

Towards Associating Negative Experiences and Recommendations Reported by Hajj Pilgrims in a Mass-Scale Survey

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ARTICLE INFO

Keywords:

Religious tourism
Pilgrimage
Islamic pilgrimage
Satisfaction
Negative experiences
Suggestions for management

ABSTRACT

The annual Hajj presents diversified negative experiences to millions of pilgrims worldwide. The negative experiences and recommendations to overcome them as per pilgrims' feedback are yet to be analyzed from an aggregated perspective in the literature, which we do in this paper. To do so, first, we perform a large-scale survey (n=988) using our comprehensive questionnaire. Then, we perform both quantitative (e.g., clustering) and qualitative (e.g., thematic) analyses on the survey data. Our quantitative analysis reveals up to seven clusters of negative experiences. Further, going beyond the quantitative analysis, our qualitative analysis reveals 21 types of negative experiences, 20 types of recommendations, and nine themes connecting the negative experiences and recommendations. Accordingly, we reveal associations among the negative experiences and recommendations based on the themes in thematic analysis and present the associations through a tripartite graph. These outcomes are expected to facilitate prioritizing tasks for the management personnel.

1. Introduction

Tourism for religious purposes has gained significant attraction to researchers in the field of travel and tourism in recent years (Lin, 2021; Nisha & Cheung, 2022). In general, religious tourism includes pilgrimage, religious festivals, religious conferences, etc. Among different religious tourism events, Hajj pilgrimage is an important field of research due to its immensity and diversity (Almuhri & Alsawafi, 2017; Zamani-Farahani & Eid, 2016). Researchers are studying different aspects of Hajj pilgrimage including spirituality, stakeholder relations, expectations, disappointments, etc., (Lin, 2021; Michalkó, Irimiás, & Timothy, 2015; Oktadiana, Pearce, & Chon, 2016). Among those aspects, understanding pilgrims' disappointment and experience of different negative experiences are very important for administrations and managements because they can take measures to eradicate

such experiences. In this study, we explore different negative experiences, understand recommendations to resolve those experiences, and associate negative experiences with recommendations from pilgrims' perspective.

Hajj is a pilgrimage to Mecca in Saudi Arabia during the Islamic calendar's final month (Dhul-Hijjah). It is obligatory for any Muslim who has the financial means and other required capabilities to make it at least once in his/her lifetime. Each year, 2-3 million people of different ethnicity and nationalities from all around the globe perform Hajj. Though during the Covid-19 pandemic, in the years 2020 and 2021, this number falls to a very small value of 1000 and 60,000 respectively, as an exception, in 2019, around 2.5 million people took part in Hajj (Jazeera, 2021; News, n.d.; Travel, n.d.). In 2022, the number of Hajj pilgrims has increased to one million compared to the years 2020 and 2021 (Reuters, 2022). It is expected to get the event back to its real crowds or even much larger, once the extent of the ongoing pandemic gets pacified. Hajj is a demonstration of Muslim's submission to the Almighty (Allah). Therefore, its fulfillment has religious and social significance for Muslims. Because of the expenses associated with Hajj, performing it is also a financial obligation for them. The financial expenses include plane tickets, housing, transportation, food, etc. Pilgrims have to spend a considerable amount of money to perform all the rituals during the Hajj season which varies by country. However, sometimes, pilgrims face unexpected experiences that lead to dissatisfaction and discomfort for them.

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Some of the negative experiences are already investigated in existing studies, such as health, heavy crowds, way-finding, and accommodation problems (A. A. Khan & Noji, 2016; Maneval, 2020; Noor Nik Zuraina, Hasan, Mohamad, & Suraiya, 2022; Rahman, Thu, Arshad, & Van der Putten, 2017; Saleh et al., 2021). However, these studies analyzed a specific negative experience, rather than all experiences in aggregation. Moreover, these studies did not perform a comprehensive thematic analysis of the negative experiences. For such studies, which method (e.g., quantitative or qualitative) is more appropriate is yet to be studied in the literature. Therefore, such studies fail to reveal any association between negative experiences and recommendations that could facilitate the management personnel for planning better services during Hajj.

To address this gap in the literature, we perform a mass scale survey covering a total of 988 pilgrims who have performed Hajj, Umrah, or both at least once in their lifetime. After collecting the survey responses, we methodically filter the collected data. After filtration, we are left with 694¹ responses from pilgrims who have performed Hajj at least once. We perform a quantitative analysis followed by a thematic analysis of the responses from 694 Hajj pilgrims. Based on the findings of both types of analyses, we investigate which method of analysis gives more comprehensive outcomes for our intended task of analyzing negative experiences during Hajj pilgrimage.

Our findings from the analyses reveal nine themes, 21 negative experiences, and 20 recommendations. Then, we prepare a tripartite graph consisting of negative experiences, themes, and recommendations. The themes are listed as - 1) negative impacts of overcrowding and their mitigation, 2) accommodation issues due to agencies' mismanagement, 3) difficulties and special needs of female, aged, and disabled pilgrims, 4) getting lost of pilgrims and getting them back, 5) pilgrims' experiences of violations of laws and norms, 6) sickness of and treatment for pilgrims, 7) support from law enforcing agencies and volunteers, 8) technological limitations and expectation to technologies, and 9) feeling of pilgrims after Hajj.

1.1. Our Key Research Questions

Based on our work in this paper, we formulate the following key research questions:

- **RQ1:** Between quantitative and qualitative approaches, which method is more suitable for analyzing negative experiences faced by the pilgrims in a comprehensive manner?
- **RQ2:** From an aggregated perspective, what are the negative experiences and recommendations from the pilgrims' viewpoint?

¹The participant pilgrims in our study have diverse demographics covering different ages, gender, profession, language, etc. However, considering the nationality, 89% of the pilgrims (n=616) among the 694 pilgrims are from Bangladesh. Therefore, our study better reflects the experience of Bangladeshi pilgrims mostly.

- **RQ3:** From an aggregated perspective, how can the different types of negative experiences faced by pilgrims be categorized into different themes? Based on the themes, how can the negative experiences and recommendations be associated with each other?

1.2. Our Contributions

To answer the research questions, we make the following set of contributions to this research work.

- We develop a comprehensive questionnaire (consisting of 49 questions under 12 sections) to survey Hajj pilgrims. Using this questionnaire, we perform a mass-scale survey both online (n=236) and in-person (n=752), and thus, collect a total of 988 responses from the pilgrims who have performed Hajj, Umrah, or both at least once in their lifetimes. Later, we filter the collected data and extract survey responses from 694 pilgrims who performed Hajj. Using the collected data, we conduct several in-depth analyses of the negative experiences and recommendations reported by the participating pilgrims.
- Over the extracted data, we conduct a quantitative analysis by performing k-modes clustering. Our analysis results in up to seven prominent clusters over the negative experiences reported by the pilgrims. Moreover, we find the same number of clusters when we consider both the negative experiences and demography of the pilgrims.
- Besides, we conduct a qualitative study by performing an aggregated thematic analysis of the extracted data to synthesize the negative experiences faced by the pilgrims. Our analysis points out 21 problem events, nine themes, and 20 recommendations from the pilgrims. These findings appear to be much more comprehensive than what we have found from our quantitative analysis.
- Subsequently, we dig into associations among the negative experiences and recommendations based on the findings of our thematic analysis.

2. Related Work

Due to having a massive crowd in a short period at Mecca, pilgrims face different kinds of negative experiences while performing Hajj (Ali et al., 2020; Qurashi, 2019; Rahman et al., 2017). It can be ameliorated by exploring the real-life experiences and recommendations of Hajj pilgrims.

Several research studies report diversified real-life negative experiences faced by the Hajj pilgrims (Ali et al., 2020; Preko, Allaberganov, Mohammed, Martins, & Amponsah, 2020; Rahman et al., 2017; Taibah, Arlikatti, & Andrew, 2018; Taibah, Arlikatti, Andrew, Maghelal, & DelGrosso, 2020). (Ali et al., 2020) discuss different issues and challenges in Hajj management from Bangladesh's perspective. These include illegal human trafficking, government

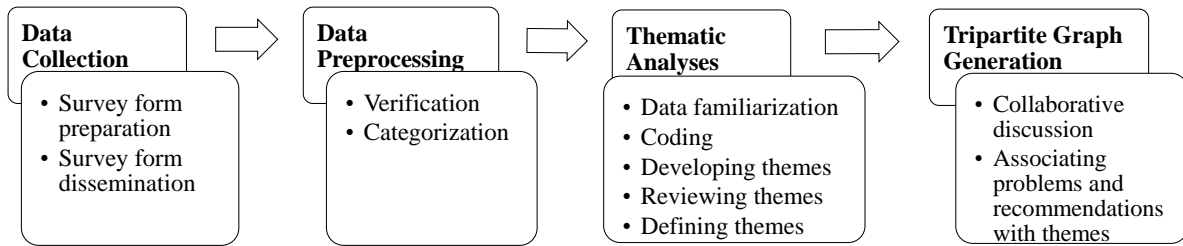


Figure 1: Flow chart of our study

monopoly of pilgrimage airfare, excessive pilgrimage fees, insufficient accommodation, scarcity of transport, etc. Apart from Bangladeshi pilgrims, (Rahman et al., 2017) revealed the experience of pilgrims from Pakistan, Myanmar, and New Zealand. Pilgrims from Myanmar and Pakistan expressed their dissatisfaction regarding accommodation and camp quality, whereas pilgrims from Australia and New Zealand were content with the overall quality. Besides, pilgrims from both countries observed better conditions in Medina than in Mecca. The distinction of experience between developing countries and developed countries is prominent in this study. In studying accessibility to technology, (Alayed, 2022) studied Arab old people in using a pandemic-driven mobile app named Eatmarna during COVID-19 period. Their study has provided an insight into the challenges that were faced by elderly people when using pandemic-driven apps.

Considering health issues, many studies investigated pilgrims' health condition during Hajj pilgrimage and different factors associated with it (Noweir, Bafail, & Jomoah, 2008; Parker, Jaffer, & Mahomed, 2022; Taibah et al., 2020; Yezli et al., 2021). (Taibah et al., 2020) enquired about which health-related threats concern foreign Hajj pilgrims visiting Saudi Arabia, how they typically seek information to be better prepared against these threats, and what economic, social, language, and cultural barriers they face. In study (Noweir et al., 2008), authors describe relation between heat casualties and climate heat load during Hajj seasons. (Parker et al., 2022) studied the effect of supervised exercise programme on the physical and mental health of Hajj pilgrims. Their study found supervised exercise programme for Hajj pilgrims has a positive effect on their physical and mental conditioning, which may reduce morbidity. (Ridda, Mansoor, Briggs, Gishe, & Aatmn, 2021) investigated the key aspects of public health concerns during Hajj pilgrimage. They proposed a framework to ensure a safe and healthy mass gatherings during Hajj/Umrah.

Apart from Hajj, (Jyotsna & Sai, 2022) investigated the key influencing factors and expected outcomes of the Hindu pilgrimage experience in India. They performed an Interactive Qualitative Analysis to understand different drivers, and factors influencing the pilgrimage experiences. Their study finds destination popularity, safety, local culture, accessibility, hygiene, the timing of the visit, pilgrim turnout,

and temple service pricing as the significant drivers for better pilgrimage management.

Besides, some studies investigated necessary measures to be taken to ease pilgrimage experiences (Alkharoubi, 2020; E. A. Khan, 2011; Majrashi, 2018; Mohandes, 2008). To ease navigation in Hajj, (Alkharoubi, 2020) conducted a study to improve pilgrims' way-finding experiences during the period of the Hajj. Their study reveals recommendations including educational and training programs on way-finding systems for pilgrims, introducing more pedestrian walkways and services, integrating navigation apps like Google map, and using tracking chips that link between pilgrims' bracelets and way-finding elements. According to studies in (E. A. Khan, 2011; Mohandes, 2008), pilgrims suggested that they must be guided by a volunteer who belongs to the same nationality as that group. In the context of mobile applications, (Majrashi, 2018) conducted a study to investigate the experiences of Hajj mobile service users during Hajj 2017. They performed thematic analysis and associated the emerged themes with specific implications for designing a better user experience of mobile applications for Hajj. However, they did not show any graphical association between negative user experiences and recommendations to resolve those experiences.

In existing literature, most of the studies investigate negative pilgrimage experiences in different contexts. Besides, a few studies report recommendations from pilgrims to improve the experience for some specific contexts. However, these studies have yet to present a comprehensive study on the negative experiences faced by pilgrims and recommendations to resolve those by the same group of pilgrims in an aggregated perspective e.g., showing association between negative experiences and recommendations. Nonetheless, these studies do not perform any aggregated thematic analysis of the negative experiences and recommendations. Moreover, these studies fail to reveal a majority of the negative experiences and recommendations during Hajj.

3. Methodology of Our Study

In our study, we prepare questionnaires for online and in-person surveys separately. We choose English as the language for the online questionnaire. Besides, we choose both English and Bengali for the in-person questionnaire as most

of the participants in the local community understand Bengali well. We disseminate the online questionnaire through emails and social media such as Facebook and conduct the in-person survey through 53 paid data collectors who collect responses from pilgrims. We present the methodology of our study as a flow-chart in Figure 1.

We have taken approval from the ethics committee of authors' institution regarding the conduction of the survey. We have asked for consent from participant pilgrims at the beginning of the survey. Taking consent from the participants, we collect responses from 988 pilgrims who performed either Hajj, Umrah, or both at least once. Among the survey participants in our study, some performed only Hajj or Umrah and some performed both. As there exists significant differences in the times and activities during Hajj and Umrah, there remain substantial differences in the experiences of the pilgrims who performed Hajj and who performed Umrah. In this study, we consider responses from only those participants who performed Hajj at least once ($n=694$) in their lifetime. The detail of questionnaire preparation, survey questionnaire dissemination, data preprocessing, and challenges during data collection are described in detail in our previously published paper (Salim et al., 2021).

3.1. Participants' Demography

We provide a highlight of the demographic characteristics of the selected 694 participants in Table 1. Here, participants are mostly from Bangladesh, 89% ($n=616$) and others are from 21 different countries such as Saudi Arabia, Kuwait, Qatar, Malaysia, India, Pakistan, Algeria, United States, Australia, Nigeria, Egypt, Germany, Indonesia, Ireland, etc. The ages of the pilgrims (during the survey period) ranged from 13 years to 88 years (average 49 years), and the age while performing Hajj ranged from 6 years to 82 years (average 47 years). 70% of the pilgrims self-reported as male, whereas the rest are female. 23% of participants' literacy level is below fifth grade and 43% are in the undergraduate stage or above.

3.2. Quality of Survey Responses

We compute pair-wise hamming distances between all 694 responses to measure how similar the responses are (Waggener, Waggener, & Waggener, 1995). Figure 2 shows the density values (or probability density function) of the calculated hamming distances. The figure exhibits a Gaussian or Normal distribution shape. We fit the probability density function to a Gaussian distribution using R and get the parameter values as: mean=0.43 and standard deviation=0.14. This finding, i.e., fitting the probability distribution function to a Gaussian distribution, implies that the received responses are not very similar and they exhibit substantial differences between each other in general. This finding confirms that our collected dataset possesses diversified information within it, as it is mostly free from having a repetitive nature.

Table 1

Demography of the 694 participants pilgrims

Distribution	Number of participants	Percentage (%)
<i>Gender</i>		
Male	483	70
Female	211	30
<i>Age groups</i>		
Youth (1-14)	5	1
Young adulthood (15-24)	36	5
Middle adulthood (25-44)	225	32
Older adulthood (45-64)	383	55
Retirement (65+)	45	6
<i>Education level</i>		
Below primary school	161	23
Primary school	78	11
High school	160	23
Bachelor degree	295	43
<i>Country of living</i>		
Bangladesh	616	89
Saudi Arabia	19	3
Malaysia	11	2
India	9	1
United States	5	1
Others	36	6
<i>Language</i>		
Bengali	638	92
English	332	48
Hindi	72	10
Arabic	94	14
Urdu	84	12
Bahasa Malay	12	2
Others	36	5

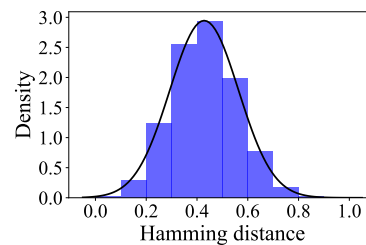
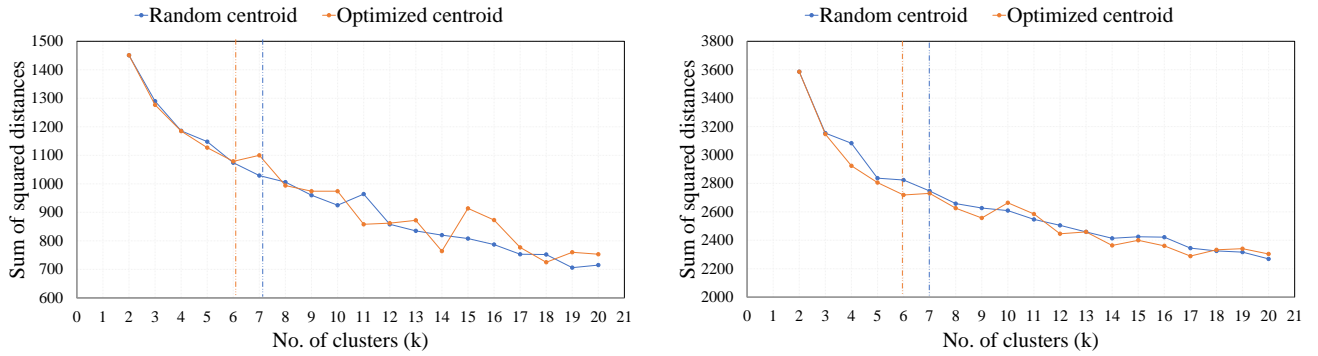


Figure 2: Distribution of hamming distances between survey responses with normal distribution fit

3.3. Clustering on Survey Responses

We have collected survey responses from 694 pilgrims who have performed Hajj at least once in their lifetime. From our analysis on quality of survey responses, this is clear that our collected responses are much diverse. Now, to better understand the responses and their similarity, we perform clustering on the responses. Specifically, the purpose of clustering is to know how many similar types of responses prevail in the data.

In our questionnaire, there are two types of questions i.e., demography and negative experiences. Besides, most of the questions have categorical options. Therefore, we perform k-modes clustering on the responses to find possible clusters (Huang, 1997). In clustering, we do not consider the open-ended questions that pilgrims can answer with free-text responses. The free-text responses are considered



(a) Number of clusters considering only the negative experiences reported by the pilgrims

(b) Number of clusters considering both the negative experiences reported by the pilgrims and demography of the pilgrims

Figure 3: Number of clusters considering only the negative experiences reported by the pilgrims as well as both the negative experiences and demography of the participants. The optimal number of clusters using elbow method is shown by vertical dotted lines.

when we perform thematic analysis which we discuss in a later subsection. Rather, we perform clustering only on the closed-ended responses. We use kmodes library available in python for clustering (PyPi, 2022a).

To choose the initial centroid for k-modes clustering, we employ two approaches i.e., random centroid and optimized centroid. In random centroid approach, we choose the initial centroid randomly. In optimized centroid approach, we use genetic algorithm to optimize the centroid and use the optimized centroid as initial centroid.

3.4. Thematic Analysis

We accumulate free-text responses to different questions in the survey. We, then, perform thematic analysis on the free text responses (Braun & Clarke, 2012; Gavin, 2008). We went through the data several times, systematically identifying and clustering the themes or codes that were present. Two researchers independently generate the codes, compare them, and reiterate the responses until we have a consistent codebook. Then, in a discussion, they merge their codes and generate a final codebook. They further organize and taxonomize our codes into higher-level categories. Finally, the researchers give each of these high-level categories appropriate names which eventually conclude the themes.

After finalizing the themes, we go through several collaborative discussions to associate each theme with relevant negative experiences and recommendations. We also take help from the codebook for finding the associations. Since our research is partitioned into three disjoint sets (i.e., negative experiences, themes, recommendations), we try to build a tripartite graph network to relate those three sets.

4. Findings

We describe the findings of the above-mentioned analyses in this section. This section constitutes the results of clustering-based analysis, thematic analysis, and graph-based analysis.

4.1. Clustering on Survey Responses

Our clustering-based approach to finding clusters, i.e., similar types of responses results in some insightful findings along with some challenges. The key challenge is to identify the optimal number of clusters. We apply Elbow method to different number of clusters (k) and corresponding sum of squared distances obtained from k-modes clustering to find optimal number of clusters. However, as shown in Figure 3a, and 3b, the knee point is not clearly visible. Thus, we use kneed library available in python to locate the knee point precisely which is also being used by many recent studies (Cuevas, 2020; Doherty et al., 2020; PyPi, 2022b; Satopaa, Albrecht, Irwin, & Raghavan, 2011).

In Figure 3a, according to elbow method and knee locator function available in kneed library, the optimal number of clusters for random centroid and optimal centroid are seven and six respectively (marked by blue and orange vertical lines). This implies that we have seven and six types of responses for random and optimal centroid respectively considering only the negative experience-related responses. Moreover, in Figure 3b considering both problem and demography the number of clusters does not change. This signifies that the demography of pilgrims does not have any significant impact on the types of responses.

4.2. Thematic Analysis and Graph Generation

Our thematic analysis reveals nine themes that cover 21 problem events and 20 recommendations. Problems and recommendations from participants are listed in Table 2. Our revealed themes and short description for each theme are provided in Table 3. Alongside themes, our analysis reveals a tripartite graph that connects negative experiences and recommendations to themes. The tripartite graph is illustrated in Figure 4 of Appendix A.1. This graph represents a visual gist of the whole thematic analysis as it presents all the nine themes with negative experiences and recommendations in a single picture. In the remaining of this section, we describe each theme in detail and present the tripartite graph for each theme.

Table 2

Negative experiences and recommendations from participant pilgrims

Negative experiences	Difficulties related to Masjid al-Haram; Lack of privacy for female pilgrims; Failed to touch the Hajar al-Aswad; Lack of transportation facilities; Getting lost; Difficulty in navigation; Lack of sound facilities; Lack of sanitation facilities; Harsh environment; Mismanagements of Hajj authorities; Language barrier; Lack of food and shelter facilities; Losing belongings; Lack of cooperation; Lack of telecommunication facilities; Accident; Difficulties faced by pilgrims with special needs; Carelessness of Hajj agencies; Lack of medical facilities; Unexpected behavior towards pilgrims; Lack of basic knowledge and etiquette
Recommendations	Remembering a particular spot to meet; Improving the food and shelter facilities; Easing the access to Mataf; Taking extra care for disabled and aged pilgrims; Employing technology in the crowd guidance system; Monitoring of the Hajj agencies; Improving the management of Hajj authorities; Extending the present infrastructures; Providing extra facilities for female pilgrims; Improving the telecommunication facilities; Increasing the number of well-trained volunteers; Easing the navigation; Improving the security; Improving the sound system; Improving the sanitation facilities; Monitoring the price of necessary services and products; Increase the awareness of pilgrims; Improving the transportation facilities; Improving the medical facilities; Improving the multilingual services

Table 3

Description of themes

Theme	Description
Negative impacts of overcrowding and their mitigations	How overcrowding situations exhibit different negative impacts (congestion in Mataf, transportation, sanitation, etc.) during Hajj and what might the solutions for those impacts
Accommodation issues due to agencies' mismanagement	How mismanagement of Hajj agencies cause accommodation problems to pilgrims and how to resolve those problems
Difficulties and special needs of female, aged, and disabled pilgrims	What are the difficulties faced by and special needs of female, aged, and disabled pilgrims, and ways to fulfil the needs
Lost pilgrims and getting them back	What are the reasons behind getting pilgrims lost and how to resolve this problem
Pilgrims' experiences of violations of laws and norms	What are the violations of laws and norms (having theft, losing belongings, etc.) faced by the pilgrims, and how to resolve them
Sickness of and treatment for pilgrims	How often pilgrims get sick and how far they get proper treatment
Support from law enforcing agencies and volunteers	How far the pilgrims get support from law enforcing agencies and volunteers, and how language barriers exhibit an impact here
Technological limitations and expectation to technologies	What technological limitations (limited navigation, no support while getting lost, poor sound facility, etc.) are faced by the pilgrims and what technological expectations pilgrims have
Feeling of pilgrims after Hajj	How the pilgrims feel, sense, and retrospect after the completion of Hajj

4.2.1. Negative Impacts of Overcrowding and Their Mitigation

Overcrowding is one of the leading reasons for many problems in the event of Hajj including difficulties in Masjid al-Haram, lack of transportation, lack of sanitation, getting lost, etc. If such a heavy crowd can be managed efficiently, many of those problems are expected to be resolved, or at least their extent should be reduced.

One of the crowded locations in Hajj is Masjid al-Haram. Masjid al-Haram has a total of 210 gates (Martens, 2020).

Among those, some remain closed due to heavy crowds inside the mosque. There is a specific time duration of opening and closing gates as stated by one participant, "A person was not allowed to enter if s/he went outside the time set there." P575 mentioned, "A serious problem is when crowd increases in Masjid al-Haram, volunteers keep closing the gates one after another. Then a pilgrim has to run from one gate to another to enter the mosque and often can not enter." For the same reason, P650 missed her prayer as stated, "They said to enter into another gate and because of that my prayer

missed.” P585 regrets by saying, “I can’t even touch the Hajar al-Aswad (The Black Stone). This is the biggest regret in my life.” To reduce the extent of such experiences P492 suggests making a corridor leading to Hajar al-Aswad as stated, “Authority should make a corridor by setting fence beside Rokne Yamani to Hajar al-Aswad. It will help to provide access for limited people to touch the black stone.”

4.2.2. Accommodation Issues due to Agencies’ Mismanagement

The accommodation problem is one of the most severe problems during the Hajj season. As millions of people from all over the world come to a specific location for their pilgrimage, the shortage of hotels and sometimes quality and service becomes very worse, especially in Mina where pilgrims reside in tents. Besides, the carelessness of Hajj agencies makes the situation more unpredictable.

Hajj agencies are responsible for managing the food and shelter facilities for the pilgrims. They often provide low-quality food and shelter to the pilgrims. Hence, discord among Hajj agencies and pilgrims occurs frequently. For instance, P586 shares his and his wife’s Hajj experience, “Camp was very much overloaded and cheap-rated. As the Muallem (the agency’s representatives) and Hajj agencies were dishonest, they rented low-rated and long-distanced tents. Therefore, pilgrims quarreled with the Muallems almost every time. As we faced this type of problem we didn’t stay in the tent. We stayed those time under a tree with my wife”. Besides, the number of beds at each tent is not enough for the allocated pilgrims, and in some cases, pilgrims had to reside in walkways as mentioned by P495, “Every year we see that the Muassasah (responsible authority) give fewer beds than the number of pilgrims. Each pilgrim must have beds in a proper place, not in walkways”

The participant also mentioned his recommendation regarding this harassment as stated, “Please, this is my heartiest request to you, please, please, the Hajj agencies and the Muallems should be monitored very tightly as they can’t do those types of crimes. I cried there thinking this, our brothers go to perform Hajj but they can’t perform it according to sunnah. I don’t know if we break sunnah, Allah will accept our Hajj? pilgrims should go to Hajj after studying a lot about Hajj and sunnah. Awareness should be raised there.”

4.2.3. Difficulties and Special Needs of Female, Aged, and Disabled Pilgrims

During the events of Hajj, female, aged, and disabled pilgrims face many problems which need special care, such as ensuring privacy for female pilgrims, ensuring wheelchair facilities for old and disabled pilgrims, etc. Privacy of female pilgrims is a prime concern, especially in the tents of Mina where millions of people reside in a very congested situation. Often, the allocated pilgrims in a tent are far more than the capacity. In this situation, sometimes, it is difficult to maintain the privacy of pilgrims, especially for female pilgrims as reported by P498, “There should be sufficient arrangement

in the tents to separate females’ area so that females in the same group can stay comfortably with their veil.” Besides, the prayer place allocated for female pilgrims is not enough in the Masjid an-Nabawi as stated by P203, “It would be better if there were more space for females to pray inside the Masjid an-Nabawi and importantly, time for females to visit Riadh ul Jannah should be fixed and declared.”

Pilgrims suggest to make room for people with special needs. For example, the management of wheelchairs for persons with disabilities should be maintained in a better way. Some pilgrims reported about the pathways which are not suitable for a wheelchair on some roads as P54 suggested, “Make sure that one on a wheelchair can reach all rituals on a wheelchair, does not have to navigate between cars, does not have to be carried through sandy roads, does not face inaccessible curbs that are not maneuverable using a wheelchair.”

4.2.4. Lost Pilgrims and Getting Them Back

Getting lost during Hajj is a very common difficulty faced by the pilgrims. In our survey, we have found that more than 25% of the pilgrims get lost at least once during Hajj. The reasons behind getting lost are much more diverse. Around 18% and 38% of the lost pilgrims mentioned that they get lost due to the lack of knowledge of necessary names and directions respectively. Additionally, there are about 18% of the lost pilgrims pointed language barrier as a problem for their getting lost. Even the local volunteers are not familiar with the directions of Hajj places which is mentioned by P510, “Local Hajj guides, e.g., police were not familiar with directions in Mina”. P431 states, “I was standing right there where I got lost so that when someone comes back looking for me, he or she can find me easily. I had no device or wristband or id card with me then and was unable to speak to the volunteers because of the language barrier.”

To address the getting lost problem, pilgrims propose several recommendations. P382 suggests, “Direction symbols should be large and tents should have the country flag”. P103 suggests, “Tents of different countries should have different colors to identify easily.”

4.2.5. Pilgrims’ Experiences of Violations of Laws and Norms

During Hajj, pilgrims often face several unexpected experiences, such as losing belongings, carelessness of Hajj agencies, etc. Pilgrims often lost their belongings during Hajj. This occurs not only in the Hajj places but also in the Airport. P11 states, “I lost my luggage at the airport medical facility”. P255 complains, “I lost my bag on the bus, which I had to spend 100 riyals to get.” Moreover, a pilgrim faced robbery during Hajj. However a little help they get from the security personnel. For instance, P515 explains, “In 2009, I was looted for all my money and cards in the wudu (ceremonial washing before prayer) place of the mosque. The police could not understand my problem. The Hajj office

505 *did not endorse my complaint. I and my wife were without*
506 *help. Police did not stop to help us”.*

507 The response to the theft was overwhelming. There
508 were some incidents at the King Abdulaziz International
509 Airport at Jedda as well. When asked about lost and found
510 incidents, several participants indicated that they lost money
511 and belongings (i.e., necessary documents, umbrella, shoes,
512 bag, etc.). The majority of them lost their necessary docu-
513 ments (i.e., passport, national identification card, etc.). This
514 happened in different places, i.e., airport, Mecca, Medina,
515 Mina, etc. Moreover, P255 complains that he had to pay an
516 amount of money to get back his bag - “*I lost my bag on the*
517 *bus for which I had to spend 100 riyals to get back.*”

518 **4.2.6. Sickness of and Treatment for Pilgrims**

519 As Hajj involves a high level of physical activities, along
520 with the scorching heat of Saudi Arabia, pilgrims often feel
521 sick. The temperature imbalance between the inside and
522 outside of the tent often caused severe illness to some pil-
523 grims. P75 states, “*Because of the air conditioner, I became*
524 *severely ill. The temperature difference between inside and*
525 *outside affected me during sleep*”. The hot uncomfortable
526 weather makes the pilgrims more vulnerable to getting sick.
527 Some pilgrims feel sick due to taking shower in hot water.
528 For instance, P166 recalls this issue stating, “*I felt sick after*
529 *having a bath in Arafat’s hot water*”. Around 6% of the
530 participants in our survey became partially or severely sick
531 when they got lost during Hajj.

532 The difficulties due to sickness became very severe when
533 the sick pilgrims can not get the proper treatment due
534 to miscommunication with the medical staff. Sometimes,
535 such miscommunication leads to an incorrect diagnosis. P99
536 mentions his experience of misdiagnosis in the medical
537 camp, “*I feel so much pain in my leg due to dehydration*
538 *during traveling from Mecca to Medina. However, the doc-*
539 *tors failed to diagnose and express my illness. Later, having*
540 *saline mitigates my illness*”. The medical staff often are not
541 so cooperative with the sick pilgrims. P225 adds, “*When I*
542 *was sick, doctors of Medina were not so helpful*”.

543 **4.2.7. Support from Law Enforcing Agencies and** 544 **Volunteers**

545 Despite the sacredness in its very nature, some unlawful
546 incidents occur during the Hajj pilgrimage, such as theft,
547 pickpocketing, bribery, robbery, etc. Pilgrims can complain
548 to law enforcement agencies i.e., police, or seek help from
549 volunteers in such events. However, some survey partic-
550 ipants pointed out that police and security forces tended
551 to ignore these complaints. The same types of complaints
552 are reported upon the volunteers also. Volunteers are the
553 people who participate in different kinds of activities to
554 ensure pilgrims’ comfort and receive them with hospitality
555 and generosity with the support and the supervision of the
556 Ministry of Hajj and Umrah. Many pilgrims mentioned
557 that due to the language barrier they were unsuccessful in
558 communicating with them. P431 describes the experience
559 after getting lost during Hajj. “*I was unable to speak to the*

volunteers because of the language barrier”. P659 states,
560 “*As most of the volunteers did not understand English, they*
561 *could not help us.*”

562 In parallel with stating negative experiences, pilgrims
563 provide necessary recommendations for the betterment of
564 the services from the law enforcement agencies and the
565 volunteers. P259 states, “*The number of volunteers needs*
566 *to be increased.*” Whereas P627 states, “*More female vol-*
567 *unteers should be appointed*”. Some pilgrims suggest im-
568 proving the activities of the law enforcement agencies and
569 the volunteers. P678 states, “*Police should be more active to*
570 *maintain crowd at Mataf, especially at Multazam and Hajar*
571 *al-Aswad*”.

572 **4.2.8. Technological Limitations and Expectations to** 573 **Technologies**

574 Pilgrims frequently face lack of technological support
575 in Hajj. Several pilgrims reported that they did not avail
576 the internet service in several places, e.g., hotels, open
577 places, etc. Both P218 and P223 report, “*I could not avail*
578 *WiFi connection in the hotel*”. In addition, P533 mentions,
579 “*Mobile internet was insanely expensive*”. P40 indicates the
580 prolonged activation period for mobile internet, “*I got lost*
581 *because my mobile internet was not yet activated at that*
582 *time. If the internet was activated at that time, it was highly*
583 *unlikely to get lost. Google maps help a lot.*”

584 Several pilgrims suggest incorporating technology to
585 reduce the number of lost pilgrims as P538 states, “*Like*
586 *Google Maps, there should be an app for locating the tents of*
587 *Mina*”. In addition, P680 states, “*Big screen display should*
588 *be introduced for ease of navigation*”. P625 proposes a
589 similar idea, “*Map should be displayed on the big screen*
590 *in the road of Mina*”. Apart from that, some other techni-
591 cal proposals were there for the improvement of the Hajj
592 experiences. Such as P528 states, “*Audio system in Arafat*
593 *should be extended so that everybody can hear and attend*
594 *the prayers at the Nimra Mosque*”.

595 **4.2.9. Feelings of Pilgrims after Hajj**

596 Pilgrims around the world save their earnings for years
597 to perform the Hajj pilgrimage. During Hajj, these pilgrims
598 spend the days in prayer and supplication. Though most
599 pilgrims overlook the negative experiences they faced during
600 the pilgrimage, some disappointment prevails. One of these
601 is being not able to kiss the black stone, named Hajar al-
602 Aswad. According to a tradition of the Hajj, pilgrims are
603 supposed to kiss, touch or gesture towards the stone as they
604 pass it. As P585 states, “*I could not even touch the Hajar*
605 *al-Aswad. This was the biggest regret in my life.*”

606 Besides, several pilgrims accuse the agencies of violat-
607 ing the rituals of the Hajj. P267, P275, P589, and P590
608 report, “*The agent lied about the sacrifice.*” Moreover, P585
609 states, “*To save money, hajj agencies violated sahih sunnah*
610 *(correct rituals) of hajj. For saving money, agencies took*
611 *pilgrims to Arafat at 7 Dhu’l Hajj after the maghrib prayer*
612 *(after the sunset). However, our prophet told us to go to*
613 *Arafat at 8 Dhu’l hajj after the Fajar prayer (after the dawn).*
614

That was totally against our prophet's sunnah. That is why my wife and I did not follow the agencies. Rather we followed our prophet's rituals."

In Appendix A.2, we prepare a list of comments from pilgrims. We enlist only those comments that we do not include in the above-mentioned writings to shape the paper within a reasonable size.

5. Discussion

We attain a rich understanding of the negative experiences faced by the pilgrims, the quality of services provided by different agencies as well as usage of technology to mitigate the negative experiences by exploring perceptions related to the disappointments of the pilgrims. This reinforces the issues faced by pilgrims from all over the world. Identifying these factors can mold the pilgrimage more pleasant. We organize this section to answer the research questions in this study. Later, we discuss our contribution compared to the other studies in the same research domain.

5.1. RQ1: Suitable method for analyzing the negative experiences faced by the pilgrims

Our survey questionnaires consist of both open-ended and closed-ended questions. Closed-ended questions have a limited set of possible answers. Whereas open-ended questions are questions that allow the participants to give a free-form answer to elaborate on their points. These answers can vary from one participant to another to a large extent. Since closed-ended questions can be answered from a limited set of possible answers, quantitative analysis can give meaningful insights in this case. Therefore, quantitative analysis can be performed on the closed-ended questions only. To perform quantitative analysis, we employ k-modes clustering on the closed-ended questions. In Figure 3a, we get seven and six clusters for random and optimal centroid respectively considering negative experiences-related questions. This signifies that we can categorize the negative experiences faced by the pilgrims in up to seven clusters. However, considering both open-ended questions and closed-ended questions, by employing the qualitative analysis (i.e., thematic analysis), we achieve nine themes along with 21 negative experiences and 20 recommendations. Since we can cover both open-ended and closed-ended questions in qualitative analysis, it shows more comprehensive results than quantitative analysis. Therefore, we prefer qualitative analysis for categorizing the negative experiences faced by the pilgrims.

5.2. RQ2: Negative Experiences and Recommendations from An Aggregated Perspective

Exploratory studies like ours are a good source of findings on the negative experiences faced by the pilgrims in Hajj as well as the recommendations suggested by the pilgrims. In Table 2, we enlisted 21 negative experiences faced by pilgrims and 20 recommendations to address such experiences. Our findings can help management personnel

in identifying potential negative experiences and take necessary steps to resolve such experiences. In the following paragraphs, we discuss the application of our study i.e., how our findings can help management personnel to organize a better Hajj pilgrimage.

As a consequence of overcrowding and mismanagement, pilgrims faced problems during taking part in various Hajj rituals, especially while entering into and moving around the Masjid al-Haram. According to pilgrims' recommendation, if management-level authorities ease the access to Mataf in the Masjid al-Haram by employing technology, such as the crowd guidance system, such hassle to enter Masjid al-Haram will mitigate. Besides extending the present infrastructures to make room for more people, increasing the well-trained volunteers can help in this regard.

During pilgrimage season, in some cases, the female pilgrims do not get separate accommodation and required privacy. There are also reports of poor food, lack of transportation, and lack of sanitation facilities. To improve accommodation, food, transportation, and sanitation, pilgrims recommend strict monitoring of Hajj agencies, as agencies are responsible to manage such services. If Hajj authorities in every country take steps to monitor Hajj agencies, cases of such negative experiences can be reduced.

Getting lost during Hajj is one of the severe negative experiences found in our study. In most cases, women and aged individuals get lost. In reducing the cases of getting lost, pilgrims recommend increasing the well-trained volunteers and self-awareness (e.g., remembering a particular spot to meet) of individuals. Besides, if authorities can ensure better telecommunication, multilingual services, navigation system, etc., such experience of getting lost can be reduced.

During Hajj pilgrimage, pilgrims often face unexpected experiences, such as losing belongings, uncooperative behavior from police and volunteers, etc. In this regard, pilgrims recommend improving the activities of the law enforcement agencies and the volunteers in some important spots, such as Mataf and Hajar al-Aswad, as these two spots remain highly crowded most of the time. Besides, if Hajj management authorities employ only the best-trained police and volunteers in the Hajj season, such situations can be avoided.

Sickness during performing rituals is a common phenomenon in Hajj pilgrimage. Pilgrims report scorching heat in Saudi Arabia, lack of medical services, and language barrier as the main reason for the severeness of sickness. Therefore, if Hajj management authorities can ensure air-conditioned accommodations, proper medical services, and multilingual services, the extent of sickness can be diminished.

Pilgrims report a lack of telecommunication, navigation, and sound facility during pilgrimage. Therefore, Hajj authorities should improve electricity, and audio facility in appropriate places, such as Arafat. Besides, pilgrims recommend that authorities should employ easily available as well as low-cost telecommunication services.

5.3. RQ3: Identifying Themes and Based on Themes, Analyze the Association Between Negative Experiences and Recommendations

In this part, we discuss the categorization of different types of negative experiences faced by pilgrims into different themes from an aggregated perspective. In addition, based on the themes, we explore the association of the negative experiences and recommendations with each other from the aggregated perspective. In Table 3, we provide short description of each themes, and in Figure 4 of Appendix A.1, we illustrate the association of negative experiences, and recommendations based on themes.

Our thematic analysis reveals nine themes. Each theme represents a specific type of experience. Then, we associate pilgrims' negative experiences and recommendations based on themes which form a tripartite graph in Figure 4 of Appendix A.1. In Section 4.2, we provide a detail description of each theme and corresponding tripartite graph-based association. Using our developed tripartite graph, Hajj authorities can identify similar types of negative experiences and recommendations. Then, Hajj authorities can implement those recommendations to resolve the negative experiences. The tripartite relation we revealed, can facilitate new research scope for other types of pilgrimages and mass gatherings

5.4. Our Research Contributions

In our study, we develop a comprehensive questionnaire and perform a mass-scale survey of 988 pilgrims. Prior work performed such survey on pilgrims on small-scale (Almehmadi, Pescaroli, Alqahtani, & Tope, 2021; Islam, 2021; Parker et al., 2022). Moreover, those surveys focused on specific negative experience, such as health issues, navigation, transport, etc., (Alayed, 2022; Kaysi, Sayour, Alshalalfah, & Gutub, 2012; Noor Nik Zuraina et al., 2022). In this study, we dig deeper into the possible negative experiences during pilgrimage. Then, we try to find cluster of experiences through quantitative clustering approach and qualitative thematic analysis. We are the first to perform such mixed method analysis on pilgrimage experience.

Through quantitative analysis, we get seven clusters in the survey responses. Then, we perform rigorous aggregated thematic analysis to synthesize the negative experiences faced by the pilgrims. Our analysis points out nine themes which is pretty close to number of clusters (seven clusters) from the previous quantitative analysis. Besides, in the process of thematic analysis, we find 21 negative experiences, and 20 recommendations from the pilgrims. Several studies performed thematic analysis in different fields of study (Abdullah, Guo, & Harding, 2020; Al-Ameen et al., 2020; Cannanure et al., 2020; Chen, Liu, Yan, Hu, & Shi, 2020; Peel, 2020; Thelwall, 2021; Xu & Zammit, 2020). However, performing thematic analysis to analyze qualitative responses in the context of Hajj is yet to be explored in the literature. Our study fills the gap by introducing thematic analysis for understanding pilgrims' experience in mass-scale Hajj pilgrimage.

Moreover, several studies focus on pilgrims' recommendations to alleviate the negative pilgrimage experiences at Hajj (Alkharoubi, 2020; E. A. Khan, 2011; Majrashi, 2018; Mohandes, 2008). However, these studies did not develop any association or linkage between the negative experiences and recommendations proposed by the pilgrims. In this context, our research analyzes the associations between the negative experiences and recommendations based on our thematic analysis. Our analysis unveils a tripartite association network that associates negative experiences, themes, and recommendations.

6. Limitations

The participant pilgrims in our study have diverse demographics covering different ages, gender, professions, languages, etc. However, considering the nationality, 89% of the pilgrims (n=616) among the 694 are from Bangladesh. Therefore, our study may not reflect the global perspective of Hajj and the negative experience-theme-recommendation graph may form a different shape from a global perspective.

7. Conclusion and Future Work

In this study, we perform a rigorous study to better understand the diversified negative experiences faced by the Hajj pilgrims and their recommendations to overcome the negative experiences. We conduct the study from an aggregated perspective, unlike the existing research studies that mostly explore a specific problem in isolation and mostly ignore associations over the negative experiences. Thus, our study presents a novel aspect of unveiling associations over the negative experiences and recommendations. To the best of our knowledge, such an aggregated analysis revealing the associations in the context of Hajj pilgrimage is the first of its kind in the literature.

In our study, we survey Hajj pilgrims covering both local and international pilgrims. Next, we perform quantitative analyses where we employ k-modes clustering to extract similar responses. Our clustering reveals up to seven clusters. Then, we employ a qualitative approach and perform thematic analysis over the free-text responses collected by the survey. In our thematic analysis, we extract and understand the themes inherent within the responses that comprise negative experiences experienced by the pilgrims and their recommendations as well. Our analysis reveals nine important themes pertinent to the negative experiences and recommendations. Our revealed themes cover highly congested crowds, accommodation problems, special needs for female, aged, and disabled pilgrims, technological limitations, getting lost during the pilgrimage, irresponsible behavior of volunteers and police, etc. We associate the themes with both negative experiences and recommendations. Accordingly, we reveal a tripartite graph network subsuming the negative experiences, themes, and recommendations. The tripartite graph reveals associations among the nine themes, 21 problem events, and 20 recommendations.

In the future, we plan to extend our work by analyzing the linkage between different entities (e.g., negative experiences, themes, and recommendations) with the help of appropriate theoretical framework. Besides, we will analyze our proposed graph by augmenting it with quantitative weight for each edge. Here, our goal will be to apply different bi-ranking and tri-ranking-based algorithms over the augmented graph for revealing other insights from the negative experiences and recommendations to eventually facilitate overcoming the negative experiences.

A. Appendix

A.1. Tripartite Graph Representation

Our revealed negative experience-theme-recommendation graph is illustrated in Figure 4

A.2. Themes and Corresponding Responses

Here, we enlist the themes and corresponding free-text responses from Hajj pilgrims.

1. Negative impacts of overcrowding and their mitigation:

"While traveling from Mecca to Medina there were very few toilets and those had very little water supply." - P572

"Intermittent water supply in Mecca Medina, unavailability of height toilet, fewer toilets in Arafat, less water supply, lesser protection safety in women washrooms in Arafat." - P528

2. Accommodation issues due to agencies' mismanagement:

"Because of air conditioner I became severely ill. The temperature difference outside and inside affected me during sleep." - P75

"As the temptation of money, Hajj agencies and Muallems goes beyond sahih sunnah (complete rules and regulations) of hajj. For money-saving, Muallems took pilgrims to Arafat at 7 Dhul Hijjah after Magrib. However, our prophet said to go to Arafat at 8 Dhul Hijjah after Fajr. This is totally against our prophet's sunnah. However, I and my wife were against Moallem and we do all thing as our prophet said to us." - P585

3. Difficulties and special needs of female, aged, and disabled pilgrims:

"In Mecca, female should be allocated a separate place for prayer and Tawaf." - P333

"Wheelchairs should be labeled and maintained strictly" - P433

"There should be a certain age limit for performing Hajj." - P361

"Hajj should be performed at an early age, as soon as it gets Fardh (obligatory) for one." - P637

"Free wheelchair for elderly persons should be increased." - P438

4. Lost pilgrims and getting them back:

"Road and tent number should be more clear." - P594

"There should be road maps at each cross-section (in

Mina)." - P573

"I went to the green light as our team preplanned it." - P258

5. Pilgrims' experiences of violations of laws and norms:

"To save the money, hajj agencies violated sahih sunnah (authentic rituals) of hajj. For saving money, agencies took pilgrims to Arafat at 7 Dhu'l Hajj after the maghrib prayer (after the sunset). But our prophet told us to go to Arafat at 8 Dhu'l hajj after the Fajar prayer (after the dawn). That was totally against our prophets' sunnah. But my wife and I did not follow the agencies. Rather we followed our prophets' rituals." - P585

6. Sickness of and treatment for pilgrims:

"Sufficient saline water should be arranged (for the pilgrims)" - P99

"The healthcare system can be free or cheaper for the pilgrims. The doctors' expenses and prices of medicine can be reduced at least" - P575

"Services should be better in the medical camps" - P231

7. Support from law enforcing agencies and volunteers:

"The local guards who speak Arabic are not always helpful and sometimes even act somewhat rude." - P430

"Security police were very rude sometimes (at Masjid al-Haram)." - P207

"Pilgrims from other groups take over other peoples' tents by force." - P495

8. Technological limitations and expectation to technologies:

"It was too hot inside the tents (because of the inadequate air conditioning system)". - P656

"We could not hear khutba (of the imam) for a sound system problem." - P492

"Electricity facilities (in Arafat) need to be further improved." - P611

9. Feeling of pilgrims after Hajj:

"Many pilgrims do not know the rules and regulations of Hajj properly, which create problems for others." - P544

"Majority of the pilgrims are ignorant of basic disciplines, rules, and etiquette, which cause extreme chaos and dirtiness." - P208

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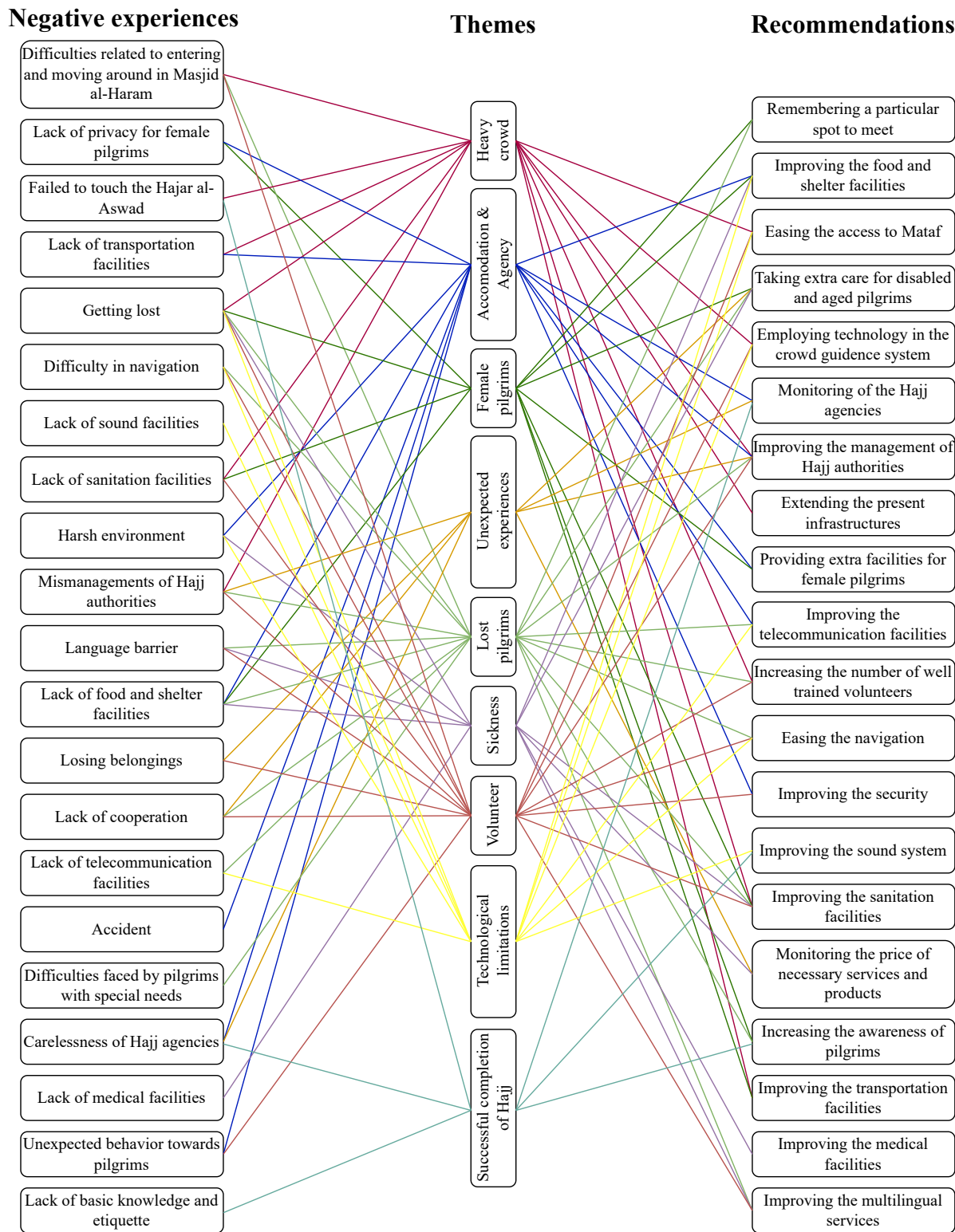


Figure 4: Tripartite graph of the themes along with negative experiences and recommendations

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