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Representing Religious Practices via AI-Generated Personas: A Case Study of Ramadan Behaviors from Four Predominantly Muslim Countries

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***Abstract*—With nearly two billion Muslims worldwide, designing technology that serves their needs is a significant task, especially during Ramadan, the season of spiritual reflection and change in lifestyle. We present a data-driven approach to generating personas representing differing religious views of Ramadan, based on a large-scale survey conducted in four Muslim-majority countries: Egypt, Indonesia, the United Arab Emirates, and Saudi Arabia. Our approach furthers the representation of underrepresented groups by embedding religious and cultural factors in persona development, aligning with the principles of value-sensitive design. Via correlation analysis, we identified seven distinct groups that reflect diverse practices and values during the Islamic holy month. These findings informed persona creation, capturing variations in spiritual engagement, digital media consumption, and the planning of Ramadan. The resulting personas provide actionable insights for developers designing inclusive applications such as charitable platforms and ecommerce systems aligned with Muslim values. We discuss the implications of employing personas for culturally aware system design and demonstrate how AI-generated personas can support inclusive design in religiously diverse settings. Ultimately, this work contributes to the growing research on human-centered technologies for value-aligned and context-aware systems.**

***Index Terms*—Ramadan, Value-Sensitive Design, Inclusive Technology, Human-Centered Design, User Segmentation, AI-generated Persona.**

I. Introduction

The need for culturally and contextually aware design has become more urgent to meet the diverse needs of the worldwide user base. This becomes critical when designing for a population of approximately two billion Muslims worldwide, representing roughly a quarter of the world's population . In Muslim-majority countries, Ramadan, a sacred month of fasting, reflection, and community, is a religious event and a culturally significant period that reshapes social routines, emotional states, and digital behaviors [1], [2]. Yet, despite its importance, few computing systems explicitly account for the unique rhythms and values associated with Ramadan for Muslim users, often overlooking the diversity of unique user practices that emerge during the Ramadan period [3]. This not only represents a usability issue but also reinforces exclusionary norms that ignore the lived realities of Muslims.

In this research, we examine how segments of religious participants during Ramadan can be represented using personas generated from survey data. *Personas are data-driven user archetypes synthesizing behavioral, emotional, and contextual patterns from structured and unstructured (numerical and textual) data* [4]. While personas are widely used in user-centered design (UCD), they often fail to account for religious practices, cultural values, or seasonal observances [5]. Moreover, when religion is included, it is usually treated monolithically, obscuring meaningful variation within user segments who identify with the same faith. Our work addresses these gaps by using empirical survey data to generate personas that reflect how people observe Ramadan differently, in terms of when they shop, how they engage with technology, how much they spend, and what emotions they associate with the holy month (see Figure 1).

We base our study on a large-scale, multi-country survey of participants in four Muslim-majority countries. Using correlation analysis, we identify significant relationships among religious engagement, digital behavior, spending patterns, and emotional outlook for the coming year. From these patterns, we generate seven personas representing the main Ramadan user segments, each grounded in behavioral evidence and enriched with emotional and cultural insights. These personas illustrate, for example, how some users prioritize spiritual reflection through online media, while others focus on community, family, or logistical preparation using online services. The personas' insights into the mindset, goals, and values of the user segments make personas powerful tools to guide inclusive design decisions and avoid the stereotype of treating all Muslims monolithically.

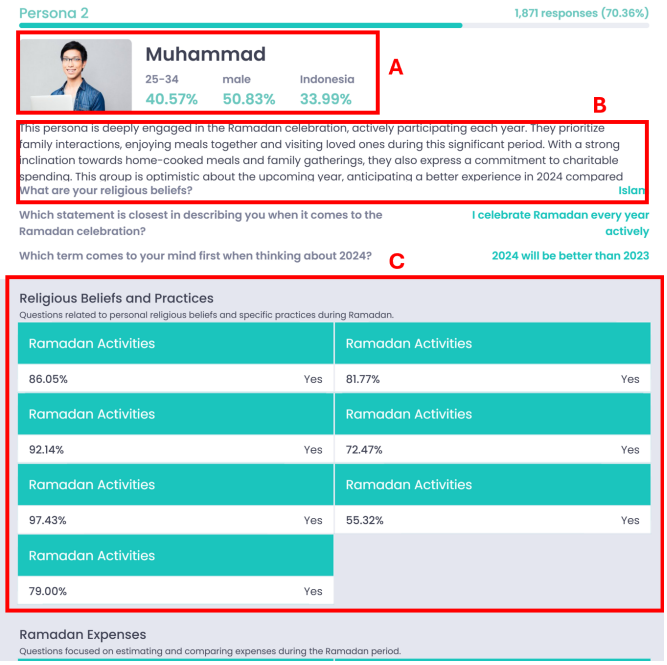

Fig. 1: AI-generated persona representing a Ramadan user segment from Indonesia. **A:** Demographic information. **B:** AI-generated persona description. **C:** AI created survey headings and survey item groupings.

Our research contributes to the growing literature on value-sensitive design [6], inclusive design [7] , and culturally aware computing by demonstrating how survey-based personas can bridge empirical data and religious user needs [6], [8]. We argue that in Muslim-majority contexts, inclusive system design [9] must go beyond surface-level localization and engage with the religious and emotional textures of users' lived experiences [10]. Situating persona development within the religious calendar and cultural context of Ramadan provides both a methodological roadmap and a practical resource for designers building applications for seasonal, value-driven settings. Additionally, we make access to the persona generation and survey dataset publicly available at [link hidden for anonymous review].

II. Literature Review

Designing inclusive computer systems for Muslim-majority contexts requires close attention to the cultural and religious practices shaping everyday technology. Ramadan, observed by more than two billion Muslims worldwide, redefines daily schedules, emotional states, and the use of technology for one month [1]. Taking place during the ninth month of the Islamic calendar, Ramadan is a significant religious period for most Muslims. Ramadan is marked by increased acts of spirituality, family-focused devotion, and acts of kindness, prompting Muslims to adopt major lifestyle changes. These include abstaining from food and drink from sunrise to sunset, practicing self-discipline, dedicating more time to prayer and reflection, and participating in charitable deeds. These shifts directly and substantially impact user, consumer, and social behavior, imposing a unique design challenge.

Human-computer interaction (HCI) research in this area has focused on three complementary themes. First, empirical descriptions of how and when Muslims engage with technology during Ramadan [1]. Second, applying value-sensitive design (VSD) [8] facilitates considering Islamic moral and cultural norms in system design. Third, survey-based and data-driven persona-generation methods make these diverse user segments tangible for design teams [4]. We now review research on these themes.

A. Digital and Behavioral Practices During Ramadan

Prior empirical work documents how Ramadan redefines daily routines and technology habits in Muslim-majority regions. Due to fasting, many activities shift to late-evening hours. Ghaban et al. followed 564 Saudi online learners and observed that logins and responses increased significantly after iftar (the meal breaking the fast at sunset), while daytime participation decreased sharply [1]. Similar patterns have been reported for work, study, and leisure. This shows that the digital services aimed at Ramadan observers reach their audience more effectively during the evening and night window [1]. Addressing these issues, social media and other platform designers must account for Ramadan's specific usage patterns, particularly heavy traffic between iftar and suhoor, and offer content that aligns with user priorities, such as Quran recitation, charitable giving tools, and community forums. In short, effective systems must mirror the month's distinctive temporal rhythms and religious practices to keep users engaged and well served [1]. Our research contributes to this effort by presenting a method for generating culturally aware personas sensitive to the lifestyle changes that occur during Ramadan.

Beyond changes in daily schedules, Ramadan also alters the nature of online engagement for many Muslims. Ramadan observers turn to digital platforms for spiritual content and community, a trend that became pronounced during the COVID-19 pandemic as religious activities moved online [3]. Studies of "techno-religious" practice report an increased use of video streaming, social media, and messaging platforms to share iftar moments, attend virtual prayers or sermons, and maintain social connections while fasting. The use of Islamic applications [11] also increases, providing Quran recitations, prayer time reminders, and charitable features [12]. Fatmawati's systematic review [2] of digital Ramadan da'wah identifies three consistently popular design elements of such apps, including interactive multimedia lessons, personalized religious prompts, and moderated community forums. Our research contributes to this understanding through a data-driven analysis of online usage during Ramadan and its impact on online engagement.

B. Value-Sensitive Design in Religious Contexts

While aligning design with observable user behavior is necessary, truly inclusive design requires that digital systems embody the values that motivate that behavior. Conceptually,

VSD prioritizes *human values* (e.g., privacy, trust, and moral integrity) throughout the design process. In contrast, inclusive design focuses specifically on making products *accessible and usable* by people with the broadest possible range of abilities and circumstances. VSD offers a principled method to integrate moral, cultural, and personal values throughout the technology design process [8]. In Muslim majority settings, this means accommodating prayer times, offering privacy controls, respecting modesty norms, and curating content consistent with Islamic etiquette. Prior research shows that neglecting such values can undermine adoption [13]. Users often repurpose mainstream tools [14] to maintain modesty and family obligations [15], revealing a mismatch between their default design assumptions and local expectations. In contrast, research grounded in faith considerations, such as Ibtasam's call to integrate religious beliefs into HCI [8], demonstrates that value-aligned features improve usability and trust.

The scholarship in HCI increasingly emphasizes the importance of integrating religious beliefs and cultural practices into technology design [16]. Ibtasam points out that historically, research in technology on religion [17] has predominantly focused on explicit religious rituals, such as prayer or scripture applications, often overlooking the subtler influences of everyday religious norms and practices [8]. From Islamic communities' experience, Ibtasam reports that cultural norms of gender dynamics, modesty expectations, and spiritual attitudes significantly impact how individuals interact with technology. For example, cultural practices such as gender segregation or women's adherence to the hijab shape communication choices, preferences for specific online platforms, and digital self-representation [8].

Ensuring that these religious values are represented in the design of platforms for this population is central to the VSD framework. Conwill et al. [18] explicitly highlight this challenge, noting that designers unfamiliar with particular cultural or religious contexts risk overlooking or misunderstanding critical stakeholder values, even when following established VSD guidelines. Some researchers suggest the integration of religious frameworks directly into the design processes [16], drawing on ethical principles from traditions such as Islamic teachings, Catholic social doctrine, and Jewish ethics. This emerging approach represents a larger effort to ground technology development in long-standing moral and cultural traditions, to create systems that are culturally responsive and ethically strong [18]. As presented in this research, data-driven personas offer a powerful tool by providing designers with tangible cultural insights into the experiences of diverse audiences.

For applications specifically targeting Ramadan, VSD encourages designers to ask practical yet critical questions, such as: *Does the system align with Islamic etiquette and modesty norms?*, *Do the application's features explicitly promote charity, community, and generosity values, especially prominent during Ramadan?*, *Is the system flexible enough to accommodate fasting schedules and prayer times?*, By explicitly addressing such considerations in the design process, VSD enhances the cultural relevance and ethical alignment of computing systems and improves their acceptance and effectiveness among users in Muslim-majority contexts.

C. Persona Generation Toward Understanding Diverse User Populations

To effectively translate user insights into actionable design guidance, practitioners often rely on personas, which are fictional humanized representations of user data that are empirically informed by user archetypes, as strategic design tools. Personas summarize essential attributes, behaviors, needs, and goals of diverse user segments into accessible and relatable narratives [19], [20]. Although personas were traditionally generated from qualitative research methods, , more recent methodological advances emphasize survey-based and data-driven approaches. These newer methods leverage empirical data collected from structured surveys, analytics platforms, and social networks to generate personas that more accurately represent the complexity of real-world user populations [4]. With artificial intelligence (AI) integration, persona systems now allow designers to interact with personas in natural language [21].

Persona generation from survey data usually entails collecting structured user data, such as user demographics, common behavioral patterns, and personal preferences, through questionnaires. Researchers then apply statistical analyses to this data to uncover meaningful user groups, which are translated into detailed persona profiles. For example, Schäfer et al. [4] used this methodology in their nationwide survey of older adults' ICT usage, deriving eight distinct personas that captured diverse abilities, needs, and attitudes within this demographic. This illustrates the larger value of survey-driven personas, as they can accurately represent minority or specialized user segments, such as elderly Muslims or distinct profiles of Ramadan observers, that traditional approaches might overlook [4].

Along with survey-based methods, data-driven persona creation has become increasingly prevalent due to advances in big data and analytics, which enable the creation of data-driven personas. Salminen et al. [5] provided a comprehensive review highlighting significant progress in data-driven persona techniques over the past 15 years. These algorithmic approaches evolved from early efforts to create sophisticated automated systems capable of processing large user data sets to generate detailed persona profiles [5], integrating demographic details with observed behavioral patterns. Such personas, deeply rooted in real behavioral data, allow designers to anticipate each user segment's specific needs and preferences with greater accuracy. They also uncover non-obvious but valuable insights [5].

D. Inclusive Design of Systems and Applications

The three themes discussed (i.e., digital behavior during Ramadan, VSD, and persona generation) form a cohesive and integrated foundation for designing inclusive technology

in Muslim-majority contexts. By closely examining digital and behavioral shifts during Ramadan, designers can gain valuable insights into the specific timing, motivations, and methods through which users interact with technology, allowing for thoughtful adaptations. [1]. Incorporating the VSD principles further ensures that the resulting systems genuinely align with users' religious and cultural values, creating trust and relevance [8]. Lastly, leveraging survey-based and data-driven persona methods transforms these behavioral and value-oriented insights into tangible design tools. Personas represent realistic combinations of user needs, behaviors, and values, enabling design teams to visualize and address diverse user segments effectively.

Integrating these diverse approaches aids in avoiding over-simplified, one-size-fits-all platforms, and it promotes inclusive design, meaning that a single system thoughtfully accommodates diverse user backgrounds, needs, and preferences. In Muslim-majority situations, inclusive design must account for variations in religious observance, cultural expectations, and regional or linguistic differences, which shape technology use during religious occasions, such as Ramadan. The existing literature underscores that when designers actively engage with authentic user practices and values and employ personas to vividly represent these diverse perspectives throughout the design process [22], the resulting technology is often more meaningful, widely accepted, and effective [4], [8]. For Ramadan applications and platforms, this comprehensive approach helps ensure that technology enriches users' spiritual and practical experience, rather than being perceived as intrusive or irrelevant.

III. Research Questions

This study poses four interrelated research questions (RQs), forming a logical sequence of inquiry:

- **RQ1:** *How do anticipated Ramadan expenditures relate to engagement in religious or cultural practices during the holy month?*
- **RQ2:** *To what extent does online behavior (e.g., researching purchases, watching religious content) align with religious or social engagement during Ramadan?*
- **RQ3:** *Can behavioral indicators, such as shopping timeframes and spending intensity, be used to segment Ramadan observers into meaningful personas?*
- **RQ4:** *How do emotional attitudes toward the upcoming year (e.g., optimism, worry) associate with patterns of religious observance during Ramadan?*

These RQs are motivated by changes in behavioral patterns, religious observances and emotional outlook during Ramadan, which significantly shape technology use, spending habits, and social engagement, and are grounded in insights from previous work on digital Ramadan behavior [1]–[3], VSD [6], [8], [10], and persona generation [4], [5].

RQ1 examines the relationship between planned financial behavior and participation in cultural or religious activities. We expect total Ramadan spending to be associated with activities such as charity, gift-giving, family gatherings, and communal meals. By examining how spending aligns with observance, our aim is to identify whether financial commitment can serve as a proxy for cultural engagement during Ramadan.

Concerning RQ2, digital tools are becoming central to Ramadan practices, especially in contexts where spiritual and community experiences are mediated through technology [1], [2]. RQ2 investigates whether users who actively engage with religious or commercial content online are also more likely to participate in traditional observances, building on studies of techno-religious behavior and the growing use of Islamic applications during Ramadan [2], [3].

RQ3 examines whether shopping behavior, specifically the timing and amount spent by participants, can serve as a basis for generating personas that represent these key segments. These personas offer a foundation for the design of a context-sensitive, user-centered system [4], [5].

RQ4 explores the emotional dimension of religious practice by analyzing how users' expectations for the coming year (i.e., whether hopeful, neutral, or anxious) relate to their observance of Ramadan. Drawing from persona dialogue conversation data, we can examine how spiritual engagement may be intertwined with emotional well-being and future outlook, adding a value-sensitive lens to our design approach [8].

IV. Methodology

This study uses a quantitative approach, identifying and characterizing meaningful user segments based on Ramadan behaviors, values, and emotional outlooks. The study's methodology systematically translates large-scale survey data into actionable user personas. The process consisted of three stages: (a) survey development and data collection, (b) correlation analysis to uncover significant behavioral and emotional patterns concerning Ramadan, and (c) persona generation using an existing AI data-driven persona creation framework and system.

A. Survey Instrument and Data Collection

A cross-national survey was administered to participants residing in four predominantly Muslim-majority countries to capture a comprehensive picture of Ramadan-related behaviors and values. The survey instrument was developed in collaboration with a commercial survey agency and comprised over 47 elements designed to obtain detailed information in several key attributes: (1) demographic background, (2) religious identification, (3) behavioral intentions during Ramadan, (4) planned spending in key categories, (5) patterns of digital media use, and (6) emotional outlook for the year ahead. The survey was conducted between 1 and 22 February 2024 in 4 countries on a representative sample of 18- 40+ self-identified Muslims. The survey sample is representative of the adult Muslim population of the given countries in terms of gender and age.

The survey items were developed in English and then professionally translated into Arabic and other languages to ensure cultural and linguistic validity. The questionnaire was

subjected to internal quality assurance procedures with the survey company to align with ethical standards for informed consent and participant privacy. The survey sample included 3,018 population-representative Muslim respondents from Egypt, Indonesia, the United Arab Emirates, and Saudi Arabia. This diverse set of participants provided representation of a range of ages, genders, socioeconomic backgrounds, and degrees of religious observance. All responses were anonymized before analysis to maintain participant confidentiality.

B. Correlation Analysis

We performed Pearson's correlation analysis on the survey data (numerically coded) to explore interrelationships between behavioral, emotional, and Ramadan dimensions. Categorical variables of self-reported religious identity and emotional attitudes were systematically recoded into ordinal or binary formats to ensure compatibility with correlation metrics. Pairwise correlations were computed across all variables, and statistically significant associations ($p < .05$) were examined for interpretation. This analysis revealed notable linkages (i.e., moderately strong correlations or higher). Notable correlations were observed between anticipated Ramadan expenditures and the frequency of digital product research and between emotional outlooks for the coming year and levels of religious observance. These statistically grounded patterns provided an empirical foundation for identifying latent behavioral-perceptual themes and informed the development of criteria used in subsequent persona segmentation.

C. Data-Driven AI Persona Creation Using Survey2Persona

To generate representative personas grounded in empirical data, we employed *Survey2Persona* (S2P), a data-driven persona generation framework and system designed to translate structured survey responses into actionable personas for system design [21]. Once the data set was uploaded, S2P took survey data and, using machine learning (ML) and AI, analyzed the survey data and reported on it. Then, based on the selected criteria from the end user, S2P can generate rich personas, presented in both a standard persona profile and a dialogue mode, where one can chat with the personas (see Fig. 2). This methodology integrates correlation patterns, behavioral indicators, and clustering outputs to synthesize multidimensional data into user profiles (i.e., humanizing the data by generating personas). S2P has been shown to perform extremely well for persona generation in a variety of contexts. In the interest of space, we refer the reader to [21] for details of the S2P system.

Once the data set is uploaded, S2P automatically analyzes the survey data set, creating aggregate summaries and graphs of the dataset (see Figure 2). The end user can then generate personas based on any single question in the survey (e.g., gender or spending during Ramadan). So, S2P allows for continual generation of a persona set based on any specific use case. Unlike traditional qualitative personas or those derived solely from analytics, the S2P approach offers a value-sensitive and behaviorally grounded model of Ramadan engagement.

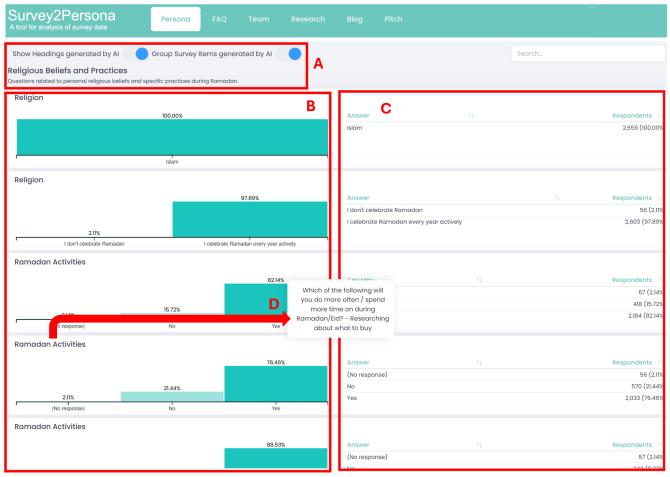

Fig. 2: Analysis of the Ramadan dataset automatically generated by S2P. **A:** AI-generated headings and the AI grouping of survey items. **B:** Graphic representation of survey responses with survey questions replaced with AI-generated topics. **C:** Aggregated responses with percentages by survey question. **D:** Mousing over the AI-generated topic causes a pop-up with the survey question [21].

This ensures that the resulting personas are empirically strong and well-suited to informing inclusive and culturally aware design.

V. Results

A. Exploratory Analysis

We conducted a descriptive analysis of the cleaned survey data (n = 3,018) to characterize respondents' demographic profile, spending intentions, planned activities, shopping timelines, and self-reported emotional outlook.

1) Data Collection: Participants were drawn from four countries with Muslim majorities: Egypt (42%), Indonesia (27%), Saudi Arabia (21%), and the UAE (11%). The mean age was 31.2 years (SD = 9.6, range = 16-90); 55% identified as male and 45% as female. This distribution offers sufficient heterogeneity for examining regional and gender-based details in Ramadan practice.

TABLE I: Mean share of total Ramadan spending by category.

Category	Mean Share of Total Spend (%)
Food & beverages	46.9
Charity & donations	22.1
Gifts	15.3
Transport & mobility	15.7

2) Ramadan Expenditure Profile: Almost every respondent planned some food expenditure (zero-spend = 0.4%), whereas gifts were omitted by roughly one in nine participants (11.5%), marking gifts as the most elastic budget item. Women allocated marginally more for charity and slightly less for transport than men; differences in food and gifts were negligible (see Table I).

3) Shopping Timelines:

TABLE II: Country-level Ramadan spending and shopping behavior.

Country	Food (%)	Gifts (%)	Charity (%)	Transport (%)	Shops More (%)
Egypt	49.2	13.4	22.5	14.9	53.7
Indonesia	44.5	16.7	21.9	16.9	92.5
Saudi Arabia	46.5	16.7	21.7	15.1	81.4
UAE	45.3	16.3	22.0	16.4	80.4

4) Country-Level Highlights : When asked when they expected to complete most of their Ramadan purchases, the respondents overwhelmingly indicated that they would do so in the weeks leading up to the holy month. More than two in five (41.3%) selected the first week of March (1-8 March), and another 27.1% cited the last half of February (15-28 February). The smaller groups planned their purchases earlier, 9.4% in the first half of February and only 2.1% in January, or later, with 16.1% waiting until Ramadan itself and a residual 1.7% postponing major purchases until the brief Eid period (8-9 April). These numbers reveal two distinct behavioral segments: *early planners*, who finalize purchases before Ramadan begins, and *opportunistic shoppers*, who concentrate their purchases during, or even after, the holy month. These two segments would be insightful for further analysis and persona generation in future research.

Although the countries in the study share broad behavioral themes, notable contrasts emerge (see Table II). Egyptian respondents dedicate the largest part of their Ramadan budget to food (just under half) and express the lowest intention to intensify shopping activity, with only about one in two planning to do so. Indonesians, in contrast, allocate the highest proportion of gifts and are the most eager shoppers, with more than nine in ten signaling increased purchasing plans. In that context, participants from the UAE set aside a slightly higher fraction for transport, a pattern consistent with higher mobility costs. This divergence cautions against assuming a uniform 'Muslim consumer' profile and highlights the need for region-specific localization in future applications.

5) Planned Ramadan Activities: Responses to the behavioral checklist indicate a distinctly communal and preparatory orientation. Almost all participants (94.8%) expect to eat more meals with family at home, and the vast majority plan to visit nearby relatives or friends (88.5%) and cook for guests (82.1%). Planning is also prominent. Three-quarters (76.5%) intend to research products before purchase, while 72.7% anticipate increasing their online or in-store purchases. Long-distance travel, for example, to celebrate Eid with extended family, is cited by 67.2% of the respondents, while eating outside the home is comparatively less common, although still supported by about half of the sample (51.1%). These figures underscore Ramadan's dual character as a family-centered and logistics-heavy period, providing design cues for meal planning, travel coordination, and late-night commerce features.

6) Emotional Outlook for the remainder of 2024: Given that the survey was conducted in February 2024, we asked respondents about their outlook for the coming year. Self-rating on ten-point scales places family relationships at the top of respondents' perceived well-being (mean 8.0), followed by friendships (7.4). Mental health, career prospects, and personal finance cluster in the upper six range. When asked to characterize 2024 in a single phrase, a clear majority (71.6%) anticipate a better year than 2023, while 15.0% foresee no significant change and 13.1% expect a downturn. The high occurrence of optimism, tempered by an undercurrent of concern, hints that platforms and applications designed for Ramadan users should balance aspirational messaging with features that acknowledge potential stressors, such as budgeting tools or mental-wellness prompts.

B. Correlation Analysis and Persona Generation

We conducted a series of Pearson correlation analyses investigating the interrelationships between key behavioral, emotional, and expenditure-related variables within the dataset. This analysis validated measurement constructs, identified behavioral patterns, and informed the subsequent development of the AI data-driven personas. All reported correlations were statistically significant at $p < 0.001$ and are summarized in Table III).

1) RQ1: How Do Anticipated Ramadan Expenditures Relate to Engagement in Religious or Cultural Practices During the Holy Month?: The results support RQ1, that is, there is a link between Ramadan spending and cultural or religious activities during Ramadan. For example, a Pearson correlation indicated a significant positive relationship between variables "Visiting friends and family in the area" and "Ramadan expenses", $r(28) = .65$, $p < .001$. A Pearson correlation indicated a significant positive relationship between variables "Researching about what to buy" and "Ramadan expenses" $r(28) = .65$, $p < .001$. A Pearson correlation indicated a significant positive relationship between variables "Visiting friends and family in the area" and "Charity (online and offline)", $r(28) = .65$, $p < .001$. This pattern highlights that social and communal participation drives spending during Ramadan. For this group, spending is relational rather than individual.

2) RQ2: To What Extent Does Online Behavior Predict Religious or Social Engagement during Ramadan?: Further analysis focused on indicators of online behavior, specifically participant engagement in pre-purchase product research. Findings support RQ2, which examines the relationship between digital activity and religious or social engagement. A Pearson correlation indicated a significant positive relationship between variables "Researching about what to buy" and "Ramadan expenses", $r(28) = .65$, $p < .001$. A Pearson correlation indicated a significant positive relationship between variables "Visiting friends and family in the area" and "Shopping (online, offline)", $r(3020) = 0.81$, $p < .001$.

TABLE III: Key correlations among behavioral and Ramadan variables. P-value $< .001$ for all correlations. We only report strong correlations, which are correlation above 0.60.

Variable Pair	r	Strength	Interpretation
Visiting friends and family in the area x Ramadan expenses	0.92	Very Strong	Ramadan expenditures relate to engagement in religious or cultural practices during the holy month.
Researching what to buy x Ramadan expenses	0.84	Very Strong	Online behavior aligns with religious or social engagement during Ramadan.
Researching what to buy × Shopping (online, offline)	0.84	Very Strong	Behavioral indicators, such as shopping time-frames and spending intensity, can be used to segment Ramadan observers.
Visiting friends and family in the area × Shopping (online, offline)	0.81	Very Strong	Ramadan expenditures relate to engagement in religious or cultural practices during the holy month.
Researching about what to buy × Eating outside your home (including pick up only meals)	0.72	Strong	Ramadan expenditures relate to engagement in religious or cultural practices during the holy month.
Researching what to buy × Ramadan shopping time frames	0.63	Strong	Behavioral indicators, such as shopping time-frames and spending intensity, can be used to segment Ramadan observers.
Visiting friends and family in the area × Charity (including online)	0.63	Strong	Behavioral indicators, such as shopping time-frames and spending intensity, can be used to segment Ramadan observers.

3) RQ3: Can Behavioral Indicators Be Used to Segment Ramadan Observers into Meaningful Personas?: Finally, a meaningful association was observed between shopping timelines and online research intensity. A Pearson correlation indicated a significant positive relationship between variables "Researching about what to buy" and "Shopping (online, offline)", $r(28) = .65$, $p < .001$. A Pearson correlation indicated a significant positive relationship between variables "Researching about what to buy" and "Eating outside your home (including pick up only meals)", $r(28) = .65$, $p < .001$. A Pearson correlation indicated a significant positive relationship between variables "Researching about what to buy" and "Ramadan shopping time frames", $r(28) = .65$, $p < .001$.

These correlations establish key behavioral and spending linkages that validate the survey's constructs and support the rationale for clustering users into distinct persona profiles.

4) RQ4: How Do Emotional Attitudes toward the Upcoming Year Associate with Patterns of Religious Observance during Ramadan?: To address RQ4, we used the S2P system to generate a set of personas that reflect the intersection of emotional perspectives and religious practices, using this survey question as a criterion to develop the personas. This analysis focused on the participants' responses to the prompt: "*How would you say that your religious practices are associated with your emotional attitude toward 2024?*" The objective was to assess whether the levels of participation in Ramadan meaningfully shaped the optimism, neutrality, or pessimism patterns for the year ahead.

Fig. 3: Set of AI-generated personas from S2P. **A:** Demographics of the personas. Note that demographics are given as a percentage, and the actual demographics may vary. **B:** Key survey questions that most represent the segments. **C:** Percentage of respondents that the persona represents.

Seven personas emerged from the data (see Figure 3), representing a spectrum of religious engagement and emotional sentiment. These personas ranged from non-celebrants with negative or neutral expectations for 2024 to actively engaged observers who expressed hope and positivity. For example, Muhammad (see Figure 3), who represents more than 70% of the relevant user segment, actively celebrates Ramadan and articulates a highly optimistic view of the upcoming year. His dialogue responses (see IV) emphasized the role of spiritual reflection, communal activities, and religious rituals in fostering a positive emotional outlook. In contrast, personas like Tarek and Khaled, who do not observe Ramadan, conveyed more negative or indifferent attitudes toward 2024, attributing their emotional stance to a lack of connection to traditional festivities or religious meaning.

Clicking on one of the personas in the set displays that particular persona. The personas were represented through two modes, one showing the core persona profiles (demographics, religious observance, and emotional outlook), and another presenting their dialogue-based responses to the research prompt (see Figure 4). These dialogue excerpts offered deeper insight into how individuals make sense of their emotional states through the lens of faith. Due to the S2P framework, the responses are based solely on the survey responses for that persona. For example, Amr (see IV), an active observer, expressed concern that 2024 would be worse than 2023, but he noted that his participation in Ramadan offered a source of comfort and connection. Meanwhile, Ahmed, despite not celebrating Ramadan, maintained an optimistic view for personal reasons that were not related to religious observance (see IV).

Table IV summarizes the proportions of the persona segments, the levels of participation in Ramadan, the emotional

TABLE IV: Personas linking religious practice to emotional attitude toward 2024.

Persona	Segment	Religious Practice	Emotional Outlook	Dialogue Response
Tarek	0.49%	I don't celebrate Ramadan	2024 will be worse than 2023	My religious beliefs are centered around Islam, but I don't celebrate Ramadan at all. This lack of participation in Ramadan festivities contributes to my negative emotional attitude toward 2024.
Khaled	0.38%	I don't celebrate Ramadan	2024 will be the same as 2023	This lack of engagement contributes to a neutral emotional outlook. I expect minimal change in the coming year.
Ahmed	1.24%	I don't celebrate Ramadan	2024 will be better than 2023	I remain personally optimistic about 2024. My emotional attitude is shaped by factors outside of religious observance.
Amr	12.6%	I celebrate Ramadan every year actively	2024 will be worse than 2023	Despite actively celebrating Ramadan, I hold a pessimistic view of the upcoming year, turning to spiritual practice for comfort.
Mahmoud	14.67%	I celebrate Ramadan every year actively	2024 will be the same as 2023	My Ramadan traditions inform a steady emotional outlook. I see the next year as a continuation of the present.
Muhammad	70.36%	I celebrate Ramadan every year actively	2024 will be better than 2023	The spiritual and communal aspects of Ramadan inspire optimism about the future.
Nurul	0.26%	I celebrate Ramadan every year actively	(No Response)	Though I haven't formed a specific opinion on 2024, my emotional stance is shaped by a deep connection to Ramadan practices.

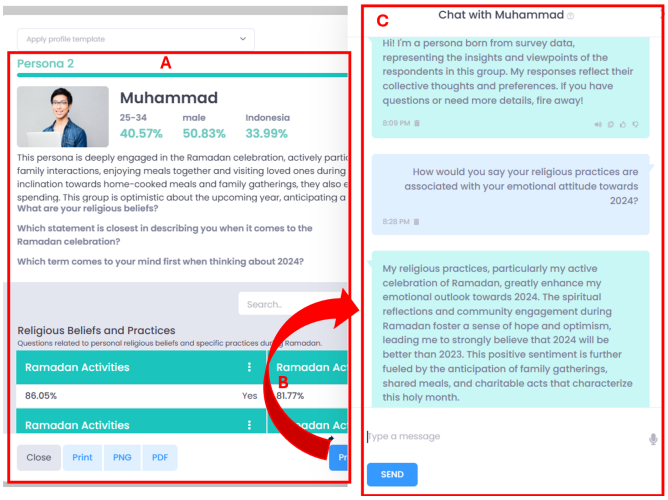

Fig. 4: Chat dialogue with persona. **A:** Persona profile. **B:** Open chat mode. **C:** Dialogue mode for talking to the persona.

attitudes reported by the survey towards 2024, and the representative responses to the dialogue. A clear pattern emerges: People actively participating in Ramadan are more likely to express positive expectations for the future, whereas those who do not participate tend to adopt neutral or pessimistic perspectives. Although there are exceptions, the general trend reinforces that religious engagement can be essential in shaping emotional well-being and future-oriented sentiment [23].

This persona analysis illustrates the potential of combining survey data and AI-generated personas to uncover subtle emotional and religious associations latent within the survey data. The resulting insights contribute to a more context-sensitive understanding of user experience during Ramadan, reinforcing the value of personas in designing emotionally resonant and culturally grounded computing systems as S2P.

VI. Discussion and Implications

This study examined how religious participant segments of religious participants during Ramadan can be identified and represented through the generation of data-driven personas and the use of artificial intelligence. This work primarily contributes to extant literature by empirically demonstrating the profoundness of intra-group diversity. Drawing on a large-scale cross-national survey, we analyzed correlations among digital engagement, level of expenditures and engagement with Ramadan practices (RQ1), online searching and spending behavior tracks with social engagement during Ramadan (RQ2), timing of online shopping and spending intensity (RQ3), and emotional outlooks for the coming year (RQ4) to uncover significant inter-dependencies. The results revealed that increased expenditures and social participation in Ramadan are positively correlated. Online activity (particularly research behavior) closely follows with planned expenditures. Finally, emotional attitudes toward the future generally align with levels of religious observance. These behavioral and affective patterns informed the development of empirically grounded personas that reflect the diverse ways in which users prepare, experience, and interpret the month of Ramadan. This work offers methodological and practical contributions, namely a framework for embedding religious identity, culturally shaped routines, and emotional dynamics into the design of human-centered computing systems and VSD.

A. Personas as Representational Tools for Religious Segments

The findings of our research confirm that personas generated from survey data can serve as effective representational tools for capturing the fine-grained diversity within religious participant segments, including during culturally significant periods, such as Ramadan. The AI-generated personas developed using the S2P framework and system reflect substantive distinctions across multiple dimensions, including financial planning, spiritual engagement, digital behavior, and emotional outlook. These differences demonstrate that Ramadan observance is not a monolithic experience, but is shaped by intersecting factors, such as socioeconomic factors and varying degrees of religiosity. By anchoring these data-driven personas in statistically significant correlations instead of relying on anecdotal archetypes, the S2P method offers a more empirically grounded and context-sensitive portrayal of religious users engaging with computing environments.

Crucially, the S2P method, with its generation of dialogue-based [24] personas using AI, enables the integration of religious, cultural, and commercial dimensions into unified persona profiles. This integration is made possible by the ability of S2P to combine structured survey data across behavioral, emotional, and expenditure-related indicators. As a result, each persona embodies not only the spiritual engagement of a user (e.g., the frequency of Ramadan observance or prayer) but also practical behaviors such as when and how they shop, how much they spend, and what emotions they associate with the coming year. The multidimensionality enables platform designers, decision-makers, and policymakers to consider personas that reflect authentic, complex motivations, such as a user who balances charitable giving and spiritual reflection while navigating economic constraints and family obligations.

These AI-generated personas also function as interpretive bridges between culturally specific user behaviors and the system design process, supporting VSD. For development teams unfamiliar with Ramadan practices, for example, these personas illuminate implicit user needs that may be overlooked. For example, a persona of digitally connected adults engaging with Ramadan spiritual content during nighttime hours can inform design choices, such as integrating night-mode interfaces, prayer-time alerts, or algorithmically surfaced religious content. In contrast, another persona characterized by high emotional investment in Ramadan and strong family orientation can spur the development of community-sharing features or personalized meal planning tools. Using this approach, these users personas are not merely descriptive artifacts, but they become generative tools for inclusive ideation, allowing development teams to prioritize features that resonate with their users' lived, value-laden experiences during Ramadan.

B. Survey-Based Personas in Culturally Sensitive Contexts

Our findings show that personas generated from survey data is well-suited to contexts where religious and cultural factors are central to user behavior. Our approach captures self-reported values, intentions, and emotional outlooks, critical elements to understanding religious engagement that cannot be inferred from usage data alone. We create the AI personas that reflect authentic patterns rather than assumptions by identifying reliable correlations between behaviors, planning styles, and emotional attitudes. This enables the representation of diverse archetypes, such as highly devout planners or secular optimists, in a manner that respects the complexity of the Muslim population.

Moreover, this approach is scalable and transferable. It can be applied to other religious or cultural periods (e.g., Hajj, Diwali) and supports the design of inclusive systems by integrating faith-driven, cultural, and commercial dimensions into user modeling. In this way, AI-generated personas help translate nuanced user diversity into actionable design inputs sensitive to the respondents' religious nature.

C. Implications for Value-Sensitive Design

The correlation analysis results point to the relevance of VSD in building systems for religiously engaged users. Key associations, such as between spending and emotional outlook or between spiritual practice and digital behavior, reflect the underlying values that shape the use of technology during Ramadan. We move VSD from abstract principles to concrete design input by embedding such values into persona generation. For instance, recognizing that increased media use may be tied to spiritual reflection or charitable preparation reframes these behaviors as value-driven, not just a usage pattern. Platforms aligning with user segment goals, ethical spending, family connection, or spiritual self-improvement are likely to resonate more with Ramadan observers.

Finally, persona diversity cautions against monolithic assumptions. Value-sensitive systems must sometimes accommodate a broad spectrum of religious motivations and expressions, from devout practitioners to culturally engaged participants, and ensure inclusivity across differing practices and interpretations rather than a monolithic view of a given religious group.

D. Design Implications for Ramadan-Focused Applications

Our findings provide actionable guidance for culturally responsive designer working on applications intended for Ramadan, in education, charity, or commerce. Systems should be built with temporal flexibility in mind during the Ramadan period. Given the shift in activity during Ramadan toward evening and night hours, applications must support post-iftar engagement through adjustable timing settings, notification controls, or user interface states optimized for nighttime use.

Also, content personalization is critical in aligning digital experiences with seasonal values. Users during Ramadan seek spiritually meaningful interactions through curated reminders, access to religious media, or practical content like family recipes and charitable opportunities. Designing for these needs requires more than token inclusivity. It involves tailoring content pipelines to resonate with users' motivations during Ramadan. Interface and feature design should also be stress-tested against segmented user profiles represented by AI-generated personas to ensure accessibility and relevance. Per-

sonas derived from our data highlight the diversity of Ramadan observers, ranging from those who are digitally cautious to those who are active planners. Platforms need to be sensitive to these variations in digital fluency, religious engagement, and socio-economic background.

Emotional attunement is also essential. Survey insight results show that Ramadan is not only about routine change, but also emotional recalibration. Platform design elements such as reflective journaling prompts, well-being trackers, or empathetic chatbots can help applications better align with users' mental and spiritual states. This study bridges cultural understanding and technical implementation by grounding these implications in quantitative analysis and persona modeling. Future work should continue to develop religiously grounded personas, particularly in underrepresented faith contexts, for globally inclusive and context-aware computing systems.

E. Strengths, Limitations, and Future Work

This study presents a data-driven approach to representing segments of religious participants during Ramadan through AI-generated personas, based on surveys, thereby advancing inclusive design in culturally and religiously significant contexts. A key strength lies in using a multi-country dataset, with AI-enabled persona modeling among behavioral, emotional, and spiritual dimensions. The S2P approach is scalable and transferable to other religious or culturally significant periods (e.g., Hajj, Diwali, Lent), offering a robust framework to investigate user behavior. Future work should incorporate longitudinal or ethnographic methods to validate and refine these personas over time and in different cultural contexts. Expanding the survey to include other observances can further generalize the model, supporting more inclusive and context-aware computing systems that cater to global populations.

VII. Conclusion

This study demonstrates that religious observance, digital behavior, and emotional outlook during Ramadan are interwoven and that these patterns can be meaningfully captured through data-driven personas using AI. By applying the S2P framework to a large-scale survey in four countries with Muslim majorities, we reveal the diversity of Ramadan experiences and offer actionable tools for inclusive and value-sensitive system design. These personas bridge data and empathy, enabling developers to design not just for users, but for the spiritual realities that shape their lives during Ramadan.

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