CONSTRUCTION OF AN INSTRUMENT TO ASSESS CYBERFAITH AMONG INDONESIAN MUSLIMS

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Cyberfaith refers to the endeavor of individuals or groups to seek religious information online through digital platforms. Furthermore, this concept encompasses religious activities such as the performance of rituals, participation in theological discussions, and the formation of virtual religious communities. The practice of religion via cyberfaith is a global phenomenon that transcends national borders and religious boundaries. Nevertheless, a critical challenge arises concerning how to measure this phenomenon. To date, no validated measurement instrument has been identified in existing research on online religious practices. Addressing this gap, the present study employs a quantitative approach, utilizing confirmatory factor analysis (CFA) and the Rasch Rating Scale Model to evaluate the measurement construct of cyberfaith within the Indonesian Muslim community. Findings reveal that the 10-item construct — encompassing aspects such as online religious information-seeking, engagement in virtual rituals, participation in digital discussions, and formation of online communities — demonstrates validity and reliability in measuring cyberfaith among Indonesian Muslims.

The development of technology and information packaged in the digital world and Internet-based social media has touched every aspect of life, from pragmatic aspects to substantial aspects such as religious rituals. Data report as of January 2022 shows that the active social media users in Indonesia amounted to 191.4 million, or about 68.9% of the Indonesian population, an increase of 12.6% from the previous year (DataReportal, 2022). Social media and the Internet shape a lifestyle of instant and fast information absorption (Surya & Erdiansyah, 2021) even in the context of religion. One can spend up to four hours a day browsing social media to watch religious lectures from admired religious figures, which sometimes fuels enthusiasm is fueled by excessive admiration and tends toward individual cults (Hatta, 2019). Social media is like a double-edged sword, on one hand expanding intercommunal ties and access to religious resources, but on the other hand, weakening the quality and opens or expanding exposure to inclusive religious beliefs (Ferguson et al., 2021).

Digital media and religion have become a growing topic of discussion for researchers in the last two decades. For example, in 2000, Elena Larsen in her survey of American residents stated that 28 million Americans used the Internet to search for religious and spiritual information, which connected one belief to another (Dawson & Cowan, 2004; Larsen, 2004). Other researchers examine the occurrence of mediatization or the long-term process caused by media development toward social and cultural changes (Hjarvard, 2016; Lövheim, 2011; Lövheim & Lynch, 2011; Mishol-Shauli & Golan, 2019; Rota & Krüger, 2019). In this mediatization, it is also revealed that there is a revival of social and cultural changes based on religion through digital media that increases the visibility of religion in many public institutions (Hjarvard, 2016; Rota & Krüger, 2019). In addition, digital media is able to change the way a person relates himslef to his religion and provides digital space for a person's religious life to become more exclusive (McClure, 2017). Considering the instant, fast-paced lifestyle facilitated by the presence of media, it is indisputable that digital media can also facilitate one's ease in practicing religion.

The term "cyberfaith" first appeared in Larsen (2004) as a part of Dawson and Cowan's (2004) book titled "Religion online." If traced back, the concept of practicing religion online was first developed by Christopher Helland (2000) and further refined by Dawson and Cowan (2004). The term "religion online" is understood as the use of the Internet as a means for individuals or groups to provide and seek important religious information. On the other hand, online religion views the Internet as a space that allows individuals or groups to practice religious rituals or worship. In other words, instead of using websites only to search for information, religious followers also use websites as an integral part of their religious life. Another concept widely used recently is "digital religion," proposed by Roland Shainidze (2019) in his dissertation.

Research on how religion, both in terms of knowledge and practice, has attracted many academics in the past two decades, focusing on how individuals express their religious identities in media and the pursuit of religious knowledge through media. The presence of virtual religious discussion groups has demonstrated the capacity to engender novel social structures and hierarchies within religious communities (Krüger, 2005). Even the practice of religious communication with media online is predicted to create religious bodies as authorities in everyday life (Reed, 2011). In addition, Yan's (2012) research analyzing cyber behavior and religious practices shows that over the past fifteen years, online religion has moved from descriptive analysis to deeper questions and has overcome some methodological challenges in studying religion online.

Online religious discussion spaces have become a third space that provides a wider religious network both within specific religious groups and between different religious groups. Although the initial purpose was to enable serious discussions about religious issues, this space also serves as a social space where individuals can communicate about nonreligious issues, express their personalities, skills, and opinions, and even interact with their anonymous peers (Okun, 2017). Wilkins-Laflamme's (2022) research also shows that digital religion is a phenomenon present among many Millennials, especially for more passive forms of digital religion, primarily digital content consumption, compared to more active forms such as social media posting. Additionally, according to him, the social environment plays a crucial role, as digital religious practices are more prevalent in more religious societies compared to nonreligious societies.

Based on the overview above, and regardless of the terms and terminology used by many researchers related to the phenomenon of religion online or digital, the major question then is how to construct measurements that can serve as a reference in measuring individuals who can be said to have either high or low levels of online religious behavior, especially in terms of seeking religious information and online religious practices. The main aim of this study is to examine how online manifestations of religious and spiritual engagement, digital access to religious information, and participation in virtual faith-based communities collectively contribute to the formulation of a holistic conceptual framework termed cyberfaith. This investigation is contextualized within the Indonesian Muslim community, with a specific emphasis on Millennials and Generation Z, demographic cohorts hypothesized to engage more intensively with Internet-based platforms in their quotidian practices.

METHOD

Participants and Data Collection

The data for this study were collected through an online survey administered between September and October 2023. Participants were recruited via a dual-method approach combining convenience sampling

and purposive targeting strategies. Recruitment channels consist of social media platforms, academic forums, and communities dedicated to religious and spiritual discourse. To augment institutional engagement, visits were conducted to multiple higher education institutions across Indonesia, facilitating collaborative recruitment support from academic authorities. Prior to survey participation, individuals were required to review and electronically sign an informed consent form. This document outlined the study's objectives, participants' rights (including voluntary participation and withdrawal), and assurances of confidentiality regarding personal data. The self-administered survey maintained participant anonymity and was designed for completion within an estimated 10-15 minutes. Inclusion criteria stipulated a minimum age of 19 years and prior engagement in online religious or spiritual activities, ensuring alignment with the research focus.

The final cohort comprised 1029 Indonesian students aged 17-24 years, with a gender distribution of 33.2% male and 66.8% female. Educational backgrounds were diverse: 60% attended general high schools (SMA), 18.1% Islamic senior high schools (MA), 6.9% Islamic boarding schools (Pondok Pesantren), 10.7% religious colleges, and 4.3% general universities. This demographic composition is anticipated to yield a heterogeneous sample, thereby enhancing the psychometric robustness of the instrument's validity in measuring the construct of cyberfaith among Indonesian Muslim populations. The stratified representation across educational and age cohorts ensures methodological rigor in capturing multifaceted perspectives on digitally mediated religious practices.

INSTRUMENTS AND MATERIALS

The analytical instrument employed in this study constitutes a developmental adaptation of a survey originally designed by Larsen (2004) in the United States. Larsen's seminal work, as outlined in the book chapter "Cyberfaith: How Americans pursue religion online" within the edited volume "Religion online: Finding faith on the Internet" (Dawson & Cowan, 2004), pioneered the conceptual framework of cyberfaith through an 18-item questionnaire. This instrument was devised to investigate how individuals engage with digital platforms for religious and spiritual purposes. The rationale for selecting Larsen's survey lies in its foundational status as the first scholarly endeavor to operationalize the term cyberfaith, encapsulating online religious practices as a distinct phenomenological category.

During the preliminary phase, a comprehensive review of Larsen's (2004) instrument was conducted to identify items most congruent with the construct of cyberfaith as operationalized in this study — defined as an individual's active participation in digitally mediated religious practices. Item selection was guided by theoretical relevance, prioritizing those encapsulating core dimensions of cyberfaith, such as Internet usage for prayer, participation in virtual religious studies, interaction with online faith communities, and engagement in other digitally facilitated devotional activities.

Following this systematic item selection, 10 items were retained for adaptation. These underwent rigorous contextual and cultural modification to align with the socioreligious dynamics of Indonesia's Muslim population. Terminology specific to the U.S. context was recalibrated to reflect local religious lexicons and practices, ensuring conceptual equivalence while preserving the original items' psychometric integrity. For instance, references to denominationally diverse practices were reframed to emphasize universal Islamic rituals (e.g., Prayers, religious gathering). This process of *cultural transposition* — retaining fundamental meanings while optimizing contextual resonance — resulted in a refined measurement construct for assessing cyberfaith within Indonesia's unique digital-religious landscape. The finalized instrument, thus, represents a theoretically grounded synthesis of Larsen's original framework and culturally nuanced modifications, ensuring its applicability to the study's demographic and epistemological objectives as delineated in Table 1.

TABLE 1: Cyberfaith instrument

No	Item	Response
1	I utilize online media by watching/reading/listening to deepen my knowledge of Islam	Never, Rarely, Sometimes, Often, Always
2	I watch/listen to Islamic lectures through online media (YouTube or similar platforms)	Never, Rarely, Sometimes, Often, Always
3	I search online for information (halal product status/prayer times/qibla direction/other)	Never, Rarely, Sometimes, Often, Always

4	I listen to/watch recitations of the Quran/Hadith/Islamic prayers on online media (YouTube/Spotify/Joox/and others)	Never, Rarely, Sometimes, Often, Always
5	I engage in religious activities (such as remembrance, reciting the Quran, seeking blessings, and religious study) online	Never, Rarely, Sometimes, Often, Always
6	I donate (such as zakat/endowment/charity/donation/other) online (using e-money/QR code/copy/shop pay/or similar)	Never, Rarely, Sometimes, Often, Always
7	I follow accounts of Islamic figures and affiliates on social media (Facebook, Twitter, YouTube, Instagram, TikTok, and others)	Never, Rarely, Sometimes, Often, Always
8	I join online Islamic study groups	Never, Rarely, Sometimes, Often, Always
9	I engage in religious discussions/comments via social media (WhatsApp/Facebook/Telegram/other)	Never, Rarely, Sometimes, Often, Always
10	I post/share Islamic content on social media	Never, Rarely, Sometimes, Often, Always

This study hypothesizes that the 10 items employed to measure cyberfaith constitute a unidimensional construct. This hypothesis is grounded in theoretical frameworks and prior empirical investigations which postulate that an individual's engagement in online religious practices represents a unified conceptual domain, reflecting Internet-mediated religious and spiritual activities, access to digitally available religious information, and participation in virtual faith-based communities (Campbell, 2012; Larsen, 2004). Consequently, the foundational assumption of this research is that the 10 items within the instrument do not assess discrete or fragmented aspects but instead coalesce into a singular latent factor. This factor, we argue, operationalizes cyberfaith as a unitary construct, synthesizing its multifaceted manifestations into a cohesive theoretical entity.

ANALYSIS TECHNIQUES

Data analysis related to the measurement construct of cyberfaith utilizes two main techniques of analysis, namely confirmatory factor analysis (CFA) and Rasch Rating Scale Model analysis. CFA is employed to test the instrument's validity theoretically by examining the relationship between observed items and the Cyberfaith construct (Mair, 2018). Meanwhile, Rasch Rating Scale Model analysis is used to assess the measurement properties of scale data, aiming to determine the validity and reliability of the measurement instrument. This helps evaluate the unidimensionality of the measured latent traits, ensuring that items on the scale measure a single underlying construct, examining item difficulty and discrimination parameters, which provide information on how well items differentiate between individuals with different levels of latent traits (Mair, 2018). CFA is conducted using Lisrel Version 8.8 software, while Rasch Rating Scale Model is performed using Winstep Version 3.75 software.

The results of CFA will display fit indices such as chi-square, comparative fit index (CFI), and root-mean-square error of approximation (RMSEA) used to evaluate instrument model fit (Mair, 2018). Meanwhile, Rasch Rating Scale Model analysis yields: 1) expected unidimensionality, with concurrent calibration method which calibrates all items on the Cyberfaith construct without considering the measured aspects and analysis of each aspect of the Cyberfaith construct according to procedures (Pichardo et al., 2018); 2) results of local independence assumption tests using critical values for Yen's Q_3 (Yen, 1984); 3) results of item fit tests with mean square values (MNSQ); 4) results of reliability tests for persons and items displaying Wright maps to determine the measurement results of the Cyberfaith construct by comparing individuals and items on the same scale; 5) expected scores curve providing the expected testing curve in an instrument item; and 6) Presenting item characteristic curves (ICC) as supplementary information to elucidate the appropriate functioning of items and their characteristics (Deviana et al., 2020). These two main analysis techniques are expected to demonstrate that the Cyberfaith construct is valid and reliable in measuring an individual's religious activities in the digital or online world.

RESULTS

Confirmatory Factor Analysis (CFA)

It has been mentioned that the Cyberfaith construct consists of 10 items. After conducting CFA, it was found that the Cyberfaith construct did not fit the data. Therefore, this study modified the model 19 times until finally obtaining a fitting model with chi-square = 21.60, *df* = 16, *p*-value = .15, and RMSEA = .01. The modification of the model was undertaken to balance considerations of statistical fit and theoretical justification, with the objective not merely to mechanistically enhance fit indices but also to ensure the model's validity in accurately reflecting the cyberfaith concept. Consequently, the finalized model yields more precise insights into individuals' engagement in online religious practices. Furthermore, these adjustments align with the inherent requirements of CFA, which prioritizes congruence with theoretical frameworks; as such, modifications are iteratively pursued until the model demonstrates adequate alignment with its conceptual foundations. These methodological steps are consistent with prior scholarly approaches that underscore the necessity of iterative evaluation in instrument development (Brown, 2015; Byrne, 2016). The outcomes of the validation tests for each cyberfaith item are delineated in Figure 1.

FIGURE 1

Chi-Square=21.60, df=16, P-value=0.15654, RMSEA=0.018

CFA model fit of Cyberfaith construct
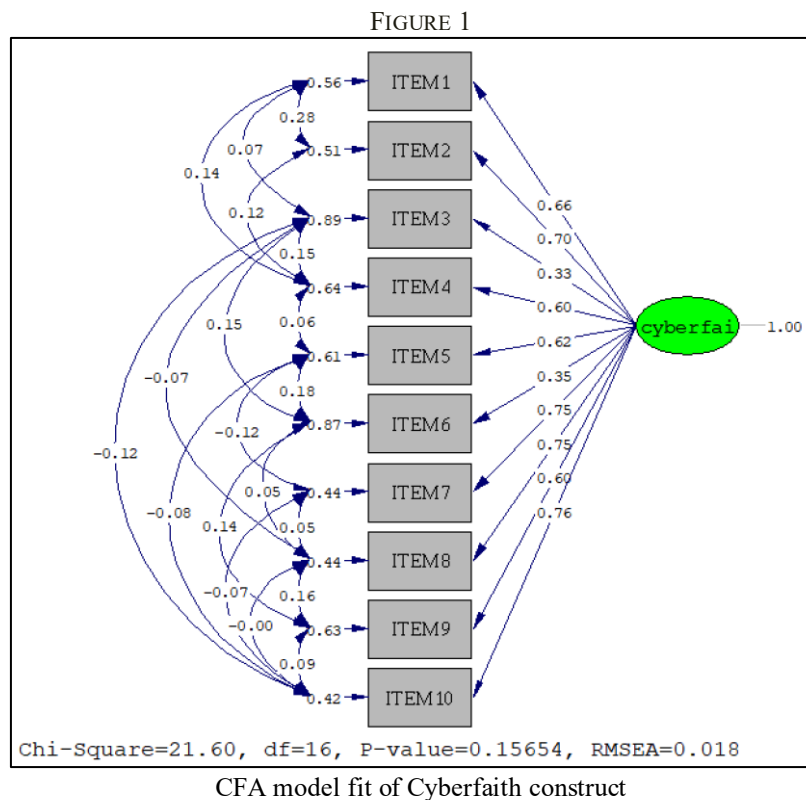
Subsequently, an analysis of the validity test outcomes for each item on the Cyberfaith construct is presented in Table 2, showcasing the intricate nuances of the assessment process.

TABLE 2: CFA of item cyberfaith validity

Item	Coefficient	*SE*	*t*-value	Note
1	0.66	0.03	21.53	Valid
2	0.70	0.03	23.14	Valid
3	0.33	0.03	9.70	Valid
4	0.60	0.03	18.63	Valid
5	0.62	0.03	19.38	Valid
6	0.35	0.03	10.53	Valid

Item	Coefficient	SE	t-value	Note
7	0.75	0.03	23.40	Valid
8	0.75	0.03	23.92	Valid
9	0.60	0.03	19.26	Valid
10	0.76	0.03	22.34	Valid

Note. SE = standard error. Valid = *t*-value > 1.96.

Derived from Table 2, it becomes apparent that all items exhibit *t*-values surpassing 1.96 (> 1.96), affirming every item's validity within the Cyberfaith construct as per the CFA assessment.

Rasch Rating Scale Model (RSM)

Unidimensionality

The examination of the unidimensionality assumption of the instrument in this research was carried out through the utilization of PCAR (principal component analysis residual; Chou & Wang, 2010; Smith, 2002). The criteria employed to assess the unidimensionality within a tested construct, encompassing each aspect measuring social support, are discerned when the raw variance explained by measures surpasses the threshold of 30% (Linacre, 1998) signifying that each facet of the Cyberfaith construct exhibits a unidimensional nature.

TABLE 3: Standardized residual variance (in eigenvalue units)

		–	Empirical	–	Modeled
Total raw variance in observations	=	21.8	100.0%		100.0%
Raw variance explained by measures	=	11.8	54.1%		53.5%
Raw variance explained by persons	=	5.0	22.8%		22.5%
Raw variance explained by items	=	6.8	31.3%		31.0%
Raw unexplained variance (total)	=	10.0	45.9%	100.0%	46.5%
Unexplained variance in 1st contrast	=	1.8	8.3%	18.1%	
Unexplained variance in 2nd contrast	=	1.8	8.2%	17.8%	
Unexplained variance in 3rd contrast	=	1.1	5.3%	11.5%	
Unexplained variance in 4th contrast	=	1.1	5.0%	10.8%	
Unexplained variance in 5th contrast	=	1.0	4.7%	10.3%	

Based on Table 3, the findings reveal that the Cyberfaith construct, designed to gauge online and digital religious engagements within the Indonesian Muslim populace, demonstrates a raw variance explained by measures amounting to 54.1%. This suggests that with a raw variance explained by measures surpassing the 30% threshold (> 30%), the 10 items encapsulating cyberfaith indicate a unidimensional nature, portraying a comprehensive and singular construct underlying the multifaceted dimensions of online religious practices among the targeted demographic. Additionally, the unexplained variance in the first contrast was < 2, indicating that this instrument does not measure any other dimensions, thereby fulfilling the assumption of unidimensionality in this study.

Local Independence

In examining the local independence assumption, the primary objective is to ascertain that the completion of one item does not rely on the completion of another item, as delineated by Mair (2018). After ensuring the fulfillment of the unidimensionality assumption, the assessment of the local independence assumption is conducted utilizing the critical value of Yen Q_3, a methodology endorsed by scholars such as (Christensen et al., 2016; Yen, 1984), which is often used in detecting local dependencies in items. Under this criterion, it is stipulated that the residual correlation between pairs of items must never surpass the threshold of 0.30 (> 0.30). According to the findings of Christensen et al. (2016) and Nair et al. (2011), if a residual correlation were to exceed this threshold, this implies a lack of local independence, indicating a scenario in which one element is subordinate to another. The local independence assumption test outcomes are detailed in Table 4 for further examination and analysis.

TABLE 4: Largest standardized residual correlations

Correlation	Entry		Entry	
	Number	Item	Number	Item
0.35	1	Item 1	2	Item 2
−0.32	3	Item 3	8	Item 8
−0.30	3	Item 3	10	Item 10
−0.27	1	Item 1	6	Item 6
−0.26	2	Item 2	6	Item 6
−0.25	5	Item 5	7	Item 7
−0.24	2	Item 2	9	Item 9
−0.24	6	Item 6	7	Item 7
−0.24	1	Item 1	9	Item 9
−0.23	6	Item 6	8	Item 8

Based on Table 4, the analysis results using the criteria of the critical value of Yen Q_3 indicate that the items exhibiting the highest residual correlation are Item pair 1, which reads "I utilize online media by watching/reading/listening to deepen my knowledge of Islam," and Item pair 2, which reads "I watch/listen to Islamic lectures via online media (YouTube or similar platforms)," with a residual correlation of 0.35, exceeding the threshold of 0.30. Thus, it can be understood that when an individual intensively utilizes online media to deepen their Islamic knowledge, it also affects how they access online media, whether through watching or listening. This also demonstrates that Items 1 and 2 pertain to a single aspect, namely "religious knowledge." Meanwhile, the other items meet the assumption of local independence testing, where the residual correlation values do not exceed 0.30. Hence, it can be argued that the items obtained in the Cyberfaith construct do not exhibit interdependence, except for Items 1 and 2, which still fall under the aspect of religious knowledge.

Item Fit and Reliability

Subsequent testing involves evaluating item fit through parameters such as infit and outfit, which are assessed based on the mean square (MNSQ) values, to gauge the efficacy of individual items in accurately measuring a given construct, namely cyberfaith. This testing paradigm also serves a dual role as it offers corroborative evidence attesting to the unidimensional nature of the Cyberfaith construct. Within the Rasch Rating Scale Model framework, the appropriateness of infit and outfit MNSQ values falls within the range of 0.5-1.5, as substantiated by the works of Andrich and Marais (2019), Bond and Fox (2015), and Deviana et al. (2020).

TABLE 5: Item measure order of cyberfaith

Item	Measure (logit)	SE	Infit MNSQ	Outfit MNSQ	PT-Measure Corr.	OBS%	EXP%
Item 9	1.14	0.04	0.99	0.99	0.68	46.2	46.8
Item 8	1.04	0.04	0.98	0.97	0.74	47.8	47.0
Item 6	0.81	0.04	1.38	1.42	0.51	40.9	46.0
Item 5	0.54	0.04	0.98	0.99	0.63	51.3	46.2
Item 10	0.50	0.04	0.89	0.91	0.70	51.7	46.1
Item 7	−0.31	0.04	1.16	1.15	0.69	44.1	47.8
Item 2	−0.69	0.04	0.62	0.63	0.69	60.6	49.1
Item 4	−0.83	0.04	0.77	0.77	0.65	54.8	49.4
Item 1	−0.92	0.04	0.63	0.67	0.67	59.9	49.6
Item 3	−1.26	0.04	1.45	1.49	0.43	42.0	51.1

As can be seen in Table 5, the infit and outfit values of all cyberfaith items are within the range of 0.5 to 1.5. This indicates that each item demonstrates an optimal fit to the Cyberfaith construct, affirming their effectiveness in accurately assessing the intended construct. Furthermore, the analysis revealed person reliability indices of 0.83 (real) and 0.86 (model), accompanied by separation values of 2.22 (real) and 2.51 (model). These metrics suggest that the measurement instrument exhibits strong discriminatory capacity in distinguishing individuals according to their cyberfaith levels, thereby enabling their classification into two distinct groups. Concurrently, item reliability was observed to be 1.00 (both real and model), with separation indices of 19.80 (real) and 20.79 (model). This underscores the instrument's ability to maintain a distinct difficulty hierarchy across items, ensuring their precise categorization within the Cyberfaith construct. These psychometric properties are further substantiated by a Cronbach's α coefficient of .84, which demonstrates robust internal consistency and reinforces the overall reliability of the measurement framework in operationalizing cyberfaith.

Wright Map

Following this, the Rasch Rating Scale Model further delineates the construct validity by delineating the hierarchy of items as discerned within the Wright map, as outlined in the study by Pichardo et al. (2018). This hierarchical representation offers a comprehensive visualization of how each item contributes to the overall construct, elucidating their relative positions and contributions within the measurement framework.
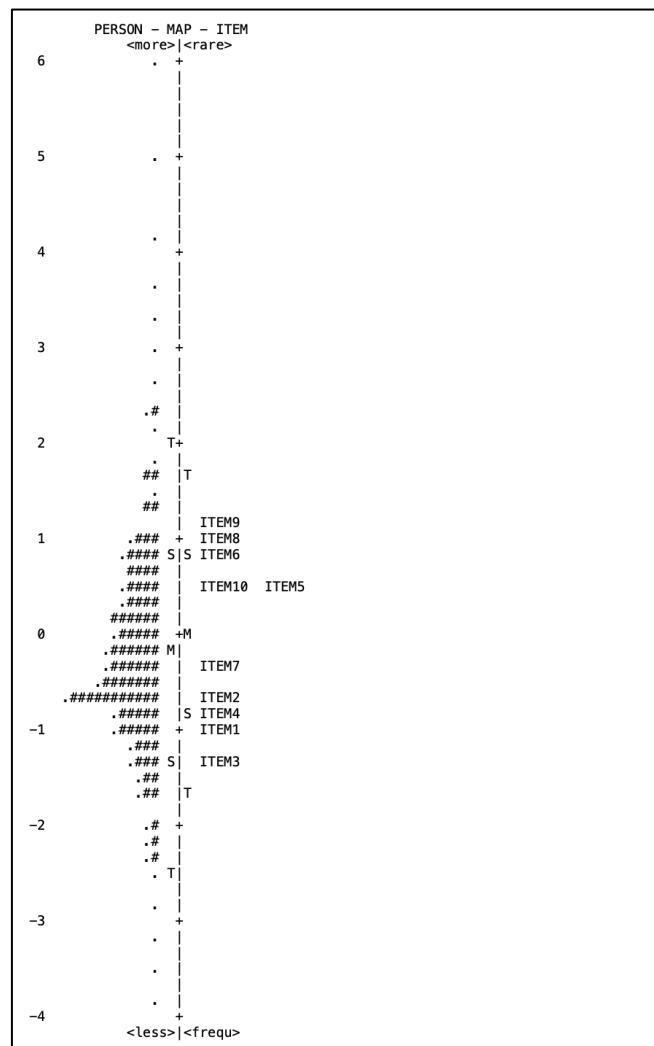
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FIGURE 2
Wright map of Cyberfaith construct

The graphical representation provided in Figure 2 delineates the juxtaposition of item difficulty along the right axis and individual ability on the left axis. It is expected that items within this framework form a continuum, with those characterized by lower difficulty levels positioned toward the lower end, moderately challenging items occupying the mid-range, and items posing higher levels of difficulty situated toward the upper end of the scale. Similarly, individuals are distributed across the spectrum by their varying levels of attributes pertinent to the measured variable. The visual depiction unveils a normative distribution of all categorical responses, spanning from the i category of "strongly disagree" to the category of "strongly agree." Moreover, the distribution pattern observed among respondents manifests an equitable dispersion predominantly clustered around the middle, thereby indicating a normal distribution. This observed pattern suggests that the array of items effectively accommodates the diverse range of individual responses.

Expected Score Curve

The expected scores curve, an integral concept within the framework of the Rasch Rating Scale Model analysis, embodies a foundational principle within the domain of measurement theory. Within the

Rasch modeling paradigm, this curve serves as a graphical representation illustrating the predictive association between the difficulty levels of measurement items and the corresponding abilities of individuals. Characterized by its sigmoidal shape, the expected scores curve delineates a continuum wherein items of lesser difficulty are positioned toward the left side of the zero point. In comparison, those of greater difficulty are situated toward the right. Through the Rasch model, it is envisaged that the curve predicts the probability distribution of observing each category along the latent variable spectrum, thereby facilitating the estimation of mean assessments across diverse proficiency levels. In the context of assessing the Cyberfaith construct, the analysis of the expected scores curve provides invaluable insights into the interplay between item difficulty and individual proficiency.
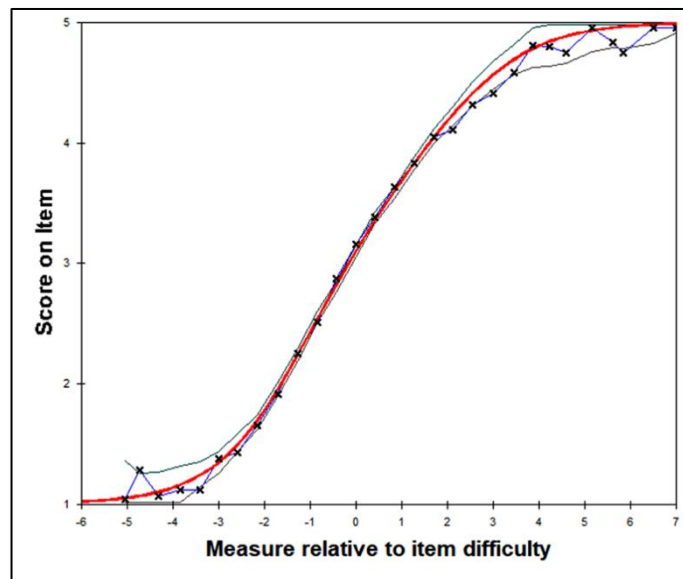
FIGURE 3
Expected scores curve of cyberfaith

From the graph delineated in Figure 3, it can be inferred that a total of seven items manifest abilities that correspond with the anticipated curve, encompassing Item 1 ("I utilize online media by watching/reading/listening to deepen my knowledge of Islam"), Item 2 ("I watch/listen to Islamic lectures through online media (YouTube or similar platforms)"), Item 4 ("I listen to/watch recitations of the Quran/Hadith/Islamic prayers on online media (YouTube/Spotify/Joox/and others)"), Item 5 ("I engage in religious activities (such as remembrance, reciting the Quran, seeking blessings, and religious study) online"), Item 7 ("I follow accounts of Islamic figures and affiliates on social media (Facebook, Twitter, YouTube, Instagram, TikTok, and others)"), Item 9 ("I engage in religious discussions/comments via social media (WhatsApp/Facebook/Telegram/other)"), and Item 10 ("I post/share Islamic content on social media"). These seven items are found to align with the anticipated computations of the Rasch model. Conversely, items that present notable challenges in response, as evidenced by the plotted points, encompass Item 3 ("I search online for information (halal product status/prayer times/qibla direction/other)") and Item 6 ("I donate (such as zakat/endowment/charity/donation/other) online (using e-money/QR code/copy/shop pay/or similar)"). Here, the ability curves deviate significantly from the expected model curve. Item 8 ("I join online Islamic study groups") is noteworthy and emerges as the most readily answered item, with its ability curve distinctly rising above the anticipated model curve.

Item Characteristic Curve

Item characteristic curves, integral to the understanding of psychometric assessments, elucidate the probability of an item's correct response based on the respondent's underlying ability or proficiency on the measured trait. These curves, fundamental to Item Response Theory, are bound within a range of 0 to 1, exhibiting a monotonically increasing pattern and are conventionally assumed to follow a logistic function shape. Each item within a test possesses its distinctive characteristic item curve, representing its unique relationship between the probability of a correct response and the respondent's ability level (Adetutu & Lawal, 2022). The graphical representation of item characteristic curves provides insights into how different items perform across varying levels of ability, offering valuable information for evaluating each item's discriminatory power and effectiveness in assessing the targeted construct.

FIGURE 4
Item characteristic curves (ICC) of cyberfaith
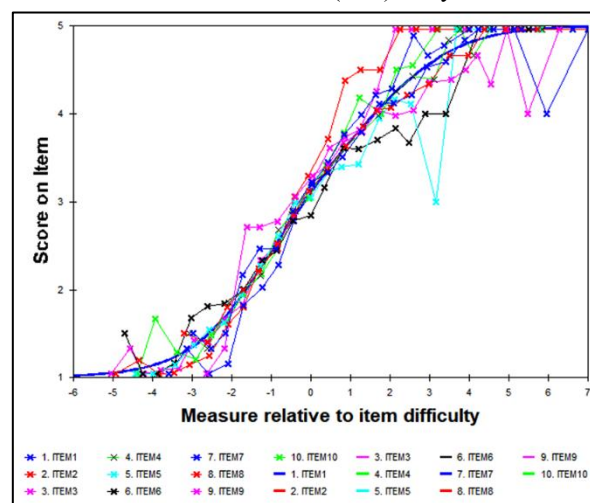
It is observed that within both the ICC (item characteristic curves) and the expected scores curve, the Cyberfaith construct is capable of generating expected scores plots, thus signifying that the items contained within the Cyberfaith construct, along with their respective categories, operate by expectations (items presenting the highest level of difficulty demonstrate a lower probability of being answered correctly, whereas items with the lowest level of difficulty exhibit a reduced likelihood of being left unanswered). The subsequent ICC outcomes additionally substantiate this assertion.

TABLE 6: ICC cyberfaith

	xsi	se.xsi
Item1	−2.550	0.040
Item2	−2.342	0.039
Item3	−2.853	0.040
Item4	−2.462	0.039
Item5	−1.225	0.038
Item6	−0.983	0.038
Item7	−1.992	0.038
Item8	−0.773	0.038
Item9	−0.682	0.040
Item10	−1.264	0.038
Cat1	−7.668	0.043
Cat2	0.088	0.027
Cat3	0.989	0.022
Cat4	2.436	0.025

Note. xsi = The item difficulty parameters; se.xsi = The standard error of item difficulty parameters.

It is pertinent to note that xsi denotes the log odds of a correct response for a specific amalgamation of item and category, portraying the item's difficulty for an individual at a particular level of the measured construct. Concurrently, se.xsi signifies the standard error of the log-odds estimation, wherein a lower standard error implies a more precise estimation of the item difficulty (Mair, 2018). Derived from Table 6, it can be surmised that Item 3, "I search online for information (halal product status/prayer times/qibla direction/other)," exhibits the highest use. xsi value among its counterparts, indicating its status as the most challenging item for respondents. Conversely, Item 10 ("I post/share Islamic content on social media") emerges with the lowest se.xsi value, denoting it as the most easily answered item among respondents.

Test Information Function

The Test Information Function (TIF) in Rasch analysis serves to quantify the psychometric precision of a questionnaire across varying levels of respondent proficiency (θ), a principle analogous to Item Response Theory (IRT). Specifically, the TIF reflects the instrument's capacity to yield accurate and reliable estimates of latent trait proficiency (θ), with higher information values corresponding to greater measurement precision in parameter estimation. In this study, the TIF for the Cyberfaith construct is depicted in Figure 5, illustrating the instrument's psychometric robustness at distinct points along the θ continuum.
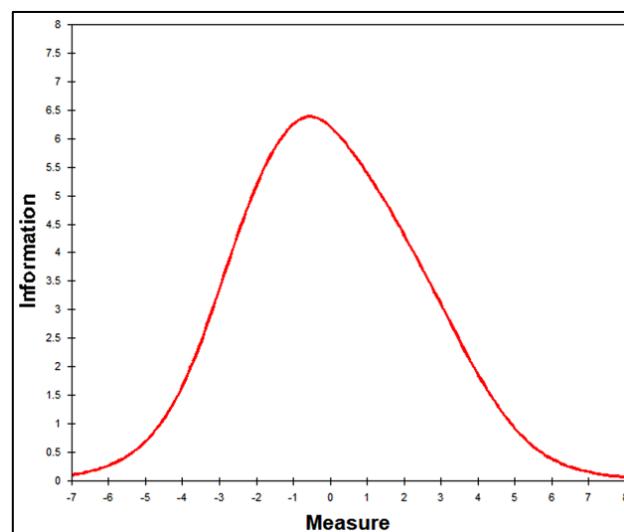
FIGURE 5
Test Information Function of cyberfaith

As illustrated in Figure 5, the TIF analysis reveals that the highest psychometric information is concentrated at a relatively low proficiency level ($\theta \approx -1$ on the horizontal axis). This indicates that the Cyberfaith construct exhibits optimal measurement precision for individuals with comparatively limited engagement in online religious practices, as parameter estimation accuracy peaks within this region. Notably, the instrument's informational efficacy diminishes markedly at extreme lower proficiency thresholds ($\theta < -5$), reflecting reduced reliability in distinguishing traits among respondents with exceptionally low cyberfaith levels. In contrast, at higher proficiency levels ($\theta > 5$), the scale retains considerable utility, continuing to provide substantive psychometric information despite the inherent challenges of measuring elevated trait magnitudes. Collectively, these findings underscore the instrument's asymmetric yet broad discriminative capacity, as it demonstrates robust informational yield across a spectrum ranging from moderate to high cyberfaith levels, albeit with pronounced precision in the lower-to-moderate range.

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Discussion

Cyberfaith is understood as the endeavor of seeking religious information accompanied by participation activities, either individually or in groups (Larsen, 2004). Elena Larsen's (2004) measurement construct of cyberfaith on 500 American society members serves as the initial framework in examining how society implements religious styles by utilizing information technology developments. However, these 18 constructs have not been validated in assessing how individuals practice religion online. This is because the constructs created by Elena Larsen (2004) are survey-based regarding the role of the Internet in enticing people to engage in their religious activities online.

In this study's Cyberfaith construct, four aspects focus on understanding how Indonesian Muslim society practices religion online. Firstly, the aspect of seeking religious information on the Internet is represented by Item 1 ("I utilize online media by watching/reading/listening to deepen my knowledge of Islam"), Item 2 ("I watch/listen to Islamic lectures through online media (YouTube or similar platforms)"), and Item 3 ("I search online for information (halal product status/prayer times/qibla direction/other)"). This aspect of seeking religious information on the Internet is in line with Larsen (2004) initial cyberfaith framework and also with Michels (2013) who considers information seeking (SI) about religion to be crucial in understanding how people utilize the Internet for religious purposes. However, the results of this analysis found a dependency between Items 2 and 1, indicating that engaging in watching or listening to religious content depends on the extent to which someone uses online media to seek religious information. The analysis also shows that Item 3, which represents the search for halal product information, is the most challenging for Indonesian Muslim society. This can be understood as the halal status of a product in Indonesia being accommodated by the Indonesian Ulema Council (MUI), making Indonesian society feel no need to check whether a product is halal or not.

Secondly, the aspect of engaging in religious activities online, measured by Item 4 ("I listen to/watch recitations of the Quran/Hadith/Islamic prayers on online media (YouTube/Spotify/Joox/and others)"), Item 5 ("I engage in religious activities (such as remembrance, reciting the Quran, seeking blessings, and religious study) online"), and Item 6 ("I donate (such as zakat/endowment/charity/donation/other) online (using e-money/QR code/copy/shop pay/or similar)"). Yan (2012) asserts that the Internet can serve as a platform for the development of Muslim identity worldwide, thus aligning offline and online religious styles. Among these three Items (4, 5, and 6), one remains that is difficult for Indonesian Muslim society to answer, which is Item 6 regarding performing charity or donations online. This is based on the fact that the majority of Indonesian Muslim population still conducts charitable acts or donations of wealth directly (offline) or through conventional institutions such as mosques, prayer rooms, and other Islamic institutions.

Thirdly, the aspect of online religious community and authority is represented by Item 7 ("I follow accounts of Islamic figures and affiliates on social media (Facebook, Twitter, YouTube, Instagram, TikTok, and others)") and Item 8 ("I join online Islamic study groups"). Campbell (2012) posits that the Internet can serve as a platform for religious communities and even has the potential to transform authoritative institutions; this phenomenon is also evident in the religious practices of Indonesian Muslim society. Based on the results of the analysis, Item 8 regarding an individual's participation in online Islamic study groups is easily answered by Indonesian Muslim society. This demonstrates that online religious discussions, which form communities, are actively pursued by Indonesian Muslim society.

Fourthly, the aspect of online religious discussions is represented by Item 9 ("I engage in religious discussions/comments via social media (WhatsApp/Facebook/Telegram/other)") and Item 10 ("I post/share Islamic content on social media"). Similar to the previous community aspect, online religious discussion is also an important component in understanding how the concept of cyberfaith is prevalent in Indonesian Muslim society. Based on the results of the analysis, it is noted that Item 10, regarding the activity of posting or sharing religious content online, is the easiest item for Indonesian Muslim society to respond to. This is rooted in the fact that Indonesian Muslim society enjoys and is accustomed to sharing content in their daily lives, whether in the form of text, images, or videos related to Islam.

A critical limitation of this study lies in the potential violation of the local independence assumption, as residual dependencies or correlations between Items 1 and 2 were identified, albeit marginal in magnitude. While these interdependencies do not substantially compromise the model's overall validity, they warrant methodological consideration, particularly in refining the narrative coherence or theoretical distinctiveness of these items prior to their deployment in subsequent research. Furthermore, while the instrument demonstrates measurement precision across individuals with moderate to elevated cyberfaith levels, its psychometric robustness diminishes at extreme ends of the latent trait spectrum (i.e., exceptionally low or high θ values).

Consequently, the inclusion of additional items calibrated to capture extreme cyberfaith magnitudes is recommended, as the current framework exhibits limited informational yield in these regions, thereby restricting its utility for populations with polarized religious engagement. A final caveat pertains to the demographic constraints of the sample, which predominantly comprised Millennials and Generation Z respondents. This age-specific sampling raises concerns about the restricted generalizability of findings to adult populations, as potential variability in sociocultural digital literacy and religious praxis across generational cohorts may influence the instrument's psychometric performance.

CONCLUSION

This study has revealed that cyberfaith — far from being an overly complex phenomenon — can be precisely measured and understood through carefully designed metrics. The 10-item Cyberfaith construct developed in this study demonstrates strong validity and reliability in capturing the nuanced dynamics of online religious engagement among Indonesian Muslims. Notably, certain items, such as Item 3 (seeking halal certification for products) and Item 6 (facilitating online charitable donations), posed challenges for respondents in terms of clarity and interpretation. In contrast, other components, such as Item 8 (participation in online religious study groups) and Item 10 (disseminating religious content via digital platforms), were more readily comprehensible. These findings underscore the multifaceted nature of cyberfaith in contemporary Indonesian Muslims. Furthermore, the indicators — online manifestations of religious and spiritual engagement; digital access to religious information; and participation in virtual faith-based communities — have demonstrated the capability to measure aspects of cyberfaith among current Indonesian Muslims.

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