Effect sizes across the model are generally modest. Evaluated against the conventional benchmarks of 0.02 (small), 0.15 (medium), and 0.35 (large), only the TIN → SEO path reaches the medium threshold ($f^2 = 0.166$). The SEO → ZSD path falls within the small range ($f^2 = 0.124$), as do all remaining direct associations. Explanatory power is likewise limited. The structural model accounts for 24.0% of the variance in ZSD (adjusted $R^2 = 0.229$) and 17.1% in SEO (adjusted $R^2 = 0.163$), while it explains 5.1% of the variance in TIN (adjusted $R^2 = 0.047$). Following established PLS-SEM practice, we do not test the statistical significance of R^2 or infer practical importance solely from these values. Blindfolding procedures yielded positive Q^2 values for all three endogenous constructs (Table 9). These values indicate cross-validated redundancy within the estimation sample rather than true out-of-sample predictive power. The Q^2 value for TIN (0.029) is particularly small, indicating limited predictive relevance for this construct. A holdout-based PLSpredict analysis.

Table 9: Explanatory power and predictive relevance

Endogenous construct	R^2	Adjusted R^2	Q^2	Interpretation
Technological innovation (TIN)	0.051	0.047	0.029	Weak
Social entrepreneurship (SEO)	0.171	0.163	0.104	Weak to moderate
Perceived sustainable-development impact (ZSD)	0.240	0.229	0.131	Moderate

Note. Adjusted R^2 computed as $1 - (1 - R^2)(n - 1)/(n - k - 1)$, with $n = 218$ and k the number of predictors of each construct. Q^2 obtained by blindfolding with an omission distance of seven and indicates in-sample cross-validated redundancy.

5.4 Mediation Analysis

Specific indirect effects are reported in Table 10 and assessed according to the inferential rule set out in Section 4. H8 is supported under both criteria: social entrepreneurship support mediates the association between technological innovation and perceived sustainable development impact (indirect effect = 0.129, SE = 0.033, $p < 0.001$; 95% CI (0.068, 0.199). Because the direct TIN → ZSD association is also statistically significant, this result indicates complementary partial mediation. H7 and H9 are inconclusive. For H7, the percentile bootstrap interval excludes zero (95% CI (0.003, 0.188), whereas the bootstrap t -statistic does not reach conventional

statistical significance ($t = 1.84, p = 0.066$). The same pattern is observed for the serial mediation path in H9 (95% CI (0.001, 0.065; $t = 1.80, p = 0.072$). In both cases, the lower bound of the percentile interval lies only marginally above zero. We therefore do not adjudicate between the two criteria in favour of the one supporting the hypothesis; rather, we record both results as inconclusive. The divergence between the two inferential criteria may plausibly reflect the asymmetric resampling distributions associated with paths originating from ZAC. As reported in Table 4, the ZAC indicators exhibit substantial negative skewness and pronounced ceiling effects, which may contribute to asymmetry in the corresponding bootstrap product terms. Percentile intervals and bootstrap t -tests can thus yield different conclusions when the underlying bootstrap distribution is highly asymmetric. Bias-corrected and accelerated (BCa) bootstrap intervals may provide a more robust assessment in this context and should be considered in any future re-estimation. The remaining two indirect paths are non-significant under both criteria. The total association between ZAC and ZSD is 0.254, comprising a direct association of 0.155 and combined indirect associations of 0.099. Because a bootstrap confidence interval for the total effect was not obtained, this decomposition should be regarded as descriptive rather than inferential.

Table 10: Specific indirect effects

Indirect path	Effect	SE	t	p	95% CI (percentile)	Inference
ZAC → TIN → SEO (H7)	0.086	0.047	1.84	0.066	[0.003, 0.188]	Inconclusive
TIN → SEO → ZSD (H8)	0.129	0.033	3.86	<0.001	[0.068, 0.199]	Supported (complementary)
ZAC → TIN → SEO → ZSD	0.029	0.016	1.80	0.072	[0.001, 0.065]	Inconclusive
ZAC → TIN → ZSD	0.037	0.027	1.37	0.172	[-0.001, 0.102]	Not supported
ZAC → SEO → ZSD	0.033	0.023	1.44	0.150	[-0.009, 0.082]	Not supported

Note. Effect = standardised specific indirect effect; SE derived as in Table 8; CI = two-sided percentile bootstrap confidence interval (5,000 resamples). "Inconclusive" denotes disagreement between the primary (CI) and secondary (t-based) criteria; see Section 5.4.

5.5 Interpreting the Estimated Associations

The clearest result concerns the position of perceived technological innovation. It is the only construct significantly associated with perceived social-entrepreneurship capacity, while also being directly associated with perceived sustainable-development impact. Viewed through resource orchestration, this pattern is consistent with the proposition that value depends on how resources are structured and leveraged rather than simply on their availability (Sirmon et al., 2011). This interpretation is suggestive rather than confirmatory: the data do not observe resource orchestration directly, and an alternative explanation is equally compatible with the observed associations, namely that respondents who hold favourable views of technology also hold favourable views of enterprise and zakat institutions more generally. Social entrepreneurship is the strongest proximate correlate of perceived sustainable-development impact, and its mediation of the innovation–impact association is the only mediation result supported under both inferential criteria. Of the findings reported here, this is the one that can be defended most readily. It is consistent with the argument that enterprise-based value creation aligns with zakat's developmental purpose (Santos, 2012; Widiastuti et al., 2021), while also indicating that this association is partly indirect.

The pattern surrounding zakat awareness is more equivocal than the earlier framing suggested. Awareness is associated with innovation and, directly, with perceived sustainable-development impact, but shows no statistically significant association with social-entrepreneurship capacity. It is tempting to conclude that awareness reaches enterprise only through innovation, but the evidence does not support this conclusion: the relevant indirect path is inconclusive, while the direct path is not statistically significant rather than demonstrably absent. What can be said more narrowly is that endorsement of zakat is near-universal in this sample and its indicators are severely range-restricted, leaving ZAC with limited variance with which to distinguish respondents. Where almost everyone endorses an institution, endorsement provides limited leverage for explaining differences in other perceptions. Against the streams identified in Table 1, the contribution is one of sequence rather than correction. Whereas the compliance literature treats governance as an antecedent of payment, comparable governance perceptions here also form part of the outcome construct. Enterprise, modelled as an outcome of disbursement in productive-zakat studies, is positioned in this model as an intervening mechanism. Moreover, whereas research on digitalisation often focuses on administrative efficiency, the observed association extends to perceived developmental impact. None of these literatures is overturned by a cross-sectional perception study, and none of these findings should be interpreted as establishing that zakat produces innovation, enterprise or development.

5.6 Theoretical Implications

For Islamic finance scholarship, the paper offers a specified and estimable mechanism where much of the literature has relied on normative assertion, while distinguishing the normative and explanatory roles of its two theoretical resources (Section 3.1). For the social-entrepreneurship literature, it locates enterprise within a faith-based and Shariah-constrained resource system rather than the philanthropic and impact-investment settings more commonly examined in that literature. The most defensible scholarly implication, however, is methodological: the model identifies which links in the proposed chain warrant more rigorous measurement, and the results indicate that the innovation–enterprise–impact segment merits further investigation.

5.7 Institutional and Policy Implications

These implications are propositions for pilot testing rather than prescriptions, and each is limited by the evidence available. The innovation–enterprise segment contains the strongest associations, making it the part of the proposed system where institutional attention may be most worthwhile. The governance perceptions embedded in the outcome construct also suggest that transparency may influence how initiatives are evaluated, rather than merely how they are administered. Any move towards productive deployment must respect the constraints set out in Section 2.1: asnaf eligibility and the ownership requirement take precedence, and a general recommendation to redirect a defined share of collections would not necessarily satisfy these requirements. Section 6.2 sets out the corresponding recommendations, identifying the relevant actor and the measures that could be used to evaluate their effectiveness.

5.8 Societal Implications and Risks

Technology in zakat administration carries risks alongside its potential benefits, and a study that places innovation centrally should acknowledge them. Digital collection and eligibility systems may exclude beneficiaries with limited digital literacy or poor connectivity, including some of the asnaf most in need. Data-intensive verification also raises surveillance and data-protection concerns for populations with limited capacity to challenge how their information is collected and used. Algorithmic eligibility scoring may encode opaque criteria that are difficult to reconcile with the transparency expected in zakat administration. The present sample, being highly educated and digitally connected, is unlikely to capture these costs adequately, which is itself a reason to interpret its favourable assessment of technology cautiously.

5.9 Limitations and Future Research

The limitations are substantial and materially constrain what the paper can claim. Measurement is the most serious. All four constructs rely on two or three coarse ordinal items from an unvalidated instrument; ZAC has inadequate internal consistency ($\alpha = 0.337$) and severely range-restricted indicators, while SEO combines familiarity and willingness, which are related but conceptually distinct dimensions. Structural estimates cannot compensate for these measurement limitations, and the construct labels should therefore be understood as convenient labels for narrow item sets rather than as validated measures. Developing and validating multi-item scales using finer response formats is a precondition for stronger tests of the proposed relationships.

The design is cross-sectional, and all measures are self-reported by the same respondents. Consequently, temporal precedence is not established, and reverse or reciprocal relationships remain plausible. For example, respondents favourably disposed towards social enterprise may rate both technology and zakat institutions more positively, generating the observed pattern without the hypothesised ordering. Common method variance therefore remains a plausible alternative explanation, as discussed in Section 4.5. In addition, the sample is a specialised purposive group rather than a representative population. Additionally, three analyses would materially strengthen a revised study but were not available here: bias-corrected and accelerated bootstrap intervals for the contested indirect paths, HTMT confidence intervals, and a holdout-based PLSpredict assessment benchmarked against a linear model. Beyond these analyses, the more productive next step is not simply a larger perception survey but a different research design: longitudinal or multi-level research linking payer behaviour, institutional digital capability, and *mustahiq* enterprise and welfare outcomes measured through administrative rather than perceptual data.

6. Conclusion and Recommendations

6.1 Conclusion

This paper examined whether zakat awareness and commitment is associated with perceived sustainable-development impact and through which mechanisms. Based on a four-construct model estimated using 218 responses, the results indicate that perceived technological innovation is associated with perceived social-entrepreneurship capacity, while social-entrepreneurship capacity is the strongest correlate of perceived sustainable-development impact and mediates the innovation–impact association. Zakat awareness is also directly associated with the outcome, but evidence that it reaches enterprise indirectly remains inconclusive under the inferential rule adopted. These findings represent associations among stakeholder perceptions at a single point in time, obtained from a specialised sample using a short and imperfectly validated instrument.

They do not demonstrate that zakat produces innovation, enterprise or development. Rather, they identify the innovation–enterprise–impact segment as the part of the proposed chain that most warrants more rigorous measurement and specify what a stronger empirical test would require. This is a modest contribution, but it is one that remains consistent with the evidence.

6.2 Recommendations

The recommendations below are necessarily bounded by the study's evidential limitations. Associations among perceptions at a single point in time cannot establish that an intervention will be effective. The model nevertheless provides a proposed ordering that can inform pilot testing, while making the propositions sufficiently specific to be evaluated empirically. Each recommendation therefore identifies the relevant actor, the evidence motivating it, and the measures that could be used to assess its effectiveness.

First, zakat institutions could prioritise digitising their administrative records before introducing more advanced technological systems. The innovation–enterprise association is the strongest estimated relationship ($\beta = 0.381$), but this finding concerns stakeholder perceptions rather than the effectiveness of any particular platform. The more immediate practical rationale is that without structured and machine-readable records of who received what and when, subsequent interventions are difficult to evaluate. Relevant indicators include the time from application to disbursement, administrative cost per beneficiary reached, and the proportion of disbursements traceable to verified recipients. Second, enterprise support could be piloted within productive allocations already permitted by the relevant jurisdiction rather than through the creation of a new share of collections. As discussed in Section 2.1, asnaf eligibility and the ownership requirement remain fundamental constraints. A defensible pilot could attach incubation, mentoring and market-linkage support to existing productive disbursement, enrol a comparison group receiving disbursement alone, and follow both groups over an appropriate period. Venture survival at 12 and 24 months, recipient income, and exit from assistance would provide relevant outcome measures. Attrition should also be monitored and reported transparently.

Third, regulators could consider requiring a concise disclosure framework that institutions can realistically implement rather than a comprehensive impact framework that may impose disproportionate reporting burdens. Four indicators could provide a useful starting point: total collections, disbursement by asnaf category, the administrative ratio, and median time to disbursement. Given that transparency and stakeholder engagement are embedded in the perceived outcome construct, these indicators could provide a practical basis for external assessment of institutional performance. Fourth, digitisation initiatives should retain a non-digital access route and monitor its use. Beneficiaries least able to complete online eligibility procedures may include some of those whom zakat institutions are intended to serve. Institutions could therefore report the proportion of recipients served through assisted or offline channels and monitor changes in this proportion as a potential inclusion indicator. The broader risks associated with digitalisation are discussed in Section 5.8. Finally, the principal priority for future research should be measurement. A shared multi-item instrument using finer response formats would provide a stronger foundation for the literature than another cross-sectional model based on two-item constructs. Where feasible, institutions could also facilitate access to anonymised administrative records covering disbursement, follow-up and enterprise status, allowing the proposed chain to be tested against observed outcomes rather than perceptions. Future research could consequently build on the present conceptual model while substantially improving its measurement and empirical design.

These recommendations are unlikely to be implemented quickly, and institutional capacity is an important constraint. Administrative budgets may be limited by statutory or institutional arrangements, while existing staff and systems already operate under resource constraints. This reinforces the value of treating the recommendations as incremental, evaluable interventions rather than comprehensive reform programmes. A modest pilot that generates credible evidence may ultimately provide greater value to the field than an ambitious programme whose effects cannot be adequately evaluated.

Declaration

Declaration of generative AI. A generative artificial-intelligence assistant was used to support the computational implementation of the estimation and bootstrapping routines, the preparation of tables and figures, and language editing. It was not used to design the research, collect data, or generate or alter any data, result or citation. All reported statistics were re-computed and verified against the source dataset by the authors, who take sole responsibility for the accuracy and integrity of the content.

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Appendix A. Retained Measurement Items

The items below were retained after purification. Items ZAC1, SEO2 and ZSD4 were removed under the criterion stated in Section 4.3; their full wording appears in the original questionnaire supplied as supplementary material.

Table A1: Retained constructs and measurement items

Code	Item	Response scale
ZAC2	Do you believe that zakat funds can play a significant role in promoting economic development and social welfare?	No (1) – Maybe (2) – Yes (3)
ZAC3	Do you think there should be more educational programmes and outreach efforts to promote zakat awareness?	No (1) – Maybe (2) – Yes (3)
TIN1	How important are innovation and technology for the success of social-entrepreneurship ventures?	Not important (1) – Somewhat (2) – Very important (3)
TIN2	How important is innovation for the success of social-entrepreneurship ventures?	Not important (1) – Somewhat (2) – Very important (3)
SEO1	How familiar are you with the concept of social entrepreneurship?	Not familiar (1) – Somewhat (2) – Very familiar (3)
SEO3	How likely are you to support social-entrepreneurship initiatives in your community?	Unlikely (1) – Neutral (2) – Likely (3) – Very likely (4)
ZSD1	How effective are zakat-funded initiatives in fostering social entrepreneurship and innovation?	Not effective (1) – Somewhat (2) – Very effective (3)
ZSD2	How sustainable are zakat-funded initiatives in addressing long-term welfare and development needs?	Not (1) – Somewhat (2) – Sustainable (3) – Very (4)
ZSD3	How crucial are stakeholder engagement and collaboration for the success of zakat-funded initiatives?	Not crucial (1) – Somewhat (2) – Crucial (3) – Very (4)

Note. ZAC = zakat awareness and commitment; TIN = technological innovation; SEO = social entrepreneurship; ZSD = perceived sustainable-development impact.